FUNDAMENTALS OF INDUSTRIAL MANAGEMENT

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Preface

THIS text is intended for courses in industrial organization and management. It aims to present the fundamentals of industrial management with several distinct features. The emphasis throughout is on decision-making. Operations research is introduced in a nontechnical fashion. The role of human relations is stressed by taking advantage of the contributions of the behavioral sciences. The essential economic foundations and relationships are introduced whenever possible, although no specialized work in that field is necessary to understand the material in this book. In addition, whatever historical background is necessary for a proper understanding of the subject has been included.

The case materials are based on actual cases adapted essentially for college courses in this subject. The cases have been deliberately kept relatively short so that they can be satisfactorily handled by students.

An underlying objective has been to present the basic principles as clearly as possible. However, possibilities of differences in practices and procedures are pointed out when the occasion exists.

A number of influences have contributed to the final product. The author's experience in business — as well as his use, over the years before and during which the manuscript began to take shape, of various texts — has been of some influence. In its developing form the manuscript has been used by the author in classes at several institutions for a number of years. The latest developments as reflected in the literature have been incorporated.

Much is owed to many colleagues and students at the different institutions where the author has taught, as well as to various businessmen. The critical comments of several readers for the publisher have been very helpful. The publisher's editor of the series, Dr. R. W. Morell, has been of considerable assistance. The author would like to take the opportunity to thank all those who have been of assistance, including his wife who assisted in the typing and proofreading of the successive drafts of the manuscript.

ALFRED H. BORNEMANN

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Chapter I

The Rise of American Productivity

As an introduction to the study of management, a survey of the development of manufacturing in the United States is worthwhile for several reasons. While developments in commerce, transportation, finance, and the public-service industries provide an indispensable basis for the development of American economic and business progress, perhaps the most spectacular reflections of growth and economic development have been in manufacturing. This field therefore readily lends itself to an illustrative introduction to our subject. Moreover, since it was in this area that the management movement first appeared, a summary of developments in this field facilitates an introduction to the management fundamentals which are applicable in all fields of business. Finally, since we are not at present engaged in a detailed study of economic and business history, it is essential to hold the material to manageable proportions.[1]

The history of manufacture reveals contributions by individuals in a number of countries. Moreover, the developments in the course of and subsequent to the period frequently called the Industrial Revolution were dependent on earlier slow advances which had evolved over many centuries. Since the rise of the factory system, however, changes and improvements have been extremely rapid, so much so, in fact, that one is apt to get the impression that they tend to become ever more rapid.

Economics of Production. Production is the creation of form, time, place, and ownership or possession utilities. Form utility is created by producing goods and services. Time utility is created by the storage of goods in public and private warehouses until they are needed by other marketing agencies for stock or by consumers. Place utility is created by marketing agencies which transfer goods by moving them to various

[1] John Chamberlain, "A History of American Business," appeared serially in *Fortune* beginning with Volume 63 (May, 1961).

locations in the market, such as retail stores. Ownership or possession utility is created by the transfer of goods from those who have no need for them to others who do have the need.

The possibilities in the development of a country's industries depend on the economics of production, which rests on division of labor and specialization, both of which depend on the extent of the market. The individual business as a specialized producer of one or more types of goods participates in the division of the work of the economic system as a whole. But its internal organization and processes of production also rest on the division of labor and specialization.

The application of power to production, the division of labor, and the transfer of skill to the machine were pointed out by Adam Smith in his *Wealth of Nations* as early as 1776. Division of labor and the transfer of skill to the machine are now reflected in labor and management specialization, as well as in specialized processes and equipment. The objective frequently sought for is mass production which involves increasing efforts for further specialization and standardization in order to achieve a high volume of output at the lowest possible unit costs. But it must be kept in mind that division of labor is always limited by the extent of the market.

Household Industry. In the colonial period when household industries predominated, family needs could only be met by such activities as spinning and weaving, smoking and salting meat, preserving fruits and vegetables, and making soap, candles, and beer within the individual household. In idle periods, especially in winter, time was devoted to the making of such things as nails, shingles, casks, and barrel staves which were sold to others. With the passage of time, raw materials for the making of goods in both these groups were sometimes provided by merchant capitalists to the wives of farmers who manufactured them into finished goods which the merchant capitalists then sold. Such arrangements were called the putting-out or domestic system.

Occasionally parts of the products were made in small factories, but itinerant artisans also did some of the work. There were also village industries like sawmills, gristmills, and fulling mills, with shoemakers, tailors, and cabinetmakers in larger communities. Shipbuilding, the fur trade, fishing, and whaling also prospered. Ironworks were developed to supply various needs.

To a considerable extent this pattern of industry persisted for some time after the American Revolution. But certain significant events foreshadowed the possibility of a far greater expansion of the factory system and the disappearance of household industries.

The Factory System. In household manufacture the family owned the equipment. But with the invention of power-driven machinery, the

necessary machinery became too costly; moreover, its operation required continuous attention by the workers and therefore they had to be supervised. For such reasons it was placed in special factory buildings to which workers went daily to perform given tasks for stipulated wages and fixed hours. Division of labor was extended, the control over the labor force became a matter of management, and the workers no longer owned their own tools. Gradually all processes of manufacture were concentrated in the factory where the machines were driven by power. Production was undertaken for the general market rather than upon special order. The possible extent of the division of labor depended upon the growing extension of the market.

The English inventions giving rise to the factory system began in spinning, with Kay's flying shuttle in 1733. This was followed by Hargreaves' spinning jenny in 1770, Arkwright's water frame in 1771, and Crompton's mule, which combined the jenny and the water frame, in 1779. Cartwright's power loom for weaving, which was propelled first by horses and later by steam, was developed by 1785. The expansion of textile manufacture greatly increased the demand for cotton, the supply of which would not have been forthcoming in the required amounts had it not been for Eli Whitney's cotton gin in 1793, which solved the problem of separating the seed and fiber in short staple fiber cotton at a far more reasonable cost than had been possible before.

After James Watt patented his improved steam engine in 1769, the firm of Boulton and Watt began the commercial manufacture of steam engines. Coal burned under a boiler produced steam, the expansive power of which was translated into the regular motion of the engine, which could be applied by means of a machine. The steam engine was therefore of great significance for the extension of machinery and factory operations and it was to become still more important when applied to transportation, first in steamboats and then in railroad locomotives. Watt's engine used low-pressure steam, it was heavy and complicated, and it was not only costly to build but also difficult to keep in repair. An American inventor, mechanic, and engineer, Oliver Evans, whose importance and influence in a wide variety of fields was not understood until recent years, built a high-pressure steam engine which was not only much more powerful for its weight than that of Watt, but also cheaper and less complex.

Early American Textile Mills. British law forbade the export not only of machinery but also of the drawings and models. In fact, even the emigration of mechanics was forbidden. But some Americans were anxious to undertake textile manufacture and at least one society made money offers for models of textile machines. Samuel Slater, a mechanic working in Arkwright and Strutt's mill in Milford, England, heard of

such offers and studied and memorized the details of Arkwright's frames in order to be able to reproduce them. When he came to the United States in 1790, he arranged to meet William Almy and Moses Brown, who arranged the financing of the firm of Almy, Brown, and Slater, with Slater getting a one-half interest. The mill was constructed in Pawtucket, Rhode Island, and was in operation by 1793. Slater's cotton-spinning mill, which for a number of years produced only cotton thread before making cloth, marked the beginning of the American factory system. It is worth recalling that this was the year the cotton gin was invented, for the cotton gin stimulated the expansion of the textile industry in New England by insuring an adequate supply of cotton. Water power was used in New England for spinning and weaving.

Weaving and spinning were not done in the same factory until 1813 when Francis Lowell and Patrick Tracy Jackson established a mill in Waltham, Massachusetts. The power loom was introduced and for the first time in America all the processes of spinning and weaving were brought together to make cloth. The resulting cheaper product helped to extend the market to the back country and discouraged the remaining household manufacture.

It is interesting to note also that, by insisting on satisfactory living conditions for the workers, Lowell was in a position to increase the labor supply by inducing farmers' daughters to come to Waltham to live and work. Before that time factory work had not been considered desirable for country girls, but they apparently liked the arrangements at Waltham and the system was widely adopted. When foreign labor increased in the 1850's, however, the farmers' daughters lost their enthusiasm. In contrast with the paternalistic but wholesome pattern established by Lowell, the Rhode Island factories followed less desirable English patterns, presumably under the influence of practices which Slater had brought over. Child labor was prevalent and working conditions generally were not very good.

Factors Stimulating American Manufacture. The tariff of 1789 was fairly low and was adopted mainly for revenue. In his *Report on Manufactures*, Alexander Hamilton in 1791 suggested a protective-tariff policy to assist in the development of home industries. Although Hamilton's *Report* did not result in the immediate passage of a law providing for higher rates, it is generally cited as one of the first steps leading to a high-protective-tariff policy which encouraged American manufacture.

The factory system as such got its real start in the period of the Embargo of 1807 and the War of 1812. After the war British manufacturers, in an effort to recapture the market from the war-born American industries, dumped goods on the United States market at ruinous prices which the American producers could not meet. The practices resulted in

public indignation leading to the tariff of 1816, which was designed to protect American manufacturers.

The patent system also exerted a stimulating influence, as can be seen from the subsequent references to American inventions. The fact that labor was scarce stimulated the desire to find methods of producing with a minimum amount of labor. At an early date lathes and screw-cutting machines were patented. Other factors of significance in encouraging manufacture will be noted in succeeding paragraphs.

In spite of the important growth of manufactures during and after the War of 1812, the scarcity of labor was a retarding factor. Moreover, transportation facilities continued to be poor for some time and prevented the extension of the market. Until about 1835 much of the power to drive the machines was water power and the streams dried up part of the time.

After 1850 factory labor, the wage system, and the wide use of steam power became much more important. Machine-made products were increasingly displacing those made by hand labor. The Civil War accelerated the growth of manufacture and, by the time of World War I, developments had been such that the stimulus of that war tipped the scale to the point where manufacture surpassed agriculture as the predominant economic characteristic of the nation.

Interchangeable Parts. A prerequisite to the development of mechanized mass production is the interchangeability of parts. The component parts of the final product to be manufactured must be so made that all of those of a given kind are interchangeable with each other; that is, they must be made so that any part of a given kind can be used instead of another of that kind. This obviously requires that they be made as uniform as possible. When the goal of making interchangeable parts has been achieved, specialization in the production of the different parts is possible. Such specialization not only makes possible a larger output of the parts, but in addition makes the assembling of the parts a specialized task. Specialization in both the making of the parts and the assembling of them results in economies of production. The achievement of interchangeability is therefore of the greatest importance.

Although Connecticut clockmakers first applied the system in clockmaking between 1807 and 1810, the principle of interchangeable parts was first applied in the making of muskets. Although the idea had been mentioned in France and Britain, it was thought to be impracticable and visionary. But Eli Whitney was not hampered by tradition. When he ran into difficulties in attempting to protect his cotton-gin patent against pirating, he turned his inventive genius to the making of firearms, the production of which was being encouraged by the government in the early years of the Republic in order to become independent of Europe

in this important field. As early as 1800 Whitney demonstrated the principle of interchangeability in producing muskets. By 1808 Simeon North, working independently, also had success with it in the same field and at around the same time another gunsmith, John H. Hall, achieved the same results. It is worth noting that the American arms manufacturing companies progressed steadily in their techniques. By the time of the Civil War the quality of American weapons had come to be recognized abroad and shortly thereafter companies producing in this field were supplying Turkey and Russia with rifles, while American machinery producers were selling machinery to England and Prussia to modernize their arsenals.

Machine Tools. The interchangeability-of-parts principle could only be applied in a small way and with little gain if developments in machinery had not progressed correspondingly. It was the machine tool which made possible the making of parts on a large scale. A tool is defined as an implement used in working, transforming, or moving material. The use of tools requires human skill unless a machine is developed to do the work, in which case the skill is transferred to the machine. A machine is a complex tool which repeats operations on successive materials and produces more units in a given period of time than can be made by hand tools. A machine in which a tool for cutting or shaping metal or wood can be placed, or made part of it, is called a machine tool. The machines used by Whitney and North were the first machine tools used for making arms.

Machine tools are frequently called the master tools of industry and they are the foundations of mechanization. They are used to make the machines bought by industrial firms for the purpose of making other

Fig. 1. A modern lathe used in industry.
— The R. K. LeBlond Machine Tool Company

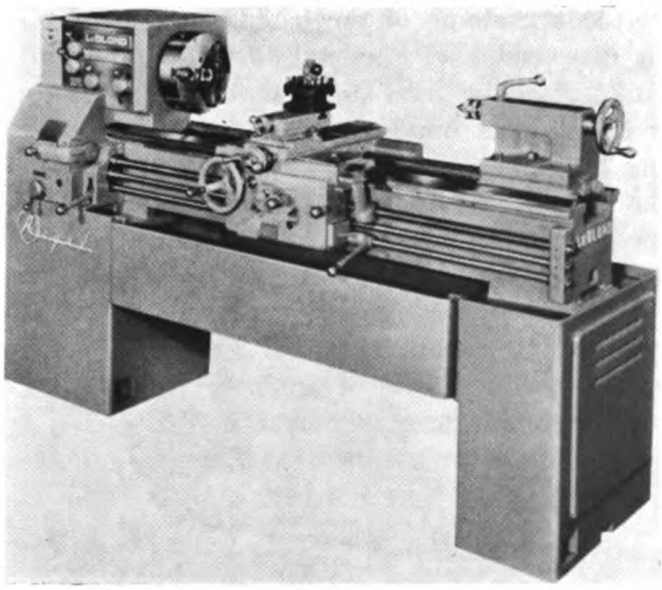
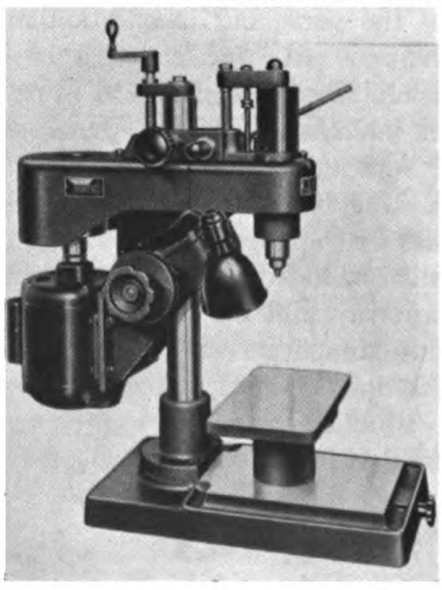
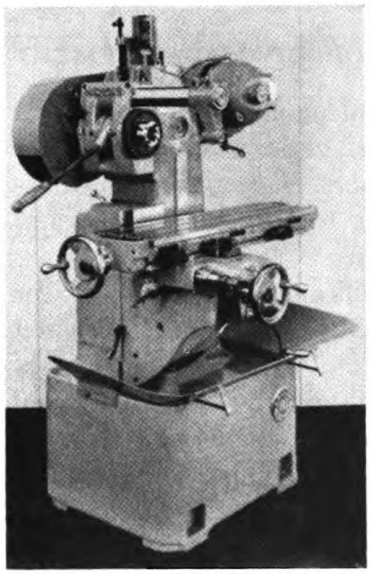


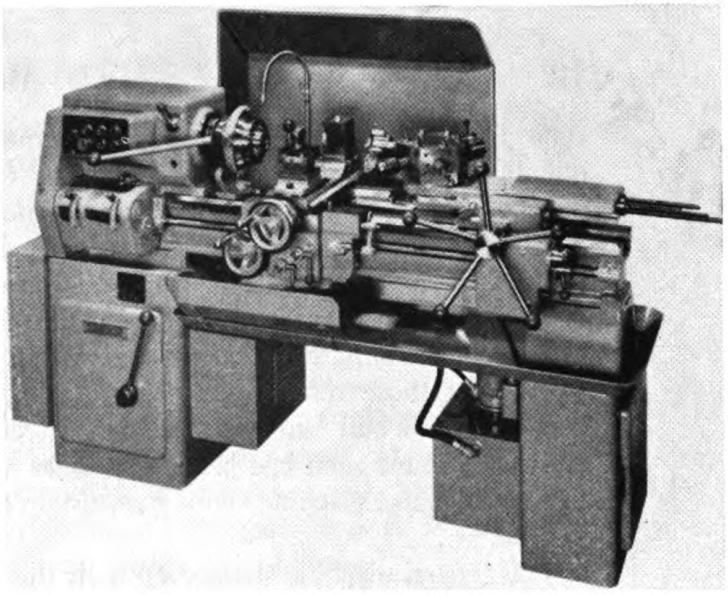
Fig. 2. A precision drill press.
— The Hamilton Tool Company





— Rem Sales, Incorporated

Fig. 3. A modern milling machine.



— Sheldon Machine Company, Inc.

Fig. 4. A modern turret lathe.

machines as well as consumer products. The lathe (Fig. 1) is a machine with adjustable centers between which an object is mounted or rotated while a cutting tool is thrust against it, shaping or turning it down generally to some circular form. The boring machine or boring mill, which bores and dresses smooth round holes, and the drilling machine (Fig. 2) or drill press are derivatives of the lathe. In the drilling machine or drill press different shaped and sized holes are drilled by pointed cutting tools shaped and sized for the different purposes. The milling machine (Fig. 3) removes metal by rotating cutters, while a planing machine is used for planing. In the turret lathe (Fig. 4) a series of cutting tools is fastened on a revolving turret and applied to a metal part in successive order.

A jig is a tool that guides the cutting tools so that their operation will be the same on each piece of metal. A drilling jig, for instance, is made with the required sizes and location of the holes, and when placed on the metal it guides the drill so that all the pieces of metal drilled will be drilled like the jig. A fixture is a tool which holds the work in place while the machine operations are performed on it. A die is a tool used in a press for forming, cutting, or perforating metals.

Machine Shops. The early development of machine shops exerted considerable influence on subsequent production methods. The gun shops beginning with those of Whitney and North were also machine shops. Not only were the machine tools for the making of firearms designed and made in these shops, but machines were also made for other types of metal and woodwork. After a time the facilities applied in musket production were extended to other metal products when the principle of interchangeable parts was feasible. The early textile mills built at least part of their machines in their own shops. With the passage of

time these textile machine shops became independent and branched out into making other articles such as tools, cutlery, and household wares. In the machine shops, improvements were made on existing machine tools but at the same time new machine tools were designed and made for general purposes or for special purposes.

A mechanical tradition of considerable significance developed. Oliver Evans' *The Young Mill-wright and Miller's Guide*, a manual designed to instruct those intending to build and operate water mills, was published in 1795 and had gone through fifteen editions by 1860. At a very early date young men had become familiar with water-driven lathes. Work in the mills and machine shops gave rise to a class of skilled workmen and mechanics.

The general machine shops eventually divided roughly into three groups. One became the machine-tool industry as such, a second group became the industries making parts on a quantity basis and assembling them into finished metal products, while a third included the metal industries which produce the iron and steel constituting the materials necessary for the manufacture of metal products. The interrelationships of the developments in the various industries were somewhat complicated, of course, and they cannot all be explored here. However, in subsequent sections some consideration will be given to industries fabricating metals and assembling the parts into finished products, as well as to the iron and steel industry.

Machine Tool and Related Developments. Bearing in mind the history of the United States in relation to geography, one would expect the early machine shops to be located in the East and especially in New England, as they were. Among others, Pratt and Whitney, Brown and Sharpe, and the Providence Tool Company were well established by the time of the Civil War. William Sellers and Company was an important and progressive machine shop in Philadelphia. Although the basic machine tools — the lathe, plane, drill, and borer — were English and European in origin, they were improved upon to such an extent that they eventually excelled those made abroad. The miller originated with Eli Whitney. The turret lathe was developed by Henry D. Stone. By 1867 William Sellers had developed a good planing machine. With the development of jigs and fixtures a good deal of hand finishing was climinated. Machine tools also increased in speed; they became automatic and were adapted to multiple repetitive action. Drilling and punching were speeded up by the multiple drill and punch, with the spindles operating simultaneously. The turret lathe had become automatic by 1900, so that one man could attend a number of lathes. Gear cutting also became automatic. By 1900 Frederick W. Taylor and Maunsell

White had developed a high-speed carbon tool steel for cutting tools, the lack of which had hitherto limited the possible speed. In 1906 they published their findings in a significant paper on *The Art of Cutting Metals.*

Meanwhile, as measuring devices were also being improved, greater accuracy was possible. Limit gauges, rules, the vernier caliper, and the micrometer caliper were developed. In 1850 Joseph R. Brown, a clockmaker, repairman, and small producer of mathematical instruments with a shop in Providence, made a small investment in equipment which led to an automatic linear dividing device for graduating rules. The new vernier caliper read to thousandths of an inch and therefore made possible greater accuracy in interchangeable parts, since it was produced at a price permitting ordinary machinists to purchase it. In 1867 the firm of Brown and Sharpe developed the micrometer caliper and at various other times since then has offered numerous improvements and advances in precision instruments. Meanwhile other companies which also produced precision tools on an increasing scale contributed to the various improvements.

The movement for industrial standards received an early stimulus when William Sellers in 1864 sponsored standardized threads for screws, bolts, and nuts. The Federal Bureau of Standards was established in 1901. A wide interest in further standardization possibilities developed during World War I and the movement received further impetus at that time and subsequently.

By 1900 the basis for the American manufacturing system had definitely been laid. But the machine-tool industry continued to make progress thereafter. Standard tools were available for all machine making. In addition, specialized and diversified equipment made possible greater variety in the interchangeable parts. Standard tools were supplemented by special-purpose tools. Machines like the turret lathe and the multiple drill were followed by multiple station tools which combined several tools into one machine. Such machines perform successive cutting processes and operate simultaneously on a number of identical parts. Jigs, fixtures, and dies increased in variety and complexity. With the improvement in tool metals, the greater reliability of the tools prevented interruptions and made possible increases in the speed of operations. With the passage of time various alloys were introduced. Even before 1930 some iron lathes were built capable of finishing a cylinder 10 feet in diameter and 40 feet in length. Boring mills were adapted to work up to 60 feet in diameter.

The making of finer tools led to greater precision of manufacture with very close tolerances. The improved gauges and measuring devices

facilitated the inspection of the parts thus produced. The increasing use of pressing, stamping, and punching machines was especially important for the automobile industry.

As steam gave way to electric power, the electric motor improved the power and speed of operations. Later the power unit was incorporated in the machines. The speed of assembly was further assisted by the application of electric power to hand tools. Although the principle had been known earlier, electrical welding was widely introduced in the 1930's. When welding became automatic, bolting and riveting operations were eliminated.

Metal-Products Industries. Industries making interchangeable parts with machine tools and assembling them into finished products developed from the second group into which the machine shops ultimately divided themselves. The growth and progress of these industries were dependent on the developments in iron and steel, which will be taken up at a later point.

The profitability of efficient large-volume production depended on the extension of the market, which was made possible by the growth and expansion of an efficient system of transportation provided by the railroads. Railroad construction required iron and steel in increasing volume and thus stimulated the expansion and improvements in iron and steel. The first locomotive engines were made to order in general foundry and machine shops. Specialized locomotive works were, however, soon established, the Baldwin works being formed for this purpose as early as 1832 and the Norris works in 1834 in Philadelphia. The early locomotives not only had a good deal of wood in their construction but they also burned wood for fuel. American locomotive manufacturers were so successful that it was not long before they were exporting part of their output to Europe.

Equipment needed by a new industry had to be designed and built by the user or by general foundry and machine shops which made equipment to order. But as demand increased companies specialized in given lines of equipment. Before the Civil War, steam engines were all-purpose stationary, steamboat, and marine engines, while locomotives were specially made. But after the Civil War, specialized equipment manufacture of a variety of new products was developed and expanded. The significance of present-day models of some of this equipment for the rapid construction of tunnels, bridges, and highway systems to which we have become accustomed can scarcely be overdrawn. The use of drilling machines in order to dynamite rock permitted hitherto unparalleled excavations. Heavy cranes, conveying and elevating equipment, dredging and excavating equipment, mining equipment, and oil well and refining equipment (Figs. 5 and 6) illustrate the manufacture of spe-

— Insley Manufacturing Corporation

Fig. 5. A 1¼-cubic yard power shovel.

cialized equipment for handling and processing material. Electrical equipment is another example of specialized manufacture. All these industries added to the demand for iron and steel by the railroads which, although it was substantial, eventually began to taper off as the railroad network was completed. To this list shipbuilding might be added, for although the American merchant marine declined, navy appropriations increased.

In the period following the Civil War, the sewing machine found an increasing market in household use, in the men's ready-to-wear clothing industry, which was made possible by it, and in the making of boots and shoes. High-precision machine tools were developed for the making of watches and clocks. The typewriter found increasing favor. As the bicycle became very popular and found a wide market, the machine shops of New England made tools for the making of bicycles, and some of them turned to the manufacturing of complete bicycles or of some of the parts. Bicycle manufacture further stimulated the development of precision instruments and also contributed the pneumatic tire, the air valve, the pressure gauge, and ball bearings, all of which were obviously

of the greatest importance for the automobile. In food canning, machinery was developed for the automatic sealing of cans, while the automatic packaging of metal, paper, and cardboard containers also became possible.

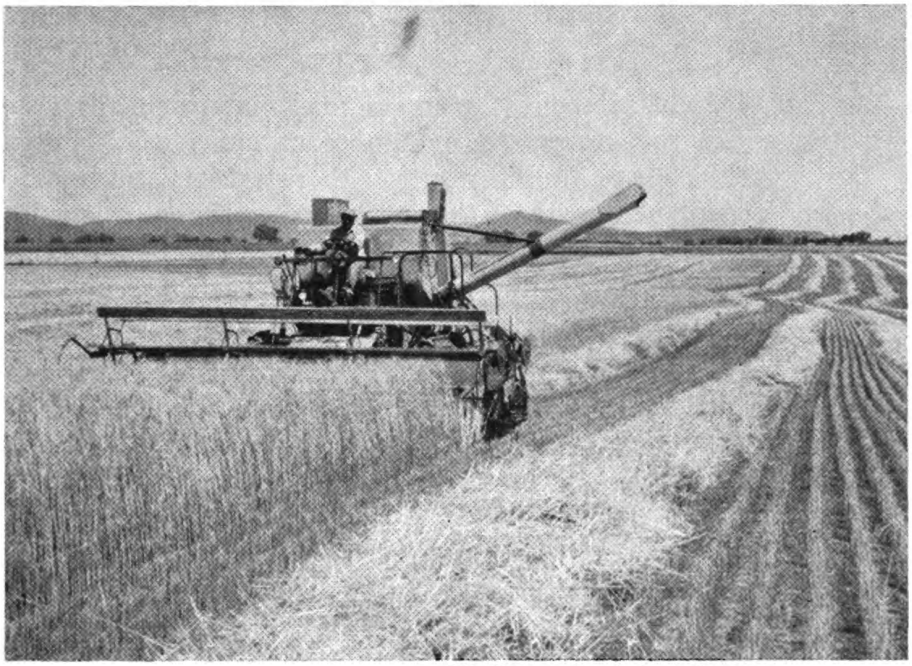
After 1900 mass production expanded in paper, steel, cement, and glass. Until as late as 1900 skilled glass blowers were necessary for glass but soon after that year machine glass blowing revolutionized the industry with important results, such as the stimulus to the electric-bulb industry. After World War I, the volume of automobile production expanded considerably, while mass production soon developed in radios, household appliances, and refrigerators as well. Machinery was applied to food packaging, cigarette manufacture, food processing, and vending machines. In World War II such methods were applied to aircraft construction and shipbuilding.

Agricultural Equipment. The developments in agricultural equipment reflected American inventive genius in response to the continuing relative shortage of labor, combined with what appeared to be unlimited soil for cultivation. During the colonial period agricultural tools were the same as had been used for many centuries going back as far as pre-Christian times. Until 1820 the equipment consisted of the hoe, the rake, the ax, the scythe, the sickle, the flail, and perhaps a plow. Thereafter, however, various types of machines were introduced on which further changes and improvements were made from time to time. Instead of being made of wood, they were made first with iron and then steel. By 1880 the foundations for mechanized agriculture were laid. The machinery which was first introduced in the nineteenth century was basically the same as that which is used today, except that it has been continually perfected and artificial power is now used (Fig. 7).

The plow, the harrow, and seeding devices are necessary for soil preparation. In 1797 Charles Newbold secured a patent for a cast-iron plow which was cast in a single piece. It was costly to operate and the farmers claimed that iron poisoned the soil and made weeds grow. The peacock

Fig. 6. Lowering-in a section of pipeline with three side-boom diesel tractors.

— Standard Oil Co. (N. J.)



— Allis Chalmers Manufacturing Company

Fig. 7. A large self-propelled combine with a 16-foot header working in wheat.

plows, patented in 1807 and 1822, were cast in three pieces and they became more popular. In 1819 Jethro Wood made a three-piece plow with the parts made from standard patterns and interchangeable, so that they could be easily replaced. Although Wood's plow, which had a steel-tipped share, was widely used in the 1830's, cast-iron plows were not entirely satisfactory and they were not adaptable to western soils. John Deere, who made three satisfactory plows with wrought-iron landsides in 1838, increased his production and sales annually thereafter and by 1847 made the first all-steel plow. His demand for steel led to the first production of plow steel in Pittsburgh. In the Oliver plow, which was first made in 1870 and widely used in the East, the cast iron was hardened by combining it with steel. The new plows greatly increased agricultural output and made the job much more effective for longer periods.

The disc harrow and the spring-tooth harrow, which were introduced after the Civil War, came into general use by 1880, as the steel required in their manufacture was cheaply available after the introduction of the Bessemer process.

Since the harvesting of many products must be done within a short time, the physical possibility of doing a given quantity of harvesting sets a limit to the acreage which can be profitably cultivated. Successful reapers to cut and harvest grain began with the introduction of the Hussey reaper in 1831, while Cyrus H. McCormick's reaper first appeared in

1834. In subsequent years, as many improvements were contributed to these two reapers by a number of individuals, Hussey did not incorporate them in his reaper, although McCormick did so. McCormick contributed some of the improvements himself, and he was also a successful promoter whereas Hussey was not. Following 1855 McCormick sold his constantly improved reapers to large numbers of farmers on favorable terms.

Mechanical rakers, which first appeared in reapers in 1854, were perfected by 1861. These improved reapers cut the grain, raked it from the platform, and then dropped it on the ground in sheaves that could be easily picked up by hand to be bound and shocked. A machine making binding easier soon followed. The Deering harvester, with a satisfactory binder and using twine, was placed on the market in 1880. The reapers greatly increased harvesting possibilities and reduced the necessary labor.

Small grains have to be threshed to loosen the kernel, the grain must be separated from the straw and chaff, and it must be winnowed to clean it of chaff and dust. Although the threshing methods first used were the traditional flail and treading floor, threshing machines began to appear about 1830, and by 1837 the first permanently successful threshing machine was introduced.

Food Processing. In the period following the Civil War there was a considerable increase in the number and variety of products being processed by factory methods as mechanization and large-scale production increased. Large-scale production developed in meat packing, flour milling, baking, and canning. Some of the more important developments in these industries are discussed in the following paragraphs.

Meat packing. The term "meat packing" originated with the necessity of pickling meat in brine and packing it in barrels for overseas trade. The lack of satisfactory refrigerating methods also made it necessary to smoke or salt meat for domestic sale by the farmers. With the rise of cities in New England, cattle were driven from the range to the slaughterhouses; this practice spread to other parts of the country, at first to New York, Philadelphia, and Baltimore, and later to Cincinnati and Chicago. With improved transportation Chicago supplanted Cincinnati in importance after the Civil War and in 1865 nine railroads combined to form the Union Stockyards. In 1867 Philip Armour began packing hogs in Chicago, and in 1877 Gustavus F. Swift established a packing plant in the same city. After Chicago became the packing center, eastern tanners moved out to Michigan, Wisconsin, and Illinois. The hemlock forests north of Chicago were the source of the tannic acid.

Until 1860 slaughtering had to be done in winter. At that time the packers began to place crates of ice and salt around the slaughterhouses

so that they could slaughter in warm weather. But since beef could not be transported very far there was a greater interest in hog raising, because pork had a much steadier market. Since Swift was anxious to sell beef in the East, he experimented with shipments in freight cars which were iced in various ways. After repeated failures, one of Swift's engineers finally discovered the principle of air circulation as applied to refrigeration. A refrigerated car was then designed and by 1880 meat was being regularly shipped to the East in refrigerator cars. Because of opposition by the railroads and eastern local interests, the packers had to build their own cars. With the surmounting of other difficulties, the packing industry became an all-year industry with a national market. These developments show in part why the packing firms became so large. They stored meat for peak periods, they took on sidelines in order to utilize the refrigerator cars on return trips, and they saw the possibilities in the many by-products.

Flour milling. Flour was first ground in homes, in some of which there were small hand mills. As early as 1632 windmills were introduced as a source of power and small streams were utilized later. The beginnings of specialization developed when a miller ground flour for others and received some of it as his toll to cover the cost of grinding. What he received he could use or sell. Eventually some of the millers bought the wheat and manufactured it for sale.

With the passage of time and the westward movement, flour milling moved westward, and by 1870 the Minneapolis flour mills began to attract national attention. They were not only using improved methods, but they were also beginning to dominate the domestic market and even getting into the markets of Europe. The advantages of large-scale production lay in buying, in filling large orders, in management, and in the ability to produce a standard uniform grade of flour as a result of laboratory work in blending. But the achievement of large-scale production required wide markets and large continuous supplies of wheat, which could be assured only by the westward expansion of the railroads. This explains in part why Minneapolis and St. Paul became a transportation center of the first importance.

Kansas City also became important as a milling center because of the rise of red winter wheat growing, which by 1892 had led to leadership in output by the state of Kansas. But the growing of hard red winter wheat spread elsewhere, and other cities also became important milling centers.

Buffalo, which surpassed Minneapolis in 1930 as the leading milling center, is favorably situated for eastern markets but it also benefited from milling in transit privileges granted by rail and water carriers. Under these privileges the freight rate is the cheaper long-haul rate from the

origin of the wheat to the destination of the milled flour, rather than two shorter-haul rates from the origin of the wheat to the flour mill and again from the flour mill to the market.

Baking. The baking industry may be divided into two groups, one of which includes biscuits and crackers which, because they are less perishable, readily lent themselves to large-scale manufacture and marketing over wide areas. Thus, the large National Biscuit Company was founded in 1890. The other group includes bread, cake, pies, and pastry, perishable products requiring the decentralization of the baking industry in or near large centers of population. Large-scale production did, however, develop in the second group because of the rise of populous cities, improved baking machinery, and truck transportation. Although small bakers continued to offer competition, they eventually all but entirely disappeared in many communities.

Canning. Although the basic discoveries in canning were of foreign origin, the industry developed most rapidly in the United States, especially after the Civil War. Before that time canning was confined to seafood and the industry was centered along the Atlantic coast. Although canning received some impetus from the California gold rush, its real start took place in the Civil War, when the Union army bought condensed milk and other canned articles. Borden, who had sought a patent for condensed milk in 1853, got his first factory into operation in 1861, just in time to have the output taken over for army use. The canning of corn began in 1880 when a machine for removing the kernels was introduced; the canning of peas began in 1893, of salmon in 1903; soups, pineapples, and the other familiar items soon thereafter. Although the only fruit juice available before 1925 was grape juice, shortly thereafter canned grapefruit juice, tomato juice, and many other fruit and vegetable juices became available.

Tin cans were handmade and were also filled by hand. This expensive

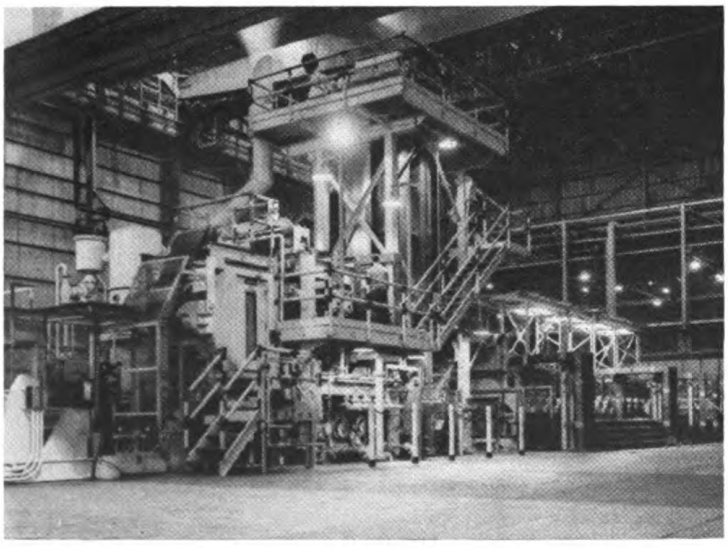


Fig. 8. Tin plate for the canning industry is coated on a massive electrolytic tinning line.

— United States Steel Corporation

procedure was soon superseded since machine-made cans were developed by 1885, after which the making of cans became an independent industry. Shortly thereafter machines for filling and sealing the cans were also invented. Figure 8 shows a modern electrolytic tinning line coating tin on tinplate for the canning industry.

Iron and Steel. As has already been mentioned, most of the industrial developments already discussed would have been impossible without the vast accompanying changes in the iron industry, the output of which was fundamental for machinery, equipment, and railroads. The whole structure of modern industry rests on cheap iron and steel.

Iron was at first made mostly in the form of wrought-iron bars, which were used by blacksmiths for the making of horseshoes, nails, wagon tires, tools, and so on. When iron ore was first reduced by smelting, the product was crude cast iron in lumps called pigs. Cast iron is brittle because it contains carbon and other impurities. These impurities were taken out to make wrought iron by subjecting the pig iron to a second refining process consisting of several heatings in an open forge and beatings under a water-driven trip hammer. The reheating eliminated various impurities and reduced the amount of carbon content. The process resulted in bars of wrought iron, which has much greater toughness and resistance than cast iron.

In the puddling and rolling process which was introduced into the United States in 1817, molten iron was first puddled or stirred to expel the carbon, then it was passed through a squeezer to expel the cinder, and finally it was rolled into bars. Until puddling was introduced it was necessary to use charcoal for heating the iron. But the new method of making wrought iron made possible the use of coal, because the open forge was replaced by a closed furnace and the sulphur and phosphorus from the coal could not affect the product. Although anthracite was first used about 1840, the use of coke began about 1850 and exceeded that of anthracite by 1875.

The use of coal made possible a large output, which could be concentrated in any area where there was sufficient coal and iron. The larger output was necessary for the growing needs of industry, including the machinery and equipment industries as well as the expanding railroads. The blacksmith's bar iron thus became of increasingly less importance in the face of the considerable variety of shapes and forms produced for industrial purposes and the railroads.

The production of steel in volume and at a low cost was also essential to the development of industry. Steel, which is harder than cast iron and more tenacious than wrought iron, had long been known and prized, but the making of steel was very costly until the middle of the nineteenth century. It had formerly been produced by first making wrought iron

and then heating the iron bars in contact with charcoal until they had absorbed the proper amount of carbon, about 1 per cent. In the Bessemer process, which was patented in England in 1855, molten cast iron (pig iron) is taken from the blast furnace and poured into a converter through the bottom of which air is blown through the molten cast iron, thus consuming the excess carbon. All the carbon is burned out by the air current and then the required amount of carbon is added before the metal is poured out into ingots, which are reduced in the rolling mill to the proper size and shape.

The Bessemer process did not remove phosphorus and sulphur, which have a deleterious effect on the final product, and hence it is only used for refining pig iron made from ores free of phosphorus. The open-hearth method eventually surpassed the Bessemer process in importance as far as output and use are concerned. In the open-hearth method, the use of which began about 1870, scrap metal and various kinds of iron are reduced to a molten state until the impurities are removed by various chemical reactions.

The new processes resulted in cheap steel produced on a large scale. While wrought iron was excellent for the blacksmith, it did not meet the requirements of the new era for which the properties of steel were desirable. Steel was therefore substituted for iron and used in machinery, railroads, shipbuilding, and structural work, while steel rails began to replace iron rails about 1870.

Pittsburgh took an early lead in iron and steel. The first iron manufacturers there were blacksmiths who forged wrought bar iron made in the rural ironworks of central Pennsylvania into finished articles. Geographical location was an important factor in the rise of Pittsburgh as the steel center because it was a connecting link between the East and West, located as it is at the head of navigation on the Ohio River. With the passage of time the Pittsburgh iron industry took over the various steps in ironmaking and all processes and operations were finally concentrated within the city, thus eliminating the rural ironworks. However, the establishment of blast furnaces at the rolling mill centers not only had to await the use of coal for smelting but it also required access to sufficient ore supplies. The use of coal permitted an increase in the scale of operations. Pittsburgh had both coal and coke. After the completion in 1855 of the "Soo" Canal, which made it possible to avoid the rapids of the St. Mary's River at the outlet of Lake Superior, the ore from the Lake Superior area could be transported to Pittsburgh by special ore steamships and ore-carrying railroads. The first blast furnace in 1857 used coke for fuel and ore drawn by rail and water. The Lake Superior ore ranges thereafter greatly expanded as the source of supply. At first

the ores in Michigan and Wisconsin were tapped, but they were hard and rocklike compared with the soft ores in the Mesabi range in Minnesota, which later commanded greater attention.

Although Pittsburgh continued to dominate the steel industry, a westward shift set in later. Shore sites on the Great Lakes were favored because of their accessibility to the ore supplies. Although coal and iron in and around Birmingham, Alabama, led to the development of a blast-furnace industry in that area by the 1880's, the enthusiastic expectations of expansion were not fulfilled, even though there is a substantial segment of the industry centering in Birmingham. In recent years steel mills have been set up in the far western states.

Improvements continued to be made in the industry. Blast-furnace improvements led to higher temperatures and increased pressure by the blowing engines. Speeded-up smelting and the use of larger furnaces greatly increased production. Rolling mills were improved with mechanical devices. The structural shapes increasingly needed for railroad bridges and skyscrapers were turned out. Plate and sheet steel output increased greatly with the rise of automobile production. During the 1920's the continuous strip mill was introduced; within a few minutes it transforms a heavy ingot into a long thin strip of sheet steel which can be wound into a tight coil for handling and storage.

The Management Movement. By the 1880's industrial enterprises had become fairly large and complex. The machinery was highly developed and operations were becoming more and more specialized. Progressive as the developments in manufacture had been, there was one aspect of production to which adequate attention had not been given. This was management itself. Although operations were interrelated, the foremen were independent managers of their own departments or shops. It is easy to see why management as a whole was overlooked when it is recalled that the men responsible for the advances in manufacturing equipment were primarily technical men who understood the engineering and mechanical aspects of operations, but had had no special occasion in their education or experience to think about management as something of a field of study in its own right.

Hence, although companies had become larger and more complex with highly developed machinery being used in production, the specialization which existed in these matters was not accompanied by corresponding planning, supervision, and coordination of the production process. In fact, the workers at the different machines were often scattered and difficult to supervise.

The American Society of Mechanical Engineers was founded in 1880 to concern itself with the development of machinery and engineering

techniques relating to production. Before long, attention was directed also to industrial management with the objective of improving production.[2]

One of the first matters the engineers turned to was the question of devising a satisfactory wage-incentive system. It was thought that if such a system could be found, it might serve as a substitute for the close supervision formerly possible in a smaller plant. Wages had generally been on a time or piece basis, with an occasional profit-sharing plan, but these methods had proved unsatisfactory. By 1886 Henry R. Towne, president of Yale & Towne Manufacturing Company, introduced a premium system which later became known as the Halsey-Towne plan of wage payment. Towne had begun even earlier to apply new management methods in his plant and his work came to the attention of Frederick W. Taylor, who was also a member of the American Society of Mechanical Engineers.

Frederick W. Taylor. Frederick W. Taylor's parents desired that he enter law and therefore sent him to Philips-Exeter Academy to prepare for the Harvard entrance examinations. Although he led his class, too much study by kerosene lamp led to an impairment of his vision and his doctor therefore advised against going to Harvard and any career requiring close study. Accordingly he was apprenticed in 1875 at nineteen as both a patternmaker and machinist in a small Philadelphia machine shop. In 1878, at twenty-two, he was a journeyman machinist and patternmaker, but he took a job as a common yard laborer in Philadelphia at the Midvale Steel Company, whose president was William Sellers. Within several years he progressed through the stages of ordinary laborer, timekeeper, machinist, gang boss, foreman, and assistant engineer to the chief engineer of the works. As a gang boss, or assistant foreman, he supervised a group of men working on lathes. His eyesight having improved, he studied engineering at night *in absentia* and earned his M.E. in 1883 at the Stevens Institute of Technology in Hoboken, New Jersey. By 1884 he was chief engineer at Midvale. He left the company in 1890 to take a position with a company owning paper mills and remained there until 1893, after which he began a management-consulting practice in Philadelphia. In this capacity, he applied his theories of management to a number of shops and establishments. In 1898 he was retained by Bethlehem Steel Company especially for that purpose.

In his job as gang boss Taylor had soon found himself in a controversy with the workers when he tried to increase the output by putting pressure on them. Since he had been a worker himself, he was aware of the practice of restricting the output, both by design and unconsciously. He later suggested that soldiering on the job was of two kinds. The one kind,

[2] B. A. Leerburger, Jr., "Scientific Management: Story of a Revolution," *Factory*, Vol. 118 (October, 1960), pp. 86–90, presents a good review of the early management movement.

natural soldiering, was the natural tendency of men to take it easy, while the other was systematic soldiering. Although natural soldiering could be overcome by an aggressive foreman, systematic soldiering arose because all men doing similar work were paid the same daily wage regardless of their output. He also knew that the workers were somewhat fearful of insecurity following the depression of the 1870's and that they were distrustful of management. At the same time, he became conscious of the fact that management had no idea of what a fair day's work really was. He concluded that these factors were responsible for such conflicts as the one he had with the workers.

He believed that the solution could not lie exclusively in wage plans, especially if management was ignorant of what the output should be. He therefore began to think in terms of measuring the time per unit of operation by means of the stopwatch in order to be able to specify the proper day's work for each operation.

Later he saw that the specifications should be derived from work at a standardized machine and finally extended the idea to require that the machines actually used in operations be of the same efficiency as the machine used in getting the standard time. He appointed a specialized foreman to attend to the machines for the purpose of keeping them in standard condition.

As a result, standard times could be specified for operations on any machine. Taylor also soon realized that since he could now know in advance when the work would be finished, it would be possible to calculate the prospective available machine capacity. The next step was planning in advance of production, which meant that the drawings could be prepared and the necessary material and tools could be scheduled in advance of production. Since it would be necessary to instruct the men in standardized practices, another specialized foreman was required. In fact, Taylor soon broke the foreman's job up into a number of specialized tasks, each of which was to be handled by what he called a functional foreman. This subject will be taken up later in greater detail in connection with organization.

The differential piece-rate system of wage payments which Taylor introduced set what was to be a rather permanently high rate for standard output and a lower penalty rate for output below standard. In 1895 he announced some of his conclusions to the American Society of Mechanical Engineers in his paper on *A Piece Rate System*, the subtitle of which he called a "Partial Solution of the Labor Problem." Although he described his wage system in the paper, his main point was that standards should be set by a time study and rate-fixing department. The engineers, however, tended to overlook the larger thesis and gave most attention to the kind of piece rate he advocated.

He continued his experiments thereafter and in 1903 set forth his system as a whole in *Shop Management*, a paper which he read before the engineering society. In this paper he suggested the desirability of a large and clearly defined daily task to be performed under standard conditions and also that the standard time be established for first-class workers. The standard task time would be paid at a high rate for the accomplishment of the standard, with a low rate for failures to meet the task. It was in this paper that he outlined his idea of the functional foremen.[3]

Among those who followed Taylor in the management movement were H. L. Gantt, Carl G. Barth, Sanford Thompson, H. R. Towne, Harrington Emerson, and Frank B. Gilbreth. Gilbreth, as the founder of motion study as a science, made a contribution which directly supplements Taylor's stress on time study. His objective was to reduce all human effort to ultimate motion elements. Whereas Taylor stressed time standards, Gilbreth stressed motion standards. With the passage of time, however, the fact that the two must be combined to make an adequate job study became more apparent.

Use of Taylor's System. Where it was used, Taylor's system showed good results. The companies which employed Taylor and his associates generally adopted only some parts of his system. But for various reasons it was for a long time not widely adopted. Among the factors impeding its use were lack of widespread familiarity with it, inertia on the part of management, the cost of installation, and prejudice by some of the self-made men toward the new professionalized managers. Some executives probably thought they would lose their jobs, especially when they had secured them mainly through having the right connections. There was also the possibility of widespread hostility on the part of the public, who it was expected might think it would result in large numbers of men being thrown out of work.

One of the incidents which reflected prevailing attitudes was that at Bethlehem Steel. This company came under the control of Charles M. Schwab, who in 1901 threw out the Taylor system on the ground that he could see no use in it. His subordinates had to put it back without his knowledge and it was not until a fire in the office destroyed the slide rules and time-study records, after which production took a sharp drop, that he admitted the value of the system.

The Taylor system came into the greatest prominence after 1910 as a result of the Eastern Rate Case hearings before the Interstate Commerce Commission in 1910 to 1911. The eastern railroads had applied

[3] F. W. Taylor, *Scientific Management* (New York: Harper & Brothers, 1947), includes his *Shop Management* and *The Principles of Scientific Management*.

for a fairly large increase in freight rates because of higher operating costs, especially higher wages. They claimed that there were no possibilities of further economies, but the shippers opposed the rate increase and secured the services of Louis D. Brandeis as counsel. Brandeis, who later became a Supreme Court justice, contended that private competitive business had developed economies in operation which permitted increases in wages without rising costs and selling prices. He brought in as witnesses a number of managers and owners of companies which had installed the Taylor system, as well as engineers associated with Taylor. It was these hearings and the talk about scientific management which led to the general use of the term "scientific management" instead of the term "Taylor system."

Not only did the term "scientific management" become popular, but more important was the fact that businessmen began to adopt the system on a wide scale. They were readily sold on it by self-styled efficiency men, many of whom were charlatans and certainly superficial. Much justifiable criticism followed their activities, but some of the criticism erroneously identified their work with the Taylor system. The fact is that Taylor understood very well that both the management and the workers had to be educated to an understanding of what is involved and that the system is not a mechanical device for quick installation to make much greater profits overnight simply by speedups. It took some businessmen a long time to learn the real meaning of the system.

Organized Labor and the Taylor System. The installations by Taylor were not in union-organized shops. In fact, organized labor was opposed to the system on the ground that the whole idea of reducing management to principles and science would really mean the end of unions. They would no longer be necessary, it was thought, because shop problems would be said to be objectively settled by scientific methods.

In the Eastern Rate Case hearings the railroads had contended that since railroad labor was organized it would be impossible to utilize scientific management methods on the railroads. As a matter of fact, the validity of their contention, for that period, was shown in an actual incident shortly thereafter. Taylor had succeeded in getting the War Department to install the system in government arsenals. In 1911 the International Association of Machinists openly resisted the effort to install the system. A congressional committee made an inconclusive investigation, but the opponents of scientific management succeeded in getting a rider to military and post-office appropriation bills in 1914–1915 which prohibited contracts to any company using the stopwatch method. In the same year the United States Commission on Industrial Relations appointed a committee under the chairmanship of Professor Robert F.

Hoxie of the University of Chicago to make a thorough study of scientific management. In the committee's critical report Hoxie wrote that scientific management

> . . . has evolved no methods of determining objective scientific fact, and has established no natural laws to which both sides must or can refer to arbitrament, equally binding upon both and through which, therefore, in the end the worker is given equal voice with the employer. In all these matters, the judgment of the employer or his agent determines the outcome, where no rules of machinery exist through which the men may express and enforce their ideas of truth and justice, and the agents of the employers, the time study men . . . are usually not fitted to stand as unbiased arbiters between employers and workmen — as the unimpeachable upholders of scientific fact and law in the midst of a struggle for personal gain.[4]

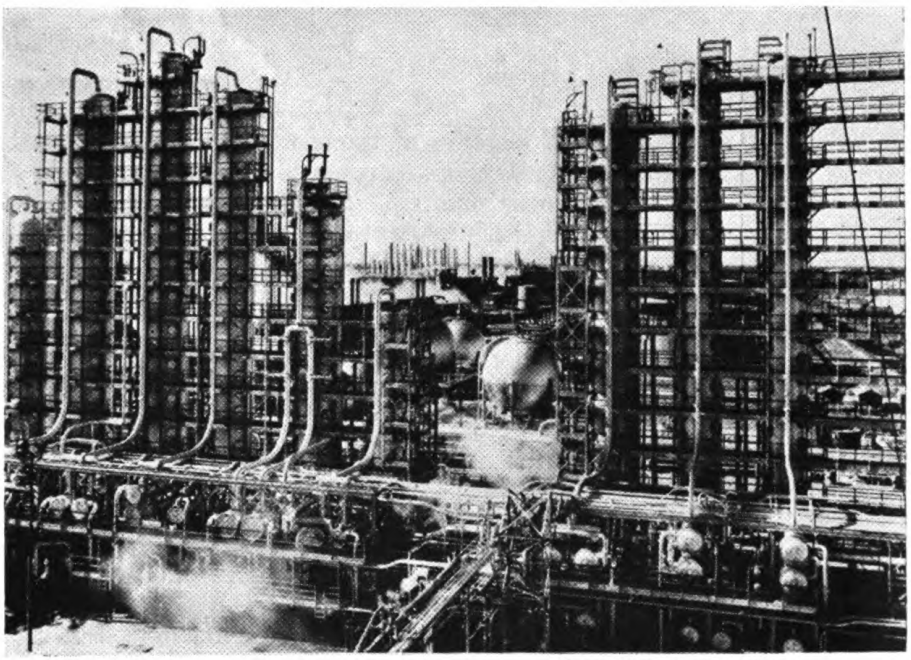
However, with the passage of time, scientific management and time studies have gained wide acceptance. Although some of the older unions still oppose time studies, they are now widely accepted by some of the newer unions, especially in the mass-production industries, and some unions have their own time-study men to supplement and check on those of the company.

Scientific Management and Personnel Administration. Opposition to scientific management died down as employment increased with the coming of World War I. Moreover, the scarcity of labor led to the centralization of the employment function in employment departments, as well as the undertaking of welfare activities which it was also thought would prevent a greater rise of unions. The development of personnel departments will be taken up separately at a later point.

At this time it is of importance to note that scientific management laid stress on the technical and mechanical problem of increasing output, whereas the personnel movement stresses the human element and emphasizes the importance of developing and maintaining morale. As can easily be appreciated these two points of view might clash under certain circumstances. In recent years, however, there has been a growing interest in human relations in industry.

Conclusion. This chapter gives some insight into the factors which shaped American industry. The objective was to survey those influences which contributed to the development of management. The material on the different industries is not intended to suggest that they are necessarily the most important. Among those which have been omitted are nonferrous metals (copper, lead, zinc, etc.), beverages, sugar refining, dairy products, shoes, petroleum, electrical equipment, and chemicals, as well as public utilities and financial institutions. (Figure 9 shows a modern petroleum refinery.) Obviously, also, the vast extension of the

[4] Robert F. Hoxie, *Scientific Management and Labor* (New York: D. Appleton and Company, 1915), p. 103.



— Standard Oil Co. (N. J.)

Fig. 9. A complex fractionating unit in a petroleum plant.

market was accompanied by important developments in marketing and large-scale enterprises in that field.

By the time of World War I, the United States had already become the greatest and most efficient manufacturing country of the world. Not only were domestic requirements being met, but there was also a surplus for export. Mechanization had proceeded apace. Standardization of products, machinery, materials, and operations had already progressed far. Management methods had been becoming increasingly more efficient. Nevertheless, there was still room for great progress as the developments of subsequent decades especially during and after World War II demonstrated.

QUESTIONS

1. What do you understand by the economics of production?
2. What reasons can you suggest as to why the developments in English textiles came at the time when they did?
3. Discuss the factors which first stimulated American manufacturers. Are parallel influences at work today in other countries?
4. What are the relationships between interchangeable parts and machine tools? What was essential for progress in this area?
5. To what present-day possibilities which we generally take for granted did progress in the metal-products industries contribute?
6. Describe the important developments in agricultural equipment.
7. Mention and discuss any food-product developments not considered in this chapter.

8. Look up brief histories of transportation and public utilities with the object of relating developments therein to those surveyed in this chapter.
9. Discuss the more significant contributions made by Frederick W. Taylor.
10. Make a list of the important new industries which have emerged since the beginning of World War II. Classify them according to their degree of importance. What factors should be considered in classifying them this way?

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Chapter II

The General Field of Management

Types of Business Activity. The various business activities which even the most casual observation calls to our attention seem at first glance to be so diverse as to make it difficult if not impossible to classify them into a reasonably small number of types which make an intelligible pattern. A little thought reveals, however, that all business activity may be roughly classified into four broad types. The first includes the acquisition of raw materials of all sorts, including food. In this group are mining, farming, dairying, lumber producing, and fishing. The second type includes manufacturing, which involves the combining of raw materials of different kinds into finished products. Manufacturing businesses include (1) those producing machinery, equipment, materials, parts, semifinished goods, and supplies for use by other manufacturers and businesses and (2) those producing finished manufactured goods for final consumption. The third type of activity is distribution, which includes transporting and marketing both raw materials and finished goods. In addition to railroad, trucking, and water-transportation companies, various kinds of wholesale, retail, warehousing, importing, and exporting businesses are engaged in this type of activity. The fourth type of activity is the providing of services of various kinds. These services include (1) personal transportation, water, gas, electric light and power, telephone, and telegraph, all of which are provided by various public service businesses, and also (2) the services provided by financial, advertising, amusement, hotel, and similar businesses. Many services are provided by the different units of government.

Firms, Plants, and Industries. Business activity is carried on through many individual firms, each one of which may be classified in accordance with the specialized activity which is performed through it. In other words, there are many separate business firms in each one of the four fields identified in the preceding section.

More abstractly, we may say that the firm is the basic business unit

within which productive resources are combined under unified control to turn out goods and services for sale. The basic business unit is not always called a firm. Sometimes it is referred to as a business; sometimes it is called an enterprise, a concern, a company, or an establishment, with or without the word "business" preceding any of these words.

The productive resources used by a business are labor and capital, which includes the buildings, machinery, and other physical equipment. Some of the buildings and equipment may be located in different geographical areas. Each such separate grouping in a different place is called a plant. Thus, a firm may for all practical purposes be the same as, or coincide with, a plant or it may have several plants. The term "plant" is sufficiently general to include not only a manufacturing but also a merchandising setup.

An industry consists of all the firms making a given kind of product. Each industry consists, then, of a number of individual firms, each of which consists of one or more plants. Since some firms make more than one product, they belong to more than one industry and as a result it is sometimes difficult to classify them.

Managing a Business. Plants and firms must be managed, which means that decisions must be made regarding the provision of adequate financing, the planning and control of the production process, and the marketing of the products. Although we shall deal at length with the important factors involved in the manufacture of goods, it is essential to recognize that many of the principles which will be considered also apply to other types of business as well. The manufacture of goods, which is called industrial production, involves the transformation of raw materials by the use of factory methods into products to be sold. A factory is simply a plant where raw materials and parts are processed or manufactured into products which are planned to be of greater value than their original value, with the objective of making the product with as little cost as possible.

A basic task of top management is planning ahead.[1] In addition, it is essential to coordinate and control the various aspects of the business in such a way as to make the greatest amount of profit possible for the business. This means that financing must be arranged, and financial reports showing the progress and status of the business provided. The income of the business and the cost of operating it must be properly managed. The plant must in the first place be located and then equipped with the necessary machinery and other physical facilities. The production process must be planned and controlled. Workers must be hired and supervised so that they do their jobs in the most efficient ways. Materials

[1] Norman F. Dufty, "The Planning Function in the Business Enterprise," *The Journal of the Academy of Management*, Vol. 4 (April, 1961), pp. 51–58.

of various sorts must be provided and made available at the proper times. The cost of production must be controlled and prices must be determined. After the products have been made, the final step is marketing. All of the foregoing factors in the management of a business are dealt with in later chapters.

Management problems differ in detail from industry to industry. Some routine details are unique to particular lines of business. Each business also has its own special problems. Our objective is to treat those aspects of organization and management which are met with in any company. It is impossible to describe in detail all the problems which might arise in each and every kind of business, let alone attempt to provide solutions. It is essential, however, to become familiar with the broader aspects of management, the major types of problems, and the policies adopted.

Management cannot be learned entirely from books, and not everyone can be a manager. Experience and common sense, which play an important part, cannot be absorbed by reading alone. Study of the factors involved in management can, however, lay the foundation for understanding problems, analyzing and appraising relations, drawing conclusions, and making decisions. Executive development is open to those with the essential qualities.[2] But this does not necessarily mean that the most satisfactory decisions will always be made, even by those with experience acquired after study. As one writer says, "One of the tasks facing managers is to find the kind of mirrors which will help them see themselves more objectively."[3]

A somewhat related question is worth mentioning. Textbooks attempt to state principles. They are influenced by the well-publicized and better methods followed by large and successful companies. Hence, when looking into the actual situation as it exists in some businesses one frequently finds wide differences from what would appear to be better practices. Sometimes there are good reasons for the prevailing arrangements, while in other instances there are not.

If only the best principles were actually followed in practice, there would be fewer difficulties even for the more successful companies. The fact is, however, that these principles are for various reasons not always followed. Sometimes responsible parties may not be entirely capable, sometimes the principles may seem to be impracticable under given circumstances, sometimes what is actually done may be simply shortsighted. But the longer-run results of any such limitations are frequently likely to be unsatisfactory.

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[2] Cf. G. Lawton Johnson, "Executive Development for Today's Business Leaders," *Michigan Business Review*, Vol. 11 (July, 1959), pp. 8–12.

[3] Edward L. Adams, Jr., "Mirrors for Managers," *Michigan Business Review*, Vol. 10 (November, 1958), pp. 6–13.

One writer has suggested that companies should develop the professional position of "Director of Intelligence Services," in order to help improve decision-making by making possible more informed balancing of alternatives.[4] Preparation for such a position would require an education cutting across various social sciences, with the objective of preparing people to be able to identify and shape the building blocks of major decisions.

It is often possible for capable and successful executives to be able to move from one industry to another. One writer lists the basic skills of such a manager as follows:

1. Mastery of the scientific method. This includes observation and invention, problem-recognition and problem solving.
2. Effective communication.
3. Understanding people and skill in working with them.
4. Organization of activities.
5. Persevering effort.
6. Memory of facts, faces, and names.[5]

Scientific Management. Management efficiency since Taylor's day has been called scientific management. In its broader traditional sense the term "scientific management" meant the application of scientific methods to all phases of management. All the functions and operations must be objectively investigated and analyzed in order to determine the best and most efficient methods of performing them. Those methods found most efficient are then adopted as standard. The objective includes not only the determination of the best methods of doing work, but also the determination of standard materials, products, and procedures. The development of standards is essential for efficient management. The investigations which are necessary in order to determine the standards are in themselves informative. Once the standards have been determined they serve as the basis of an efficient system. Some proponents of traditional scientific management maintain that the proper use of scientific method is the most important quality of good management. Some of them imply that good judgment and experience are of secondary importance to the objective scientific setting of standards. This view can be carried too far, however, since the very process involved in setting standards requires judgment and experience at many points.

In a more narrow sense the term "scientific management" has been applied to methods of securing greater labor efficiency. However, it is generally recognized that the greatest labor efficiency is not possible

[4] Marion Harper, Jr., "A New Profession to Aid Management," *The Journal of Marketing*, Vol. 25 (January, 1961), pp. 1–6.

[5] Theodore O. Yntema, "The Transferable Skills of a Manager," *The Journal of the Academy of Management*, Vol. 3 (August, 1960), p. 83 f.

without standardized equipment, an efficient layout, proper material-handling devices, and, above all, attention to human relations.

The best practices of scientific management in its traditional sense are taken for granted today, but considerable emphasis has been placed on the achievement of satisfactory human relations to encourage productive output. Moreover, management thinking has shifted to focusing on the process of decision-making. Although decision-making is discussed in the following sections of this chapter, various aspects of human relations will be taken up at a later point.

Decision-Making. Although individuals make many decisions regarding their personal affairs, few are very conscious of the intellectual processes involved in decision-making. However, it is necessary to consider this subject in connection with management, since management is essentially concerned with making decisions and in seeing to it that they are carried out. It should be noted at the outset that the managerial decision-making process, although obviously of considerable importance on higher levels, is not confined to such levels and that even a routine selection of one hand tool as against another or a decision to start work at one moment as against another is a management decision. Of course, as we shall see, the process involved in making a routine decision may be practically a matter of habit with little conscious decision-making involved.

When we ask the question, what kind of thought process should be involved in conscious decision-making, we are really asking what is logical and scientific method, for it is this method which underlies the logical mental processes which are essential to good decision-making.

Formulating Goals. A decision is a selection from among several alternative possibilities for the purpose of achieving some desired goal or goals. It is therefore essential as a first step to understand and clearly formulate the goal or goals sought. That this is sometimes difficult to do is indicated when we ask what the goal or objective planned for the particular business is. Although an immediate reply might be that the objective is to maximize profits, further thought soon reveals that this objective cannot be pursued exclusively without considering surrounding circumstances and influences.[6] Among these is the fact that some decisions will affect various aspects of the business differently, while some decisions made to achieve a goal in one part of the business will affect other parts in one way or another. Although all decisions should be based on the general objectives of the business, it is in effect impossible to evaluate all alternatives. Decisions frequently made to bring about the best results for particular segments of the firm may mean lesser possible achievements for other segments. In addition, constraints of different

[6] Cf. Robert N. Anthony, "The Trouble with Profit Maximization," *Harvard Business Review*, Vol. 38 (November–December, 1960), pp. 126–134.

sorts must be taken into account, including the possible reactions of competitors, consumers, unions, and government.

Actually, since an organization has a variety of objectives, the factors in some types of decision-making are necessarily complex. Since there are many intangibles and information as to possible consequences may not be available, the best solution may not be attainable. However, although the very best alternative may be very difficult to discover and select, a quite satisfactory alternative is usually available. In fact, most decision-making involves the discovery and selection of satisfactory alternatives which meet minimal criteria. Moreover, most decisions are not on decisive or ultimate values involving the continued existence and prosperity of the firm. Decisions on other matters are, however, related to these ends. As already mentioned, decision-making is not confined to decisions concerning the organization as a whole, since decisions relevant to the organization are also made by and for individual and component suborganizations.

Formulating Alternatives. As a preliminary, in order to develop an awareness of alternatives and their consequences, it is essential to decide what to observe. Ideas may at first be vague, but when more specific information is acquired and thought about, it becomes organized so that propositions can be formulated for rechecking, comparison, and finally the making of a decision which can be communicated. Ideas arise from a wide variety of sources. They may come from an individual's stored past experience, but some of them may be suggested by policy statements which stimulate drawing on such experience. They may come from the findings of specialists, observation, the board of directors, or outsiders. In formulating alternatives, they must be tested as to their reliability and consistency by reference to theories and principles, empirical evidence, further observation, or experience.

When the alternatives have been formulated as propositions or premises, the decision-maker is in a position to consider each alternative proposition and decide on the one which will come nearest to achieving the goal sought. Since many types of decisions must be accepted by individuals and groups, it is essential to attempt to anticipate their attitudes toward the different alternatives available. A well-received decision will improve the likelihood of its being properly carried out. This outcome also requires adequate channels of communication to and from centers of decision-making. While decisions may be accepted with scarcely any display of authority, the need for employing sanctions may develop if satisfactory leadership and communication have not been employed.

Selecting the Alternative. In deciding on the alternative to be selected, the expected consequences from each of the alternatives must be considered. Operating policies and procedures, custom and habit in

the business, past experience and practice, trade practices, the experiences of others, cost, and the time available for the formulation will influence the evaluation of alternatives and the one selected. Moreover, the degree of uncertainty present, possible alternative uses of resources, the relationship of the decision to the company's objectives, and judgment must enter into the process.

Under conditions of certainty, where the facts as to the future effects of the decision are available in advance, the only justification for a poor decision would be failure to consider all of the relevant facts. Except for certain comparatively simple problems not related to larger objectives and problems of the business, however, most decisions fall into the realm of uncertainty, and plans must be formulated on the basis of incomplete knowledge of the future consequences.

Nonprogrammed Decisions. Although decisions fall into a variety of categories, ranging from those which are very specific and repetitively made to those which are unique and even vague, decisions may be conveniently classified as programmed and nonprogrammed. A program is a detailed method of controlling the steps in the solution of a problem.

The most important decisions, which require a good deal of judgment, are nonprogrammed decisions. These decisions are made to solve new and important problems, some of which may be described as dealing with a firm's strategy or important parts of it. This kind of decision-making is likely to require a search for alternatives and information gathering. Since there are various ways of securing the information, the procedures followed may affect the final decision made. Some of the possible alternatives will not be explored after a suitable one has been found.

Programmed Decisions. Programmed decisions, which are on routine, repetitive matters, are handled by specific methods and procedures developed in an organization to deal with such matters in the best way from among alternative possibilities. Although programmed decisions were traditionally made on the basis of habit, standard procedures, and well-defined channels of information, they are now frequently made by operations research involving mathematical analysis, the use of models and simulation, as well as electronic data processing by computers.

Operations Research. Operations research is the application of scientific principles to the solution of decision-making problems.[7] Since it involves the use of scientific, mathematical, or logical methods to solve business problems with rationality, operations research may be said to be

[7] Cf. National Industrial Conference Board, Inc., New York, *Operations Research*, Studies in Business Policy No. 82, 1957; William Lazer, "Operations Research: A Management Assessment," *Advanced Management*, Vol. 26 (June, 1961), pp. 13–17.

applied decision theory. In operations research a team of specialists with backgrounds in different disciplines work together to solve specific problems. The objective is to measure the relative worth of alternatives on as rational a basis as possible with the estimates available. When problems can be reduced to mathematical terms which can be manipulated, factual and quantitative information can be provided to assist in decision-making.

The term "operations research" originated in the military during World War II, when it was used to attempt to solve certain problems. The success achieved with it attracted attention; and when applications were made in other areas, the same name was continued to describe the method and procedures.

Models. In order to carry out an operations research analysis, it is first essential to outline the framework and structure of the problem by learning its nature and scope as well as the assumptions and limitations. The problem may be in such areas as production control, inventory control, manufacturing processes, quality control, or purchasing. After all available information concerning the problem has been secured, the variables must be selected and combined in a logical way to form a model of the problem. A model, which is an abstraction partially representing and describing the real situation in order to explain the behavior of some aspects of it, is much less complex than reality, but it must be complete enough to be able to solve the problem. A model should be as simple as possible to economize time and thought, to permit ready understanding, and to permit quick and effective modification if necessary. A good model is one which is useful, despite its incompleteness, for predicting the effects of changes among the variables in the system. Models are not decision-makers, but aids to decision-making when the outcomes of various alternatives can be predicted. Although a poor model may sometimes be worse than none at all, the attempt to construct a model may be an analytical help in understanding a problem and arriving at a more satisfactory decision. Although one finds physical, template, diagrammatic, chart, and mathematical models used in industry, operations research is largely concerned with mathematical models.

Although we shall not attempt to deal with the advanced mathematical principles and methods used in operations research, the general ideas underlying the procedures should be understood. Mathematical models are used to reflect the relative influence of each controllable and uncontrollable factor or variable on the situation and to determine the effect of a change in one or more of these on one or more others. The objective is to maximize or minimize some dependent variable (e.g., profits, production costs, or tons shipped) which is a function of several independent variables when the independent variables are subject to

various restrictions on the use of resources (e.g., maximum warehouse space). The size of the dependent variable thus depends on several critical factors which are the independent variables.

All available information concerning the problem is arranged in the form of an equation or formula describing the relationships among the different variables. To write the equation, it is necessary to know the form which the interrelationships take. Inventory planning, for example, involves questions concerning what to stock, the location, and reorder levels. An optimal inventory results in minimizing the cost of acquiring and carrying the inventory, as well as any costs arising from inventory shortage. An inventory model is necessary to minimize total costs and provide an acceptable economical level of service at the expected rate of use. Such a model is a mathematical description of the inventory situation which accounts quantitatively for all factors affecting inventories as well as their interactions. Hence data are necessary on costs, demand or rate of use, and lead time to solve the model.

The objective of the decision-maker is thus a dependent variable whose value depends on the values of the independent variables. Values must be assigned to all variables, some of which may be uncontrollable or uncertain and therefore have to be determined on the basis of probability theory by means of which the ratio of chances favoring an event to the total number of chances for and against it can be determined. Probability theory, which permits the rational calculation of odds on the outcome of a contemplated course of action, can predict the likelihood of certain events and provide an estimate of the gain or loss which will result from given alternatives. Under some conditions of uncertainty, probable consequences can be estimated by what is called "subjectivistic probability." Thus the relative worth of the different alternatives can be determined within the mathematical model.

The accuracy of a model can be tested by inserting data known to produce certain results. A solution derived from a mathematical model is useful only if the variables retain their values and interrelationships. If there are any changes they must be taken into account.

Linear Programming and Other Techniques. Linear programming, which is a mathematical method for selecting the most effective of a number of possible solutions, is utilized in a number of mathematical models developed in operations research. By means of linear programming, such problems as the determination of the best allocation of limited resources or the best use of facilities, maximizing or minimizing profits, costs, or tons shipped, and so on, have been attacked. The use of linear programming is based on the fact that in a number of situations the various factors or variables can be quantitatively expressed with some degree of accuracy and related to each other in linear functions.

The assumption of linearity is a good approximation to reality in problems where it is used and it simplifies the mathematics. The objective is to determine a minimum or maximum value for a designated dependent variable in a group of constant and variable factors. The method is practicable when the element of uncertainty is relatively small.

Linear programming may be used to solve problems relating to production control, machine time, manpower allocation, transportation, warehouse control, where to buy, and where to sell. A job-assignment problem, for example, may involve determination of the least costly assignment of a number of jobs to various machines. A transportation problem may involve the selection of the least costly shipment schedule from various plants with given capacity and costs to various distribution centers with given demands and given costs of transportation. While an optimum solution to these and other problems cannot be completely accurate, an answer based on all the known facts and reasonable assumptions regarding the variables is much better than a guess.

Other methods and techniques used in operations research include game theory, which is intended to evaluate and formulate quantitatively such matters as strategy against the competition of an informed opponent. Queuing theory uses probabilities to determine answers to such questions as how many people will stand in line at a given number of supermarket check-out counters or bank windows. Sampling theory, which involves the use of carefully chosen random samples instead of full-count population figures, is used in inspecting the quality of output. Monte Carlo technique, which is a method of simulation in which data are generated by use of some random-number generator, such as a roulette wheel, makes possible approximate evaluations where sampling cannot be used because of the complexity of the situation.

Computer Solutions. The solution of mathematical equations in operations research without machines is a lengthy, time-consuming job requiring a great deal of effort. Because of the costs which would be involved in such work, the procedures would not have attracted the interest of industry had computer machines not become available. Since the introduction and use of electronic data-processing machines facilitates and speeds the calculations enormously, business interest in this type of analysis has increased considerably. Since the computing machine does only what it is instructed to do, it must be programmed by drawing a flow chart showing the relationships between the parts of the particular operation to assure that the entire process will be integrated. The flow chart presents the logic of the solution, after which the flow chart is translated into specific instructions to the computer.

Economic and Social Setting of Business. One of the broader aspects of management is its changing status. Historically, the management of

a business was more or less a personal matter, with the owner himself usually the manager. His chief responsibility was to himself, and he had to adjust himself only to market forces. With the passage of time, however, a number of significant changes have taken place. Businesses have grown larger and the owners are frequently widely scattered stockholders who are no longer the actual managers. When management is thus separated from ownership, those actually managing a business have an obligation to the stockholders. Moreover, attitudes toward labor have changed considerably. More consideration of workers as individuals has developed. Employers take the view that it is desirable to pay the highest wages they can afford to pay because high wages in general make it possible to buy the products of industry. The desirability of leisure time is also recognized, not only because it makes possible the wider use of industrial products, but also because leisure-time activities promote morale and stimulate citizenship and community activities. In addition to recognizing its obligation to stockholders and labor, management has also come to appreciate more fully its obligation to consumer interests. By providing consumers with the most satisfactory product possible at the best price, with due regard to stockholder and worker interests, they can buy more goods and the company's, as well as the consumer's, interests are served. Since forward-looking management is also interested in the general public welfare, attention is directed to community and national affairs. Thus, as management has come to realize that it has a sort of trusteeship for stockholders, workers, consumers, and the public, it has developed a social point of view.

Although a realization of these matters was already fairly widespread among management men by the 1920's, there were nevertheless sufficient maladjustments, difficulties, and abuses of various sorts in those years as to result in the collapse beginning in 1929. For several years thereafter attention was largely directed to survival, while the government sought to bring about conditions conducive to revival under private auspices. Substantial revival was, however, hindered by the banking collapse late in 1932. Beginning in 1933, the New Deal of President Franklin D. Roosevelt's administration set in motion a series of regulatory measures which stimulated business activity in some areas but raised many problems for management.

The National Industrial Recovery Act in 1933 provided for the forming of trade associations to formulate codes of fair competition. Although later declared unconstitutional by the Supreme Court, this Act exercised considerable influence in giving an impetus to the growth of labor unions which were further encouraged by the enactment of the National Labor Relations Act of 1935. Meanwhile, the federal government undertook the financing of large-scale programs of relief and public works in

order to alleviate unemployment. The increased government outlays were made possible by deficit financing and increases in taxes. Income taxes were increased partly in order to raise additional revenue and partly because of a social philosophy designed to equalize incomes. A program of social security was legislated and new taxes were imposed for this purpose. The sale of securities was made subject to regulation. Agricultural production was regulated with the object of reducing the output and raising prices.

Although a principal objective was to achieve high levels of employment, this objective was not attained until the country became involved in World War II. During the first term of the Roosevelt administration, unemployment was relieved to some extent, but it nevertheless continued at high levels, and the serious decline in business activity in 1937 brought renewed difficulties. It was not until about 1940, when the defense program was more actively undertaken, that the real beginnings of decreasing unemployment could be seen. Thereafter, with the draft, the war production program, and active participation in World War II, unemployment was at a minimum. But the demands of the war economy brought about drastic controls.

The dynamic changes in the climate of opinion in which business had to operate in the period from 1933 to about 1940 imposed many problems for management. These problems were succeeded during the war period by detailed regulatory measures governing prices, materials, and labor. It is difficult for those who were not concerned with price and material controls to imagine the problems which arose. It is perhaps not so difficult to see how a tight labor market would encourage the further expansion of labor unions and a more demanding attitude on the part of workers who could not be readily replaced. The various difficulties did not, however, prevent the notable production achievements of American industrial management during the war.

With the relaxation of controls following the cessation of hostilities in 1945, a more normal environment for management set in. Prosperity was widespread, prices and profits high, and no feeling of crisis developed, even at times when business activity fell off somewhat. Following the outbreak of hostilities in Korea in June, 1950, business activity and employment continued at high levels. Although increasing regulatory measures raised a number of difficulties for a while, the military action was soon over; and, though the succeeding prosperity was marked by downturns in business, they were much less serious than that of the 1930's. Although considerable unemployment set in on one or two occasions, the general difficulties in that regard were, by comparison, mild.

Other problems, however, arose. For everyone, including management,

rising prices and inflation constituted a really serious problem. For management specifically, annual union demands for pay raises either as additional wages or in the form of what came to be called "fringe benefits," such as pensions, sick pay, hospitalization, and so on, became a significant problem. One of the most widely discussed and controversial issues was whether wage increases were a cause of the rising prices and inflation.

The fact that private business enterprise continues to be viewed favorably by most Americans raises a challenge to management to continue to justify such confidence. At the same time, mistaken proposals which would tend to destroy the business system have to be guarded against. Management must be alert to actual and potential changes and influences. As an integral part of society, business not only exercises considerable influence on other activities but is itself influenced by them. While the objective is to operate at a profit, it is possible to do so only if goods and services are provided at prices which people are willing and able to pay. If products are not forthcoming at such prices, if large-scale unemployment develops, or if abuses of trust take place, public demands for considerably more government intervention are likely.

Public Relations. Public-relations activities have become increasingly significant in modern business organizations.[8] Whereas formerly "a company's relations with the public were presumed to be good until they got so bad their fragrance was overpowering," today public relations is more concerned with preventing misunderstanding by publicizing policies and practices.[9] One of the interesting but difficult questions is just how wide an area should be included in a company's public-relations program. Its location, size, scope of operations and markets, and so on, are factors; but the exact determination of what to stress and where is not easily arrived at. Since relations with labor, the community, colleges, stockholders, and the public in general may be involved, the department responsible for such work may be called the public-relations department.

Opportunities in Management. The beginner in industry should familiarize himself with future possibilities for which his training and experience will fit him, not only within the business and the industry but also in allied industries. He has to consider his own personal future possibilities as well as the future of management and business in general. As far as his personal future is concerned, a good deal depends on himself, much on the practices and traditions regarding advancement within the company for which he is working, and a certain amount on

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[8] National Industrial Conference Board, Inc., New York, *Public Relations in Industry*, Studies in Business Policy No. 80, 1956.

[9] Anthony De Lorenzo, "Public Relations in Modern Management," *Michigan Business Review*, Vol. 10 (November, 1958), p. 17.

luck, business conditions, government activity, and so on. Anyone who expects to move toward the top should have an interest in broad management problems, as well as in the economic and social setting within which business operates.

Some of the types of jobs and the opportunities in industry will become evident in succeeding chapters. Regardless of the particular job one takes, however, he should also have a basic understanding of the various other phases of the business, because they are all interrelated.

A number of positions in established industrial companies are more or less within the province of engineers. A good many aspects of the physical facilities, for example, can best be appraised by engineers. Research and product development is the work of different specialties. Although mechanical engineers are frequently found in various managerial positions in industrial plants, such matters as time and motion study or methods work in general are often handled by industrial or administrative engineers.[10] However, such work is sometimes done by men who have not taken a formal industrial-engineering curriculum, but who have done specialized work in industrial management. The technical knowledge which is necessary for production-control work varies.

The nature of some industries is such that a person who is not technically trained could not advance far up the management line. In some instances, however, technically minded individuals can progress without very much formal training. In still other instances, the production process is relatively easy even for others to comprehend adequately. These comments apply to such work as production control and purchasing.

Personnel work provides opportunities for those with varying backgrounds.[11] This field has been expanding over the years, and the number of employees needed has likewise been growing. However, so many have been interested in such work that it has sometimes been oversupplied with applicants.

Accounting offers many and varied opportunities. Financial accounting involves not only the supervision of the books of account but also the preparation and interpretation of financial statements. Cost accounting and budget work are done by men who have studied a good deal of accounting, but these men should also have a good background in management in order to be most effective.

It is not always necessary or even desirable for the college graduate seeking an opportunity in industry to decide on the particular job he

[10] See National Industrial Conference Board, Inc., New York, *Industrial Engineering: Organization and Practices*, Studies in Business Policy No. 78, 1956.

[11] James I. Patin, "Self Development of Personnel Men," *Michigan Business Review*, Vol. 13 (January, 1961), pp. 2–5, in discussing what one company is doing for its personnel men, mentions qualities sought and not sought of candidates for personnel positions.

would like to have. As a general rule, one should try to decide first on the general business field or industry in which he would like to work. If the decision is to enter manufacturing, for example, then the next step would be to study some established companies and their policies in order to decide on several which would be agreeable. After making such a decision, application can then be made to those companies. It will frequently be found that the different companies have varying policies regarding what they consider desirable entering positions. After getting a position the possibilities within the company will become clear, and opportunities for improving one's status by advancement will ordinarily present themselves.

An increasing number of companies have established management-training programs, which range from informal methods to highly organized programs. Informal programs may involve rotation among various activities of the business, with actual work in some or all of them and perhaps only observation of others. Formal programs may go so far as to be organized along the lines of an educational institution, with carefully worked out contents and materials as well as a planned sequence of studies possibly combined with job activity.

It is not always feasible to select a company and then develop within it. Information regarding opportunities is difficult to organize even in the best of times. Moreover, new businesses and industries are always under way, and they may provide better opportunities than established ones. Hence, employment agencies, help-wanted advertisements, friends, and so forth may have to be depended on to get a position. In such instances, one does not have as clear cut a choice in deciding on the particular company to work for as when he makes a selection from among well-established companies. The situation is, of course, more difficult in periods of recession or depression, when the exigencies of conditions make for a limited choice and the need for expediency in getting a job.

Conclusion. The American business system is frequently referred to as a business-enterprise system. In order for it to continue to grow and prosper, many enterprising men and women are needed to undertake and operate businesses. Not everyone has the inclination or ability to be an enterpriser, but there is a need for more enterprise on the part of college graduates. Even though finances may be a problem, the orientation and ambition of all too many are to study business in order to work for already existing firms. While the study of management is a definite help in preparing the student for doing so, it should be kept in mind that it is also of assistance in preparing him to undertake and operate a business of his own. Although the schools of business cannot teach students how to be enterprisers, they expect and hope that some

will be such. Since this is perhaps too passive an approach, it is desirable to emphasize the importance of enterprise whenever possible.

QUESTIONS

1. In the financial world, companies are classified as industrials, public utilities, and railroads. How does this classification compare with the types of business activity described in this chapter? Which classification do you think is better?
2. Is it possible to identify specific fields in which it would be difficult to place firms in one particular industry? Mention and comment on several firms which might be difficult to classify.
3. How would the necessary ability best be developed to achieve success as an executive who can transfer his activities from one industry to another?
4. What do you understand by scientific method? Is experimentation possible in management?
5. Make an analysis of decision-making in terms of the role of judgment exercised in the different types of decisions.
6. Are the public-relations activities of business propaganda? How would you distinguish between the two? Consider some companies of which you have some knowledge, even though comparatively little, and try to determine the desirable scope of their public relations.
7. How would you decide on the merits of a company's management-training program for college graduates?
8. What value do you think might lie in the suggestion that it would be desirable to profit from the "school of hard knocks" by taking a succession of several jobs in different companies for several years before deciding on one's lifework?
9. Could there be any disadvantages for an individual in getting into a good management training program of an established company in order to grow with that company?
10. It is frequently pointed out that in a private enterprise economy such as ours we should be certain that enterprising individuals undertake new businesses, and yet the colleges and departments of business administration are instead developing potential employees for established businesses. What could the colleges do to encourage more enterprisers?

CASE: Middle States Insurance Company

The Middle States Insurance Company, which was founded by John Thompson forty years ago, has been developed into a rather large firm. Thompson chose his associates in management with some care and perhaps good fortune, as shown by the fact that his top-management team has for years cooperated very well and successfully together. Of these men, the one with the company the least time has been there for fifteen years. Much of the management's attention has been given to matters relating to steady expansion.

The company has been successful in developing and maintaining a good field organization, as well as an office organization with high morale. It does not

have any well-defined training program but for the most part has been following a policy of promotion from within, except for the top-management group for which there has been no need for replacement.

When Thompson himself reached the age of sixty-eight he decided to survey the age of his top-management team, and found the youngest one was fifty-two. He felt that some arrangements should be made for succession to posts on the top team. In discussing the problem with his managers, there was division of opinion as to whether any men within the organization were qualified to be moved up. If not, it was generally understood that this was no fault of the employees, some of whom might have been good management potential if arrangements had been made looking forward to the problem which was now faced for the first time.

One suggestion made was that some kind of training program might be desirable to provide for promotion from within. Another was that it might be desirable to get at least some experienced but younger management men in from the outside.

Before any decision was made Thompson died. After a brief period of indecision on the part of the management, the fifty-two-year-old executive was incapacitated and it was not clear when he might be able to return to work.

1. What would be the best policy for this company now?
2. If one of the present managers heads up the company, what should he include in his program?
3. If a man is taken in from outside to head the company, what qualifications should he have and what should he include in his program?

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UNIT 2

ORGANIZING AND LOCATING THE BUSINESS

Chapter III

Choosing the Legal Form of Business Organization

THE common legal forms of business organization are the single proprietorship, the partnership, and the corporation. Although the sole proprietorship and the partnership are of limited importance for large enterprises, the partnership is frequently found in medium-sized businesses. Since the sole proprietorship helps to understand the partnership, it will be briefly considered.

Sole Proprietorship. The sole proprietorship is easily formed. Anyone has the right to undertake such a business without any formality except such licenses or permits as may be specified for particular lines of activity; but such requirements would have to be complied with by any other form of business as well. The owner can personally manage his business with a considerable degree of flexibility, and he does not have to take into account the possibly conflicting ideas of others. In addition, he may have more incentive than if he were working for a larger organization. There are also no organization or franchise taxes, and income taxes are on personal income only, not on the income of the business as well as on the personal income derived from the business.

To these advantages there are, however, certain offsetting disadvantages. For one thing, the capital is largely limited to the personal resources of the proprietor, except that certain property might be mortgaged, and borrowing from trade creditors may be possible. More important, perhaps, is the fact that the single proprietor is personally liable to the extent of his personal fortune for the debts of his business. While this unlimited liability might itself exert some check on expansion, the inability personally to manage a much larger enterprise effectively may also retard expansion. The question of effective management is particularly important because, with expansion and the accompanying delegation of authority, responsibility is divided and control tends to be dissipated at the same

time that the increased financial responsibilities give rise to correspondingly greater personal liability. A final limitation of the single proprietorship is its lack of stability as a continuous organization since it is terminated by the death, insanity, or bankruptcy of the owner. While the last of these possibilities is the only one which would personally concern the proprietor, all three of them make for a lack of stability, which is reflected in a more limited credit standing than other forms of business have.

General Partnership. A partnership is an association of two or more persons to carry on, as co-owners, a business for a profit. Although the partnership form of organization rests on the law of contracts, the Uniform Partnership Act, drawn up as an attempt to codify partnership law, has been enacted into statute by a number of states.

Although a partnership agreement may be oral if it can be performed in less than a year, it is desirable to have a written agreement. A partnership agreement should include provisions regarding the nature of the business, the capital contributions, changes in capital, interest on capital, withdrawal of capital, interest on loans and withdrawals, division of profits and losses, salaries of partners, dissolution, settlement after dissolution, the accounting system to be used, and the settlement of disputes.

Unlike the corporation, the partnership firm is not a legal entity apart from its owners. Therefore a legal suit must be brought in the names of all the partners, and not in the firm name. Since each partner is an agent of the partnership for its business, he may bind the partnership by any act which is apparently necessary for carrying on the business.

In the absence of an agreement, profits and losses are shared equally regardless of the capital contribution of the various partners. It is to be noted, however, that the liability of each partner is unlimited in the sense that if the partnership is unable to pay its debts each partner can be held responsible to the extent of his personal fortune. A partner with larger personal assets than those of another therefore risks a larger amount. In other words, in the event of financial difficulties, if the liabilities are such that one or more of the partners cannot meet his share of the debts from his personal assets in accordance with the proportions agreed upon for sharing losses, any partner having more than enough to meet his own agreed upon proportion is obligated beyond that amount to the extent of the unsatisfied debts and his remaining personal assets.

A partnership is dissolved by contract, that is, by the lapse of the agreed period or by mutual agreement to dissolve, by the bankruptcy of a partner or of the partnership, by the withdrawal of a partner where no fixed term has been agreed upon, by the death of a partner, by war between the nations of which the partners are citizens, by court decree in cases of misconduct prejudicial to the carrying on of the business,

by insanity, by breach of the partnership agreement, by inability to carry on the business except at a loss, or by the court's finding that dissolution is necessary and equitable.

When a partnership is dissolved the claims against the partnership are settled in the following order: first, those owing to creditors other than partners; second, those owing to partners other than for capital and profits; third, those owing to the partners in respect of capital; fourth, those owing to the partners in respect of profit.

A partner cannot assign his interest in the control and management of a partnership to anyone else. The partnership contract is a personal agreement by the partners and it can end only in the ways previously specified. Under the rule of *delectus personae* every partner has the right to choose his own partners. Therefore no partner can assign his interest to anyone else without dissolving the partnership unless the remaining partners accept the new partner. Under this rule the heirs of a partner have no right to succeed him without the permission of the other partners.

Like the sole proprietorship, the partnership is easily and inexpensively organized. It is free from government control and from organization taxes. Although income taxes must be paid by the partners on their income from the partnership, the business itself does not pay such tax in addition. The personal incentive of the partners is likely to be almost as great as that of the sole proprietor. Of course, the partners can contribute a larger total of capital than a single one of them could invest in a sole proprietorship. By the same token, their combined credit is greater than would be that of any one of them alone. This credit is, of course, enhanced by the unlimited liability feature.

On the other hand, there are certain disadvantages in the partnership form. The unlimited personal liability might discourage individuals from entering a partnership. There is a fairly high degree of uncertainty regarding the stability and continued existence of the partnership. For this reason, longer-term borrowing power on the general credit of the business is likely to be limited. The fact that there is divided responsibility and authority may also give rise to difficulties and conflicts.

Limited Partnership. In order to avoid unlimited liability on the part of one or more partners, the limited partnership device may be utilized. The limited partnership is an agreement drawn strictly according to statutory requirements between one or more general partners who have all the rights and liabilities of general partners and one or more limited or special partners whose rights and liabilities are different.

The limited partnership must file a certificate disclosing such information as the name of the partnership, the character of the business, the place of business, the name and residence of each member, the duration

of the partnership, a description of the original capital contributions, a statement of the liability for any additional contribution of the limited partners, the compensation of the limited partners, and the terms of their withdrawal. These provisions are for the protection of creditors. Other provisions to protect the creditors from thinking that limited partners are general partners with unlimited liability are that the names of the limited partners be excluded from the name of the business, that they be in no way held out to the public as general partners, and that they may not act as agents of, or make contracts for, or participate in the management of the partnership. In view of the general nature of the limited partnership, the limited partner may sell his interest to another without causing dissolution of the partnership. Dissolution occurs only according to the terms of the agreement or by those acts of general partners which terminate a general partnership.

The limited partnership is easily formed, and the taxes are similar to those of the general partnership. Because of the limited-liability feature, the amount of capital which this form of business organization can attract is greater than that of the general partnership, for some individuals are much more likely to be willing to contribute capital with the possibility of sharing in profits without the greater risk of unlimited liability. Moreover, the sharing in profits may be more attractive than making a loan at a lower rate of return. Finally, since the business acquires additional capital, its credit standing is enhanced.

Against the advantages of increasing the capital available and enhancing the credit standing of a single proprictorship or general partnership, there remain the disadvantages of impermanence, the unlimited liability of the general partners, and the problem of raising still larger capital. It is also important to notice that limited partners are likely to be treated as general partners in states other than the state in which the limited partnership was formed. Furthermore, although the limited partnership interest is legally transferable, in practice it is much more difficult to find a buyer than it is to sell the shares of some corporations, for the capital of a limited partnership is likely to be derived from persons who know the general partners well.

The Corporation. As a device for raising and controlling large amounts of capital, the corporation is by all odds the most important form of business organization. The rise and expansion of modern large-scale industry as we know it was in no small measure facilitated by the availability of the corporate legal form of business. The reasons for its importance lie in its legal attributes, according to which a corporation is a legal person independent of those who own and operate it and with the right to sue and be sued in its own name. The owners are not personally liable for its debts. Its life, which may be perpetual, is specified in the

charter granted by the state and does not depend on the personal fate of its owners.

The classical definition of a corporation is that laid down in 1819 by Chief Justice Marshall in the Dartmouth College case:

> A corporation is an artificial being, invisible, intangible, and existing only in contemplation of law. Being the mere creature of law, it possesses only those properties which the charter of its creation confers upon it, either expressly, or as incidental to its very existence. These are such as are supposed best calculated to effect the object for which it was created. Among the most important are immortality, and, if the expression may be allowed, individuality; properties, by which a perpetual succession of many persons are considered as the same, and may act as a single individual. They enable a corporation to manage its own affairs, and to hold property without the perplexing intricacies, the hazardous and endless necessity, of perpetual conveyances for the purpose of transmitting it from hand to hand. It is chiefly for the purpose of clothing bodies of men, in succession, with these qualities and capacities, that corporations were invented, and are in use. By these means, a perpetual succession of individuals are capable of acting for the promotion of the particular object, like one immortal being. [Dartmouth College *v.* Woodward, 4 Wheaton (U.S.) 518 (1819).]

Corporations in the United States were originally chartered by the state legislatures. A charter was regarded as a privilege. This theory of the charter as a privilege was soon succeeded by the view that the securing of a charter is a right which should be open to all. Another factor encouraging the change in outlook was the bribery and corruption of legislators. Such practices had become widespread in efforts to secure corporate charters. As early as 1811 the legislature of the state of New York passed the first incorporation law making it possible for any five or more persons to secure a charter to form a manufacturing company by filing a document with the secretary of state. By 1837 a general incorporation act permitting incorporation for any legitimate purpose was passed in Connecticut. Other states soon followed.

Corporations generally were not permitted to hold stock in other corporations until New Jersey in 1888 amended its general incorporation law specifically to permit this practice. This and other steps liberalizing the New Jersey law made the state an attractive one in which to incorporate. But other states entered into competition for the incorporation business, which is a fruitful source of revenue, by liberalizing their requirements still further. New Jersey's early popularity was succeeded by that of Delaware, which still retains the lead. Although some other states have gone much further than Delaware in the simplicity and looseness of their requirements, because their corporation law is not entirely settled, and since Delaware's requirements meet with general satisfaction, other states seeking to attract such business have not been especially successful in doing so.

Factors in Incorporation

State of Incorporation. A corporation incorporated under the laws of a particular state is called a domestic corporation within that state. When it is doing business in another state it is known as a foreign corporation in the other state. The states prescribe by statute the conditions under which foreign corporations may do business within their borders.

An initial corporation tax or fee, usually based on the authorized stock of a corporation, is levied by the state in which incorporation is sought. Although the tax may be a flat charge per thousand dollars of authorized capital stock, it is more frequently a graduated scale with a smaller charge for additional amounts of authorized stock. There is also a small filing fee. While the initial tax may be important in some instances, it is after all a single payment, and therefore need not ordinarily be given so much attention as the recurring annual franchise tax. In some industrially and financially important states, including California, Connecticut, Massachusetts, and New York, the income tax has replaced the franchise tax. A state income tax may, however, be levied in addition to the franchise tax. Corporations, like proprietorships and partnerships, must also pay state and local property taxes.

Among the legal requirements which must be considered are requirements regarding directors, the place of corporate meetings, the voting and subscription rights of shareholders, and the powers of directors. In a number of states some of the directors must be citizens of the state, and usually a stipulated nominal amount of shares called directors' qualifying shares must be owned by each director. Most states permit directors to hold their meetings outside the state, but relatively few permit stockholders' meetings outside the state. Under the common law the preemptive right of shareholders requires that they be the first to be offered additional shares before they are offered for sale to others, but some statutes exclude the preemptive right. Nonvoting stock is permitted by the popular incorporation states but not by some others. The use of nonvoting stock may be desired in order to keep control within a small group. Under the laws of the states which are popular for incorporation, the powers of directors may be much greater relative to those of stockholders than in some of the other states. For example, the directors alone may be permitted to mortgage the property, while only a majority of the stockholders may be able to sell the property or amend the charter.

Because the legal requirements are quite exacting it is customary to secure the services of legal counsel in organizing a corporation and in complying with formal requirements regarding meetings, resolutions, and

minutes. Continuing advice on these matters is not necessary, however, and there are also manuals which may be consulted by the secretary of a corporation to make certain that formal requirements are complied with. When it is understood that the formal requirements must be complied with and the proper steps are taken to do so, it is found that the management of a corporation is otherwise the same as that of any of the other forms of business.

The Corporate Charter. The application for a corporate charter, called the certificate of incorporation, includes the information which is to constitute the charter itself, for when it is accepted by the state it becomes the charter. While the specific requirements differ from state to state, the following provisions indicate the nature of the requirements to be expected. The name of the proposed corporation is usually given first. The principal office within the state of incorporation must be given. A principal office is not necessarily the main office for doing business; in fact frequently it is merely a nominal address maintained by a trust company which for a small fee acts as the agent for many corporations for the purpose of providing such principal offices. It maintains a duplicate stockholders' list and provides a place where legal papers can be served on the corporation for which it acts as agent.

The purposes of the corporation must also be stated in the charter. In stating the purposes some of the powers of the corporation are explicitly given, but in addition there are certain implied powers which are necessary to carry on the stated purposes. Actions beyond the powers of a corporation are called *ultra vires* acts. The promoters of some corporations include such broad terms as "or otherwise" and "or any other" so frequently and in such ways that these corporations could possibly engage in virtually any type of business in addition to that which was presumably basically intended.

The authorized capital stock, including the number of shares and their par value, is also included in the charter. If there is to be more than one kind of stock, the different classes are explicitly set forth.

While the names and residences of the incorporators are required, this provision is a legal formality since the incorporators are likely to be what are called dummies; the legal counsel and his clerks secure the charter for the purpose of relieving the principals of the details involved in getting it. After the charter has been obtained, the corporation is turned over to the principals.

Finally, the life of the corporation is stated, even when the charter is taken out for a corporation in perpetuity as it frequently is. There may also be other provisions such as those fixing the powers of the directors, and sometimes the state may specifically require particular statements. For instance, the Delaware law requires a statement to the

effect that the stockholders are not personally liable for the debts of the corporation.

Bylaws. When the charter has been secured the incorporators hold a meeting, at which they adopt the bylaws and elect the directors. The directors then hold a meeting in accordance with the provisions of the bylaws. At this meeting the subscriptions to capital stock are accepted and the form of the stock certificate is adopted.

The bylaws are those rules and regulations for the proper legal management of the corporation which are not included in the charter. They include regulations for the issue and transfer of stock, including authority for the directors to appoint a transfer agent. There must also be provisions for regular and special stockholders' meetings including the time, place, and method of notifying stockholders. The time, place, and quorum required for directors' meetings are also included. There are also provisions for the election and qualifications of directors, a statement of the officers to be elected by the directors and the duties of such officers, a statement concerning standing committees to be appointed by the board from among its members, and provisions regarding the care and management of property and finances. The chief executive officer provided for is the president, who is also chairman of the board of directors unless the bylaws provide for the election by the board of a chairman from among their members.

Board of Directors. The management of a corporation is delegated by the stockholders, who own the corporation, to the board of directors, who must be elected periodically.[1] The board in turn appoints the chief executive officers who are responsible for the organization, management, and operation of the business. The number of directors is fixed by the certificate of incorporation or the bylaws. The importance of an odd number to prevent ties is usually kept in mind. Too large a board becomes unwieldy, whereas too small a board prevents the proper representation of different interests. In practice the size varies from a minimum of three to as many as possibly thirty-five. Depending on the size of the corporation, the average number of directors ranges from about five to fifteen.

As has already been mentioned, the directors are frequently required to hold a nominal number of qualifying shares. How many additional shares they may happen to own varies. In the larger corporations no single individual owns a large percentage of the shares.

The board may consist in varying degrees of management officials, but outside interests are frequently represented. A balanced board might include elements of management, law, finance, large ownership interests,

[1] National Industrial Conference Board, Inc., New York, *Corporate Directorship Policies*, Studies in Business Policy No. 90, 1959.

and experts in general management. Sometimes prestige is a factor in selecting particular individuals as board members.

Although compensation of directors may be in annual salaries, some form of profit-sharing, or directors' fees of rather nominal amounts, in practice the most widely used arrangement is the payment of directors' fees for attendance at meetings. The frequency of regular meetings varies from weekly to monthly and quarterly in different corporations.

Since many directors have other interests in which they are more active, provision must be made to keep them informed of developments in the corporation. In addition to the information made available at meetings, some corporations forward reports, budgets, forecasts, and newsletters to directors.

The board of directors should be responsible for establishing the general policies, including the organization structure, and for selecting the principal executive officers. Studies of actual practices show that the procedures followed by boards of directors may be divided into the four types of deciding, confirming, counseling, and reviewing. On some important matters a board will make its own decisions somewhat independently, although to some extent on the basis of advice received. Many decisions of the management are, however, merely confirmed. But the managing officers frequently seek the counsel of the board regarding possible alternative policies. The board also reviews legal documents and reports of various sorts.

In actual practice the nomination of directors rests to a considerable extent with the board itself, and the managing officers are likely to dominate the choice, with formal approval made by the directors. The board's action on other matters is also likely to be mainly the ratifying of what has already been decided on by the executive officers.

Executive Officers. The directors appoint those managerial officers who have chief responsibility for the detailed management and operation of the corporation. These officers have authority over those immediately responsible to them, who in turn exercise authority over those still further below. Although the precise lines of responsibility differ somewhat from corporation to corporation, several executive officers are found in practically every corporation.

As chief executive officer of the corporation, the president is responsible to the board and has authority over all other officers even though they are appointed by the board. Depending on the particular arrangements, he may exercise his authority over the various departments of the business through the officers or through the department heads.

The vice-president is sometimes thought of as a possible substitute for the president, as in political affairs. But this view is not very helpful, for the vice-president of a corporation is more likely to be in continuing

charge of a particular function of the business, such as the vice-president in charge of manufacturing. In fact, there may be a number of vice-presidents, each in charge of a broad function, such as finance, purchasing, production, sales, and personnel. Sometimes, also, a vice-presidency may be established as an honor for a retired person, or even for such purposes as signing documents.

The treasurer has custody of and responsibility for the money and securities of the corporation. Depending on the particular arrangements in the bylaws, he might be authorized to sign checks, either alone or together with the president, but in a large business subordinate officials might handle such matters subject to various forms of internal check. Related functions of the treasurer would include the keeping of records of financial operations and the financial condition, the granting of credits and the collection of accounts, and the handling of interest, sinking funds, insurance, and redemptions of bond issues.

The comptroller or controller is the chief accounting officer. As such he is in charge of bookkeeping, accounting, auditing, and financial reporting. He is responsible to the president and is frequently counted on by the finance committee for financial planning and budgeting. The preparation of a budget involves the making of a financial plan for a future period. Such a plan consists of estimates of sales and other revenues and of anticipated expenditures, both of which it is expected to control in some measure once the budget is adopted. Although the office of comptroller does not exist in all corporations, where it does exist it is evident that it encroaches on the treasurer's functions, and it is even possible that the treasurer may be left only with responsibility for receiving and disbursing money. It is not unlikely that controllership will continue to grow in importance and embrace wider areas of finance.

The secretary records the minutes of the meetings of the directors and stockholders. He issues notices for these meetings and keeps the minutes of the meetings. He keeps the stockholders' list and the corporate seal, which is used on important documents. He is usually authorized to sign — with the president — contracts, mortgages, bonds, stock certificates, and similar documents. If the corporation itself handles the recording of the transfer of its stock, this work is the responsibility of the secretary. Otherwise, a bank or trust company is selected as transfer agent.

The treasurer, comptroller, and secretary may be assisted in their functions by one or more assistant treasurers, assistant comptrollers, and assistant secretaries, to each of whom specific aspects of the general functions might be delegated.

Corporate Books and Records. The management of a corporation must keep two classes of books, namely, the corporate books or records and the financial books. The corporate books and records kept by the

secretary include the minute books for the meetings of directors, stockholders, and committees, the stock book which is a record of the names and addresses of the stockholders as well as the number of shares they hold, and the transfer book in which the transfer of stock is recorded. The financial books, which are basically similar to the accounting records kept by any other form of business organization and for which the comptroller is responsible, are the books of account in which the business transactions of the corporation are recorded.

State corporation laws provide that a corporation's books must be open for the inspection of stockholders. In practice, corporations issue periodic reports, annually or semiannually, showing the results of operations in the form of a profit-and-loss statement and a statement of the financial condition in the form of a balance sheet. The annual report contains a list of the officers, a general statement by the president or chairman of the board regarding past results, prospects, and plans, the financial statements, a statement by the outside auditors attesting their review of the accounting records, and perhaps also some operating statistics. In recent years the tendency has been to present the annual report in a more interesting and understandable fashion than in the past.

Stockholders. As has already been pointed out, a corporation is owned by the stockholders, who elect the board of directors to manage the corporation. In a large corporation with many scattered stockholders the difference between the stockholders and the directors is apparent. But this difference must also be kept in mind in the small corporation where the stockholders may be so few that they elect themselves directors and as directors appoint themselves officers. All of the elections are supposed to be formally held, and they must be recorded in the proper corporate records in accordance with the bylaws. The fact that stockholders of a small closed corporation elect themselves the directors and then appoint themselves officers illustrates the idea that in practice the management officers are likely to have a more strategic position than that of the directors or the stockholders. This is so because it is not so much as directors that they act in making decisions at directors' meetings, but rather as active managers whose knowledge and proposals are derived from day-to-day concern with the affairs of the business. In other words, in utilizing the corporate form they must comply with certain formal requirements according to which directors must make decisions, although for all practical purposes it is in their capacity as managing officers that they come to decisions which must, however, be formally adopted by the board in the form of resolutions, as though the board itself had initiated the resolution.

The law permits stockholders who are not present at meetings to delegate others to vote their stock at a stockholders' meeting. This is

called voting by proxy. The person who votes in place of the stockholder is called a proxy, but the term is also used as the name of the written authorization signed by the stockholder granting a power of attorney transferring his right to vote. Proxies are revocable and the statutes usually prescribe a maximum time limit on their effectiveness. The large corporation sends proxies to stockholders for all annual and special meetings. The directors of such corporations designate a proxy committee from among their number to act as attorneys or proxies, and their names are printed on the proxy forms sent to the stockholders. Since it is easy to sign a proxy and return postage is provided, a sizable number of shareholders can be depended upon to sign and return them. The members of the proxy committee can therefore vote thousands of shares which they do not own. When there is opposition to the existing management, a minority group may seek sufficient proxies to oust the directors and thereby the officers. Although such efforts are difficult to carry out because of the attitudes of stockholders, who usually prefer to give their proxies to those in authority, there have in recent years been several significant instances in which managements were deposed.

In large corporations the management generally continues in power, because stockholders either return signed proxies or ignore them altogether. Although 51 per cent of the total voting shares is technically necessary for control, proxies for less than 51 per cent of the stock can control a meeting. Control is also maintained by the use of nonvoting stock, by borrowing rather than issuing additional stock, by the denial of the preemptive right when selling additional shares under charters not recognizing this right, by the use of the voting trust, and by forming a holding company to acquire and hold the controlling shares of another company, which can then be controlled by the directors of the holding company.

The regular meetings of stockholders for the election of directors and any specifically designated matters which must be voted by the stockholders are held annually. At the annual meeting one or more of the officers may make a report, and it is also possible for stockholders to raise questions. Certain matters may, however, be taken up only at special meetings. These include proposed changes in the purposes and powers of the corporation, in capital stock, in the number of directors, and in the location of the office. Only that business for which a special meeting is called can be transacted at such a meeting.

So far in the discussion of the corporation the implication has been that all stock carries the voting privilege. Actually, however, there is a form of stock called nonvoting stock, the holders of which by their purchase of it waive the right to vote. Therefore, when one speaks of voting by the stockholders he means voting by those who hold voting stock.

Business Combinations

This chapter has so far been concerned with the legal forms of single business units. For a variety of reasons, however, two or more of such single businesses are often combined. Among the reasons for business combination is the desire to secure the advantages of large-scale production in the form of greater efficiency and lower costs resulting from economies in buying and selling, the more profitable utilization of by-products, the greater ease in carrying on research projects, the further specialization of labor, and the use of more efficient and highly specialized, although often much more costly, machinery and equipment. The personal motives of those forming the combination may also play a role; that is, they may derive satisfaction from effecting the deals, they may feel pride in heading the larger organization, or they may simply be motivated by the desire for more power. Some business combinations exceed the best and most efficient size.

Industrial combination first took place on an important scale in this country in the period following the Civil War. Combinations were first formed by simple agreements, pools, and trusts, and later by holding companies, consolidations, and mergers. The simple agreement and the pool which provided for limiting production, maintaining prices, or allotting to each participant a definite portion of the available business were not enforceable under the common law, and they were made illegal under the antitrust laws.

Under the trust arrangement, holders of the stock of two or more corporations turned over their shares to a board of trustees in exchange for trust certificates which could then be bought and sold like shares of stock. The trustees, by holding in trust the shares of the corporations, could vote them and therefore control and coordinate the activities of the corporations thus combined. This use of the trust to control the stock of several corporations was declared illegal by the courts on the ground that corporations could not legally enter into what were in effect partnerships, and also because it resulted in monopoly and hence was contrary to public policy and illegal under the common law.

When, beginning with the amendments to the New Jersey statutes, it became legal without specific statutory permission for a corporation to hold the shares of other corporations, holding companies were formed to acquire and hold the stock of subsidiary companies, which could then be managed by the holding company.

Combination can also be effected by a merger or a consolidation. In a merger two or more corporations are fused, with one of them surviving and the other losing its corporate existence, its properties having

been combined with those of the surviving corporation. In a consolidation a new corporation is formed and the properties of the constituent corporations, which lose their separate existence, are transferred to the new corporation. Combination and expansion are also possible by leasing land, plants, and equipment, thereby making possible the use of additional property without acquiring more capital.

Combinations may be classified as horizontal, vertical, and complex. In horizontal combinations the constituent companies or plants are engaged in making the same or similar products in one industry. In vertical combinations the successive steps in the manufacturing process are performed under integrated management. Complex combinations include both these types in a wide variety of possible relationships.

Businesses can be expanded not only by combination but also by selling more stock or by reinvesting some of the earnings in the business. The additional capital so acquired could be used to acquire other existing businesses, but it can also be used to construct new plants and to buy new and additional equipment.

The combination movement following the Civil War led to state and federal legislation directed against monopoly. In interpreting the Sherman Anti-Trust Act passed by Congress in 1890, the Supreme Court applied the "rule of reason" under which a combination found by the Court to be an unreasonable restraint of trade is illegal. In 1914 the Clayton Act was passed to strengthen the Sherman Act by forbidding certain unfair trade practices where they would "substantially lessen competition or tend to create a monopoly." In 1950 an Anti-Merger Act was passed forbidding the acquisition of, or merger with, other companies where the effect may be substantially to lessen competition or to tend to create a monopoly.[2]

The latter act was passed in response to the merger movement which began in the period after World War II. In the first postwar decade, some two thousand corporate mergers took place in manufacturing and mining, to say nothing of those in other fields. These combinations were sometimes formed with the object of avoiding taxes by acquiring other companies suffering losses. More important, however, have been the combinations formed by acquiring one or more corporations in entirely distinct fields from those in which the acquiring corporation originally operated. While the motives behind some of these combinations were not always entirely clear, a number of them were said to have been undertaken in order to achieve the advantages of diversification.

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[2] Cf. Herbert C. Morton, *Living with the Antitrust Laws*, The Amos Tuck School of Business Administration, Hanover, N. H., Bulletin No. 16, June, 1956.

For a criticism of antitrust legislation and interpretation, see Sylvester Petro, "The Growing Threat of Antitrust," *Fortune*, Vol. 66 (November, 1962), p. 128 ff.

Government Owned and Operated Businesses

Local, state, and federal governments engage in a variety of business activities. Business activities carried on by the federal government have increased considerably in recent years. Many business activities carried on by government units are more or less traditional. Some local governments operate one or more of the local public-utility enterprises. The federal government operates the post office, arsenals, and other enterprises of long standing. Activities of this sort are carried on as part of the work of departments which carry on other work or by departments set up for the particular purpose. During the 1930's the federal government increasingly used the public corporation, financed by appropriations from the federal treasury and organized and managed somewhat like private corporations; a number of these government corporations were organized under Delaware law. Some examples of these public corporations are the Home Owners Loan Corporation, the Federal Deposit Insurance Corporation, the Inland Waterways Corporation, and the Tennessee Valley Authority.

Conclusion. Although the several legal forms of business organization offer the possibility of choice, it should be remembered that it is in general possible to change from one form to another. Of course, once the corporate form has been chosen and the firm has expanded beyond a certain point, the necessary capital for another form would be difficult, if not impossible, to raise.

QUESTIONS

1. What are the advantages and disadvantages of the partnership?
2. To what extent can a limited partnership be used to achieve the advantages of the corporate form?
3. What are the important factors in choosing the state of incorporation?
4. What are the chief differences between the corporate charter and the bylaws?
5. What are the legal and managerial responsibilities of the board of directors?
6. Describe the duties of the major officers of a corporation.
7. Do stockholders take their responsibilities more seriously in smaller corporations than in larger ones? Why or why not?
8. Describe the different kinds of business combinations.
9. It is sometimes proposed that, since state incorporation acts (including that of Delaware) are too lax, corporate charters should be issued only by the federal government. What would be the advantages and disadvantages of this for business?
10. What criteria should be used to determine the point at which a business becomes a monopoly under the antitrust laws?

CASE: Lampete Company

For the past ten years Lawrence McConnon and Peter Bradley have successfully operated the Lampete Company as a general partnership in the construction industry in an eastern city. McConnon had started the business fifteen years ago, after service in the army when he succeeded in getting his first contract for excavating work. At first, he rented the equipment but had as his objective not only the acquisition of his own equipment, but also expansion into road and other public-works construction. During the first five years, profits reinvested in the business did not permit much in the way of expansion. However, he met Bradley who had some capital and induced him to become a partner. They worked together harmoniously, and the business was moderately successful. Both men felt that some diversification would be desirable because of the seasonal nature of the work. Profits were insufficient to permit such diversification, however, even if they were reasonably sure of the direction into which to diversify.

The partners thought it might be best not to try to locate one or more additional partners since they considered themselves fortunate enough to have gotten along so well together, and thought they might risk dissension if a new partner or partners were brought in. And, of course, there was always the unlimited liability and financial risk.

If they incorporated now, they would have to sell stock to raise the additional capital that would be needed. They realized that it might be difficult to locate potential stockholders at the present time. On the other hand, if they could get started as a corporation and if it were really successful, they could later sell portions of their own holdings to the general public. They expected these holdings would grow if their plans for growth materialized and reinvested earnings made stock splits possible.

1. Should these men incorporate now, or would it possibly be better to attempt intermediate term financing from a bank? Might joint ventures with other firms be worthwhile?
2. Why might they want to be able to sell their own stock later?
3. Are there any other alternatives which should be investigated?

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Chapter IV

Building the Organization Structure

Administration, Management, and Organization. The terms "administration," "management," and "organization" are sometimes used differently by different writers or for different purposes. Administration is defined in two opposite ways: (1) it may be used to mean the determining of the general policies of the business or (2) it may be used to mean primarily the carrying out of policies. In the first and broader sense, administration includes control and coordination by means of the establishing of policies, the planning and setting up of the organization which is to carry out the policies, and the operating or running of the organization. In the second sense, administration includes mainly the operating or running of the organization, or what amounts to the execution of policy. Although the term "administration" is widely used in both academic and political circles in the first sense, the second meaning is more in accord with business usage.

Although management is sometimes defined as including policy-making, organization, and control,[1] it is also widely used as meaning the execution of policy. The term is also used to describe the group of executives who do the managing.

Organization is the process of dividing the work to be done into proper functions and jobs, arranging the correct relationships, and assigning the jobs to individuals with clearly defined responsibility, authority, and duties. The word "organization" is also used to mean the arrangement resulting from the foregoing process.

It is important to become familiar with the different meanings of

[1] For a discussion of the meaning of "control," see E. S. L. Goodwin, "Control: A Brief Excursion on the Meaning of a Word," *Michigan Business Review*, Vol. 12 (January, 1960), p. 13 ff.; Lyndall F. Urwick, "The Meaning of Control," *ibid.* (November, 1960), pp. 9–13; E. S. L. Goodwin, "A Further Sally on 'Control,'" *ibid.* (November, 1960), pp. 14–18; Henry M. Albers, "What Does Control Really Mean?" *ibid.*, Vol. 13 (March, 1961), p. 23 f.

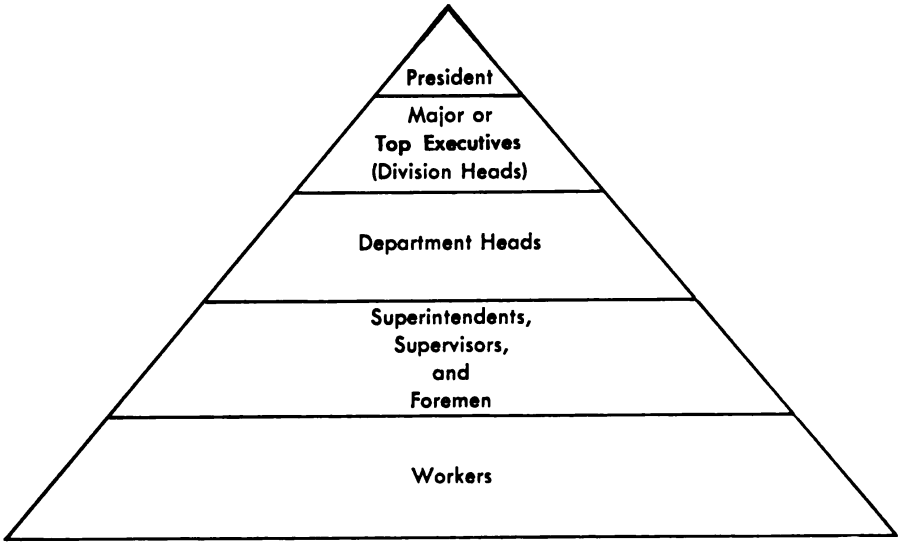


Fig. 10. Pyramid of authority in business.

these words in order to be able to detect and understand what is meant when they are encountered either in reading or in business.

In the present chapter, we are concerned with the structure of organization. Although some reference is made to the human factors in organization, this subject is taken up at greater length in Chapter XVI.

Pyramid of Authority. In every organized social, political, and economic group there is a pyramid of authority. The small group of leaders at the top exercises authority over a broader group below who in turn control a still broader group, and so on down the line until the broad mass at the bottom is included. Excluding the board of directors, the pyramid of authority in a business is somewhat as indicated in Figure 10. The levels of management are not completely described by the terms used in the diagram. For example, management might be classified into top executives, middle management, intermediate executives, junior executives, and supervisors and foremen. In actual practice, the particular emphasis depends on the custom in the individual company or industry.

Organization Fundamentals. There are certain fundamentals which must be understood and kept in mind in order to achieve effective organization. The major functions of the business are separated into their proper subdivisions, with any overlapping eliminated. The various positions are defined and the levels of authority clearly distinguished. Authority and responsibility must be delegated to each official. Authority flows downward and responsibility or accountability upward. No one should be subject to orders from more than one source unless the areas of authority of several superiors are clearly defined to avoid overlapping authority, nor should orders ever be given over the head of a responsible executive.

Span of Control. It is commonly believed that, since individuals have

a limited span of control because of limitations of knowledge, time, energy, and attention, it is essential to determine as carefully as possible the maximum number of persons who can be effectively supervised. This number varies with the level of authority, the type of work, the layout, the machinery and equipment, the production methods, and the kind of workers. While the exact number cannot be precisely stated, it is believed that fewer can be supervised as one goes up the managerial scale. Thus it may be estimated that at the plant level an attempt to supervise more than twelve will result in increasing inefficiency, while only four or five and no more than six may be the maximum number reporting to high officers.

Where the workers are capable, disciplined, and skilled craftsmen, little supervision is necessary and few supervisors are needed. At the other extreme, where operations are highly mechanized and the tasks are routine and unskilled, few supervisors are needed because the production arrangements impose the required discipline.

The concept of limited span of control has been challenged with several contrary arguments. For instance, it is maintained that in a growing organization a narrow span of control will increase the number of levels, with the result that communications will become more difficult when the formal channels are followed. A wider span, by improving communication and participation, develops initiative by encouraging delegation of more authority and responsibility. As a matter of fact, there are also some large established enterprises which do not limit the span of control at top levels to the small number mentioned at the end of the first paragraph of this section.

These conflicting views suggest the importance of careful analysis of organizational effectiveness. There is little doubt that each point of view may be appropriate in varying degrees depending on the particular organization. Where management is highly successful in delegating and where participation in decision-making is encouraged downward along the line, the wider span may be highly desirable, provided excessive decentralization does not result in diminished efficiency. In this connection, it appears appropriate to suggest that an organization may develop a unique personality of its own, or perhaps it should be said that such a personality is developed for it through the ideas of those responsible for its policies, as reflected in the selection of personnel.

Authority and Responsibility. Formal authority, which is conferred by delegation, is the right of one person to require another person to perform certain duties. More generally, it is the right to see that tasks are accomplished. It includes the right to plan and decide policies within the designated limits, as well as the right to command and enforce. A good manager must choose his subordinates and delegate authority for decision-

making to them, with the expectation that they will do so independently. Men who do not delegate authority adequately and become involved in detail work themselves are not good executives. When authority is delegated, those to whom it is delegated have power to act for the individual who delegated it.

Authority flows step by step down the scale, with each step representing a gradation of authority and responsibility. The fixing of authority and responsibility in a series from the top on down the line is called the scalar principle. The process of determining the hierarchy of organization may be called the scalar process. Organization charts, which are taken up later in this chapter, graphically illustrate the scalar principle.

Authority carries with it the responsibility or accountability for performance. Anyone to whom responsibility is delegated is accountable to the official from whom he derived his authority. When the authority and responsibility of any executive or supervisor are clearly defined and understood, the employees to whom he must give orders will be more ready to accept his authority and orders than if they are not certain of the exact status and scope of his authority because of conflicting lines of authority.

Departmentalization. There are three types of operating organizations. The first, which is most common and basic, is the functional type based on the specialized functional activities of business, each function being under a major executive. The second is organization on the basis of products or commodities. When a company produces more than one kind of product, the skills and equipment required may be different for the different products. The production executives will then be specialists in the production of particular commodities, but at the same time the authority and responsibility of the top functional executives will cut across all the product groups. When the plants producing the different products are located at different places the company is decentralized. A third type of operating organization is also decentralized but on a geographical or regional basis. Actually most organizations of any size contain elements of all three of these types of operating organizations. But in all of them the different functional activities must be distinguished.

A function is a specialized task that can be clearly distinguished from another task. The functionalization of management is specialization in the work of management. When the various functions are clearly recognized the major functions are decided on, and the minor ones are subordinated to the particular major functions to which they are most closely related. If all the major functions are not recognized and provided for, the organization is defective.

The major functions in an industrial organization are finance, accounting, purchasing, production, marketing, and personnel. Finance is concerned with raising capital, controlling the utilization of funds, and

administering income. The function of accounting is to record the transactions of the business and to provide periodic statements showing the estimated earnings or losses and the financial status of the business. The function of purchasing is to procure the materials, parts, and supplies which are necessary for manufacturing and other purposes. The function of production is to manufacture the goods which the firm sells and to control the manufacturing process. Marketing involves the distribution of the goods made. The personnel or industrial-relations function involves making available an adequate number of competent employees to carry out the various functions of the business.

The major functions are organized in specialized departments, which are the basis on which the whole structure of organization is built. The term "division" instead of "department" may be used to cover the larger area; but when the major functions are organized as divisions, the term "department" is used to describe the major subdivisions of the division. The departments may also be broken down into sections, production centers, and so on. The major executives are either division or department heads, depending on the particular terminology used.

Executives. The major executives must assume authority, impose responsibility, and exact accountability. The executive decision-maker must have a foundation of technical competence, a broad intellectual outlook, a high sense of honor, and an understanding and appreciation of human relationships, and he must give attention to the public interest.[2] He must have information on such end-product matters as production, sales, profits, and percentage of earnings to sales. In addition, he needs data on what have been called "intervening factors," which means that he must keep in touch with the state of the organization and the performance being achieved. He must have measures of such matters as loyalty, attitudes, levels of motivation, consistency of employee and company goals, degree of confidence among members of the organization in each other and in the different hierarchical levels, extent of leadership skills and abilities of managers and supervisors, and so on.[3]

The executives in charge of the major functions are vice-presidents or department heads in charge of manufacturing, purchasing, marketing, industrial relations, finance, and accounting. Below the top executives are senior executives, such as the chief engineer, the factory manager, the sales manager, and sometimes the personnel director, the purchasing agent, and so on. Although these men have considerable authority and responsibility, they do not have the rank of top executives. The next

[2] Cf. Robert N. Hilkert, "Achieving Administrative Competence — The Executive," *Michigan Business Review*, Vol. 11 (July, 1959), pp. 24–30.

[3] Rensis Likert, "Measuring Organization Performance," *Harvard Business Review*, Vol. 36 (March–April, 1958), pp. 41–50.

level consists of assistants to these senior executives, such as the assistant chief engineer. Junior executives may be illustrated by assistant superintendents who to some extent direct the work of shop foremen.

The works manager is under the vice-president in charge of production and above the superintendent. The supervisory hierarchy is the superintendent, the supervisor (of several foremen), the foreman, and the assistant foremen. These men are responsible for getting the work of the quality required done on time, and they are also expected to suggest improvements. The foremen direct the employees, they show workers how to do the work, and they have a part in handling grievances.

When it is necessary to appoint several foremen to supervise those engaged in a particular task or set of tasks, the foremen's superior is called a supervisor. The supervisor, together with other supervisors, is under the jurisdiction of the superintendent. In view of this the scope of the foreman's job, as well as that of the supervisor, requires analysis in the particular firm's context. In a small firm, a foreman's job may embrace the duties included in a supervisor's job, while the scope of his job may be less in a larger firm. Since it is difficult to distinguish these possibilities in setting forth management principles, the reader must exercise care in interpreting the content of such titles.

In office practice, the term "supervisor" may be used to describe the lowest supervisory job. The term "foreman" is not used in office management.

Supervisory employees directly in charge of workers are responsible to their immediate superiors for performance, and they represent management to the employees under their supervision. Since they are the contact between the higher levels of management and the workers, their position is of considerable importance in maintaining satisfactory labor relations because what they do is considered management policy by the workers under them. Some supervisory employees in the lower ranks are practically nonmanagerial, however, since they have little authority to direct employees. The exact dividing line is not always clear.

Most of the preceding titles are widely used in approximately the same way as they have been here. But titles vary and the scope of work included differs somewhat from company to company. Moreover, some industries and companies have more or less unique titles or meanings for titles.

Cooperation Among Officials. The importance of cooperation among the various officials of a firm cannot be overemphasized. In connection with production, for example, decisions regarding the quality of materials to be bought are frequently the joint responsibility of several officers, including those responsible for production, engineering, and purchasing. Adequate coordination requires that sudden changes in production schedules or planning be promptly reported to all departments con-

cerned. Delays and difficulties in procurement must likewise be reported since delivery promises may have to be changed because of such delays. Cooperation and coordination may be facilitated by the utilization of the committee system, which is frequently found not only on higher policy levels but also on other levels.

Executive Responsibility in Large Enterprises. In large corporations chief executives choose the personnel in the higher executive ranks and they may even influence the selection of directors. They should spend a good deal of time on the structure of organization, the allocation of responsibility and authority, and the establishment of procedures regarding the use of committees. Corporate executives as a group determine the volume and direction of investment for their firms, they set prices and formulate price policies, and in general make the most important policy decisions. The chief executive is the head of the executive group and the key figure in management. Below him decision-making is diffused through the entire executive group, in which the vice-presidents play a leading part in the executive committees.

In large well-established corporations routine operating decisions on prices, marketing, volume of output, and research and new products are generally not made by the chief executive acting alone.[4] In given instances the importance of particular decisions leads to their being made by the chief executive; but, on the whole, responsibility for these operating decisions is varied and sometimes diffused.

Decisions regarding finance, external expansion, dividends and reinvestments, labor, and public relations are likely to be more centralized.[5] The least amount of delegation exists in financial decisions, which are generally made by the chief executive and the directors if they are active. Internal-expansion plans are generally formulated by operating officials with final approval resting with a committee in which the chief executive exercises considerable influence, or with the chief executive alone, or sometimes formally with the board of directors. The chief executive is generally the initiator of external expansion by purchase of outside plants. But the financial aspects of such proposals, including their desirability and the problem of raising funds, are frequently studied by a committee, even though the final decision does rest with the chief executive. In connection with dividend and reinvestment policies, the chief executive plays an important and frequently a dominant role. Organizational decisions may be initiated by the chief executive and are in any case subject to his approval. Labor matters of various sorts are being increasingly

[4] Robert A. Gordon, *Business Leadership in the Large Corporation* (Washington, D. C.: The Brookings Institution, 1945), p. 81 ff.

[5] *Ibid.*, p. 91 ff.

handled by the chief executive. The chief executive also takes a leading responsibility in public relations and dealings with the government.

System. A system is a method of getting work done by following the routines provided for. In every well-organized company a general overall system is developed, with subordinate systems for all the major functions and subsidiary systems within each major functional area. All of the subsidiary systems must, of course, be properly related to the larger system of which they form a part. Since system reduces the work to routines, executives are relieved of details and can depend on summaries and reports which are brought to their attention. It is important to note that all pertinent information should be brought to the attention of executives in such reports. This is, however, not always done, as has sometimes been indicated in some labor difficulties of which executives were not aware until it was too late to settle them peacefully.

A system should be as efficient and simple as possible. It should not require too much red tape and paperwork. And it should certainly not become an end in itself, as has sometimes happened.

Exception Principle. A system for carrying on the various activities in the business will not be adequate for handling every conceivable possibility, since there will always be some exceptions. Of course, when there are enough exceptions of the same kind they should be provided for in the system.

The system should be such that exceptions will be clearly apparent as not provided for by the systematic routines. In this way the exceptions will be brought to the attention of the executive or supervisor concerned. The system provides for handling the routines without the personal activity of the executive, department head, supervisor, or foreman. By implication it also provides that exceptions must be brought to his attention. Under the exception principle of management, the executive acts only on the exceptional matters as they are brought to his attention.

Organization Charts. It is desirable to prepare organization charts showing the major functions and their relationship to each other, as well as the relationship of subordinate activities to the major functions.[6] Organization charts are constructed by blocking out functions and positions, not the individuals occupying the positions. After they have been prepared the names of current occupants of the positions may be included under their title, but this is done only for positions on higher levels, which are not expected to have much turnover. Of course, new charts should be prepared when a change in personnel has taken place.

The preparation of organization charts is in itself helpful in requiring

[6] Cf. National Industrial Conference Board, Inc., New York, *Charting the Company Organization Structure*, Studies in Business Policy No. 168, 1959.

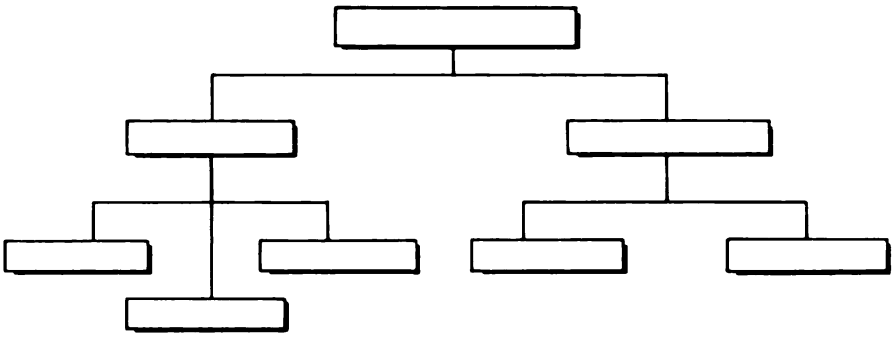


Fig. 11. Preferred type of organization chart.

thought about the relationships in the organization. Once prepared, the charts are also helpful in showing individuals how they fit into the organization as a whole. But the charts should not become ends in themselves. Provision should be made for changing them as necessary changes in the organization are made.

The organization charts of large companies cannot be sufficiently detailed to show all the relationships on one sheet. For this reason several charts are prepared to show the top organization, the details of the departments, and so on.

Two ways of drawing organization charts for industrial companies are indicated by Figures 11 and 12. Figure 11 is the one most commonly used. Although the second is sometimes used to save space, it is not as clear as the first. Less clear than either of these is the so-called left-to-right (horizontal) chart and the circular organization chart. Because relationships are visualized with greater difficulty in the horizontal and circular organization charts, these two types are used less frequently than the vertical or conventional types shown in Figures 11 and 12.

Types of Organization Structures

Line Organization. The arrangement in which authority is delegated from step to step down the scale is called line or military organization. Those to whom the authority is delegated have line authority or the authority of enforcement. Line organization may be illustrated by

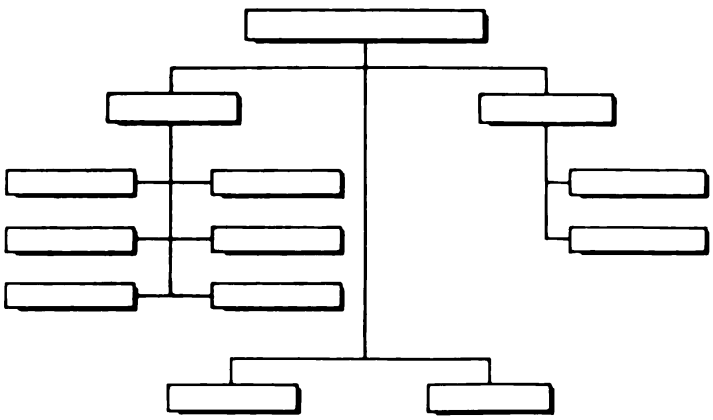


Fig. 12. Organization chart designed to save space.

Figure 13. In this example the superintendent, who exercises general supervision over three foremen, does not do any of the physical work. In a simpler arrangement in which there is only one shop, the position might be the same as that of a foreman. There are also many instances in which an assistant foreman is not particularly essential. As a matter of fact, the assistant foreman is in any case likely to be a working foreman who may plan the job in preparation for the actual work. If he has little authority, workers tend to call him a straw boss.

The line organization is the simplest type of organization. Since authority and responsibility are clearly fixed, discipline is easily maintained, and quick action is facilitated. Since the top management must be in constant touch with all details of operations, however, the line arrangement becomes unwieldy in any sizable enterprise. Line organization is also inflexible and may be too arbitrary. Although there is no question of who is the boss, foremen may become too autocratic.

Staff. Work of an advisory nature is called staff work.[7] It includes such matters as research of various kinds, market studies, the study and development of methods, product development, and the offering of recommendations based on the investigations made. Staff officers do not have the authority to give orders putting any of their ideas into operation. However, if they are requested to put a plan into effect, as sometimes happens, they will be exercising temporary line authority. Although staff work is thus in contrast with line authority, it may be noted that staff departments are themselves organized on a line basis.

A general engineering department may consist of sections responsible for methods, studies and recommendations of tools and equipment, product design, special customer design, manufacturing engineering, testing and product performance, customer service engineering, possibly plant construction, and so on. But one or more of these functions might be and frequently is considered of sufficient importance to warrant the setting up of a special department.

Line and Staff. A line organization with one or more staff officers or departments is called a line and staff organization. Some staff officers are directly responsible to the chief executive, but most of them are respon-

[7] National Industrial Conference Board, Inc., New York, *Organization of Staff Functions*, Studies in Business Policy No. 165, 1958.

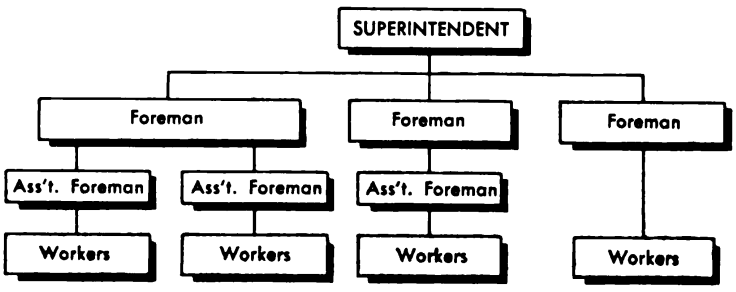
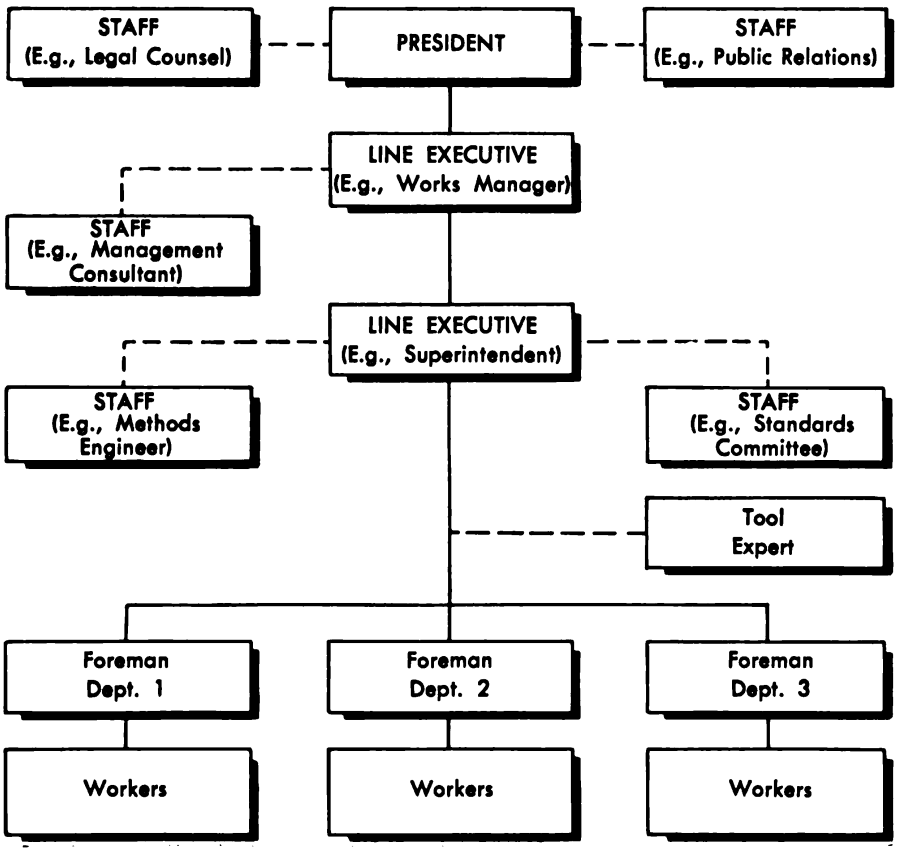


Fig. 13. Line organization.

sible to subordinates of the chief executive. Figure 14 helps to illustrate the relationships in the line and staff organization; the broken lines (which are not necessarily used in practice for this purpose) indicate staff relationships to line executives. It is, of course, not essential for one organization to have all of the staff officers shown on this diagram which is merely illustrative of possibilities. Figure 15 is the organization chart of General Motors Corporation. Figure 16 shows the typical organization of a Du Pont operating division.

Functional Foremanship. Frederick W. Taylor found that the general foreman had too many things to do if they were to be done properly. The "old-fashioned foreman," as he called him, had to be a good machinist, he had to be able to read drawings, he had to plan the work, to see to it that the men kept their machines in good shape, that they worked steadily and fast, that the work flowed in proper sequence; and he had to supervise timekeeping and rate-setting, and also maintain discipline. Taylor pointed out that men having all these abilities in sufficient measure would scarcely be available for positions as foremen. However, since some men had some of these qualities, they could be assigned to specialized duties on a functional basis. If each man from the assistant superintendent

Fig. 14. Line and staff organization.



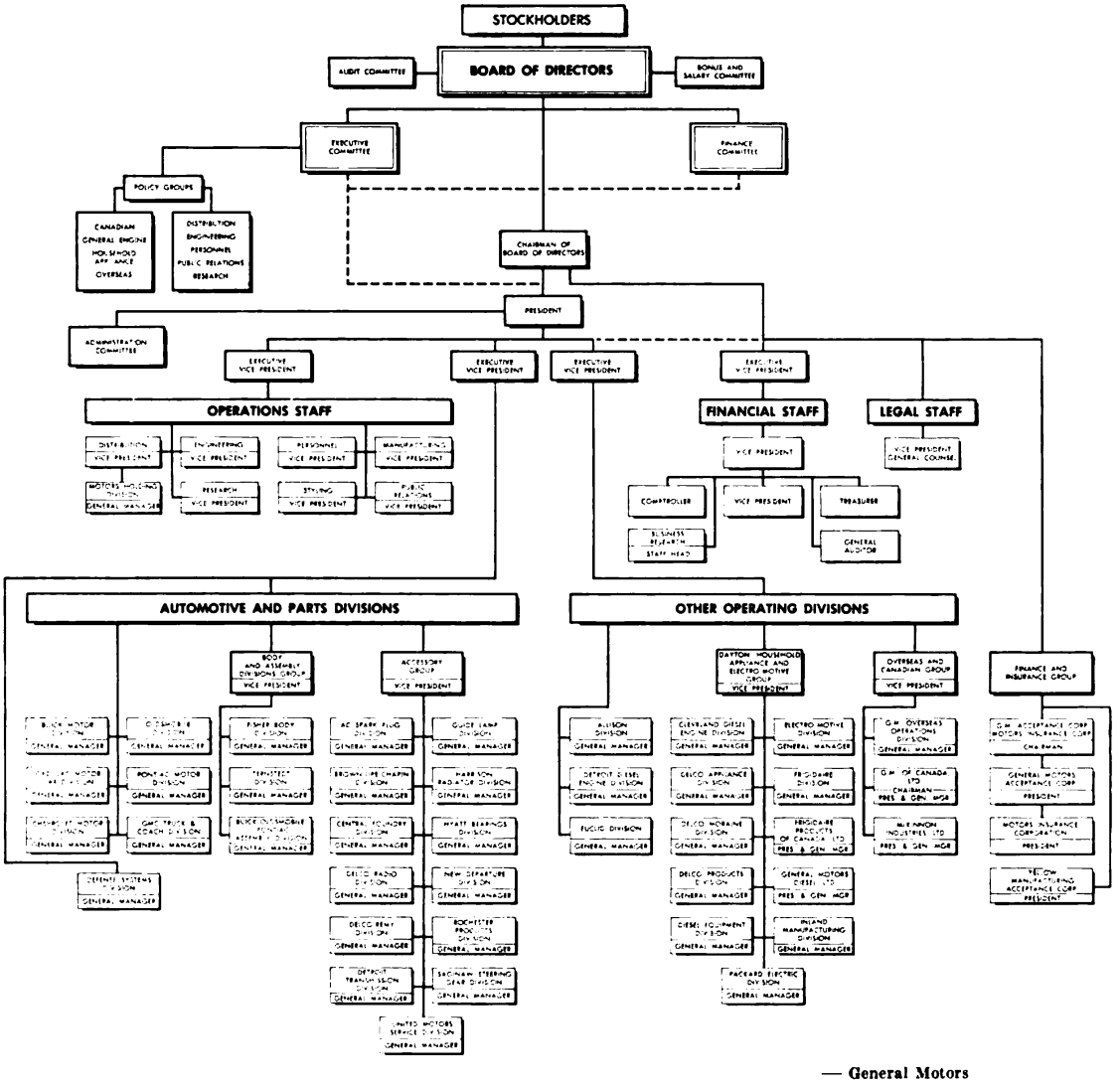


Fig. 15. Organization chart of General Motors.

down were to have as few functions as possible, it was necessary to break up the general responsibility of the foreman into its elements.

Taylor analyzed the duties of the foreman into eight elements, of which four were on the planning level and four were on the shop-performance level. The elements on the planning level he analyzed as (1) the order of work or routing, (2) instruction cards, (3) time and cost, and (4) shop discipline. He removed these planning activities from the shop, where they were not only being inefficiently performed but also interfered with production, and put them in the hands of clerks in the planning department office who could specialize in them. It will be noticed that these are largely staff functions. Taylor's time and cost clerk has been succeeded by the payroll and cost departments, the shop disciplinarian was the forerunner of the modern personnel department,

the order of work or route clerk's work is related to present-day production planning and control, and the instruction card clerk's work is that of the time and motion-study men.

The four elements of foremanship on the shop level were analyzed by Taylor as (1) the gang boss, (2) the speed boss, (3) the repair boss, and (4) the inspector. The gang boss was to receive the orders and directions from the planning department. He was to see to it that the machines were set up for the jobs and that the work was efficiently moved from machine to machine. He showed the men how to set the work in the machine in the most efficient way, but had nothing to do with running the machines. The speed boss instructed the workmen in the best ways of doing the work and saw to it that they maintained the required rates of production. He was not a speedup man, for the emphasis was mainly on instructing workers in ways of achieving attainable goals. The inspector was to be responsible for the quality of the work by inspecting the first piece and making a check from time to time. The job of the repair boss was not only to supervise the maintenance of the machines but also to see to it that the machines were in proper working condition and that the workers kept their machines and workplaces in proper condition.

The work of the gang boss is now done by two men, the setup man and the move man. The speed boss is the assistant foreman. The repair boss has become the maintenance and repair department. Inspection has also become separately organized.

Under Taylor's system of functional foremanship the workers would have four functional bosses in the shop, but there would also be some contact between the clerks on the planning level and the workers in the shop. The arrangements are illustrated in Figure 17.

Since eight men had varying degrees of authority over the workers, the system of functional foremanship had the defects of multiple authority. Because of the difficulty of locating responsibility, frictions and conflicts which could easily develop among the supervisors might readily

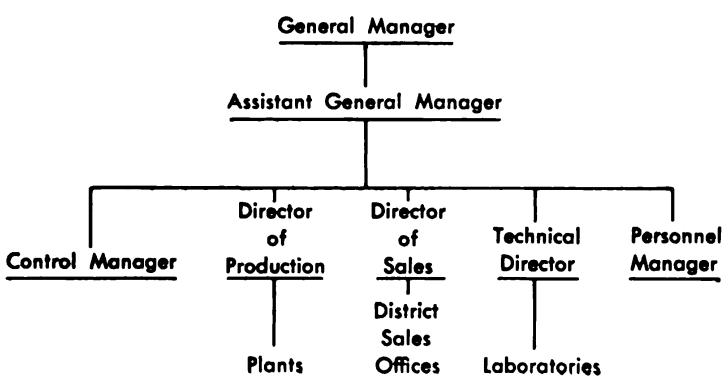


Fig. 16. Typical organization of one of the operating divisions of the du Pont Company.

— E. I. du Pont de Nemours & Company

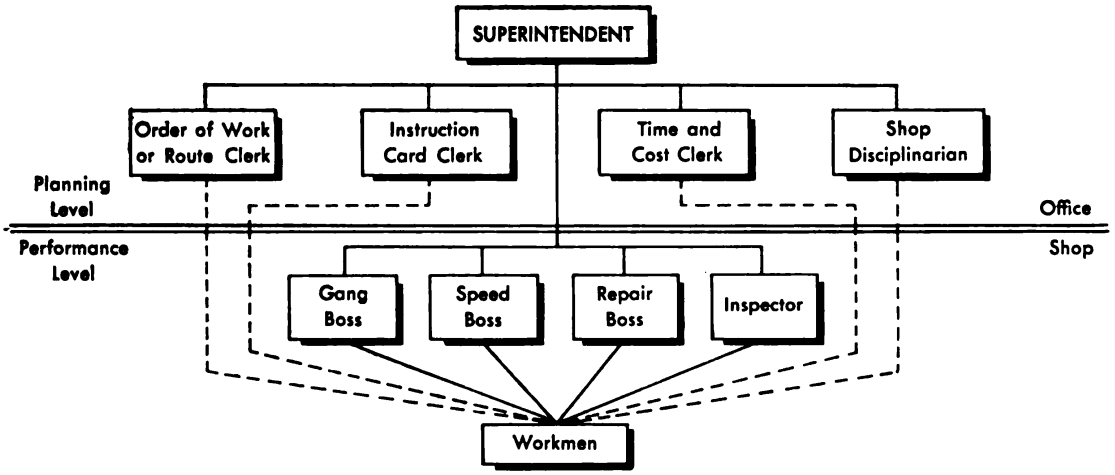


Fig. 17. Functional foremanship organization.

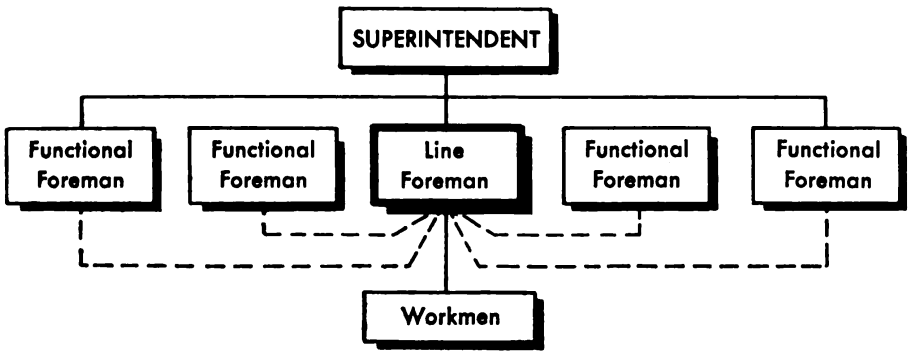
undermine the morale of the workers. It is now generally recognized that no man should have more than one foreman.

Although Taylor's system of functional foremanship was used in various plants, its disadvantages became apparent and it gradually disappeared altogether by about 1920. However, although the system is not used in practice, it helps to explain present-day organization, in the development of which it was an important step. The advantages of specialization are now secured by distinguishing between two kinds of authority: (1) functional authority which is the authority to prescribe how activities related to the carrying out of a particular function should be performed and (2) line authority which is the authority of enforcement. Functional executives issue orders through the line executive who alone has the power of enforcement. The arrangements are illustrated in Figure 18. Figure 19 is a typical organization of a Du Pont manufacturing plant.

The functional foremen thus become analogous to staff officers. Both the functional foremen and the line foreman are responsible to the superintendent, who resolves any disputes or conflicting orders in accordance with the exception principle.

Line and Functional Staff Organization. The preceding discussion of

Fig. 18. Functional and line authority graphically distinguished.



the possible relationship between functional and line foremen helps to explain the line and functional staff organization, which is characteristic of modern business. Not only do we find pure staff officers and departments, but we also find that the various functional departments in effect serve each other as staff departments. When a department performs a service to other departments, or when it acts in an advisory capacity, or when it must impose some requirements on other departments in order properly to carry out its own functions, it is acting in both a functional and a staff capacity. Thus, although the various functions are organized as line organizations, they are also in effect functional staff organizations. All functions are, in fact, performed as services to the business as a whole and they are related to each other as functional staffs. Specialists in functional fields are likely to have a bias in favor of their area. Those in manufacturing sometimes leave the impression that this field is the reason for the firm's existence. Those in marketing or other areas tend to leave a similar impression regarding their own field. The fact is that manufacturing, for example, serves marketing by making the product available for sale, while marketing serves manufacturing by selling the product. A single department does not exist independently for itself but to serve the firm. Although certain departments, such as accounting, have frequently been looked upon as merely expense departments, it is clear that such departments are as essential to the success of the business as any others since the firm could not exist without them.

Fig. 19. Typical organization of a manufacturing plant.

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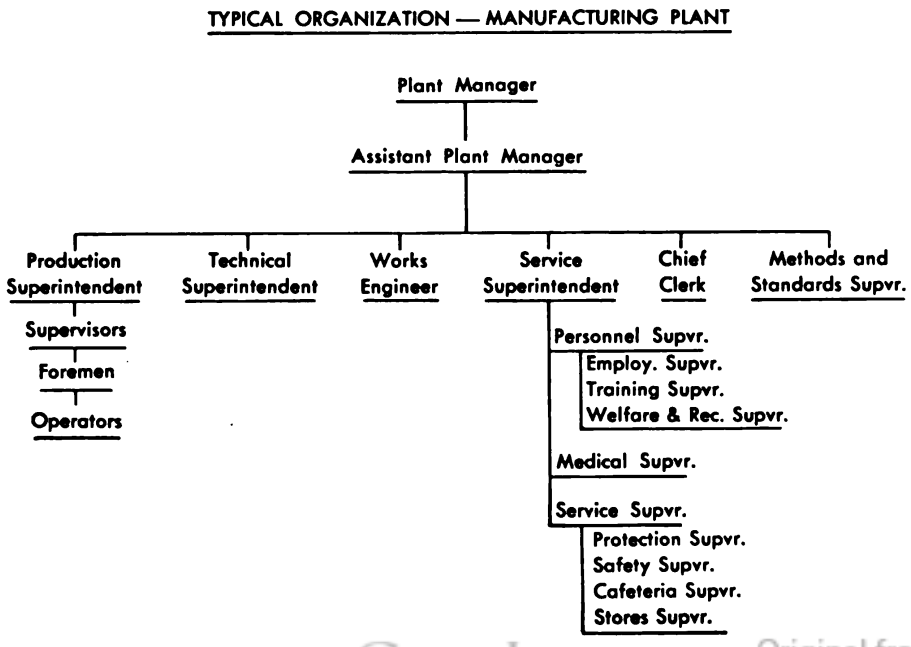

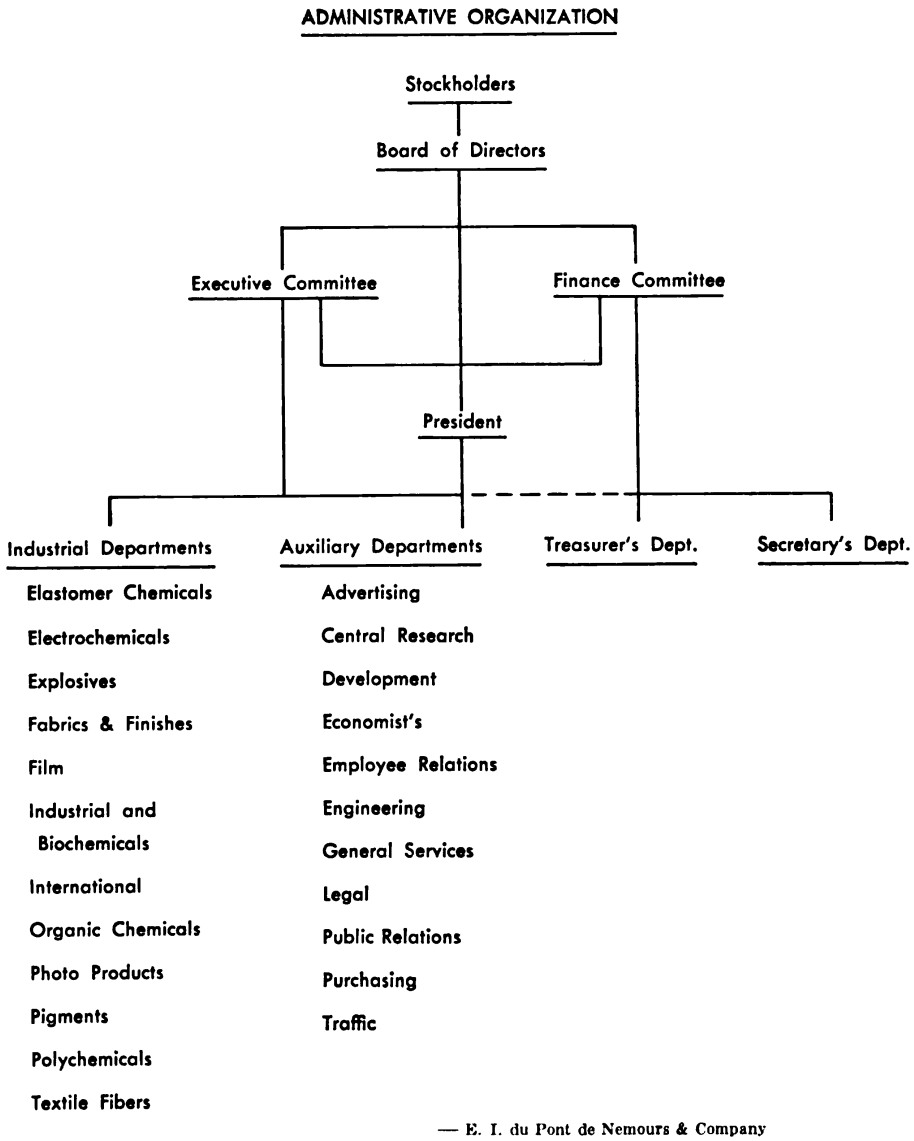

Fig. 20. Administrative organization of the du Pont Company.

Committees. Committees are fairly widely used on different management levels, for the purpose of discussing differences and arriving at suggested programs and recommendations. They may help to develop ideas and proposals as a supplement to staff departments. To be effective, however, committees should not work out their own problems requiring the development of facts and their interpretation, for they have no one to do such work. Either the chairman or secretary, or preferably a staff department, should be the working agency to develop the facts and conclusions and present recommendations.

Committees are used at the board of directors, the general management, and the operating levels. There may be a general executive com-

mittee, an appropriations committee, a wage and salary committee, a personnel committee, a production committee, a manufacturing advisory committee, shop conferences of foremen, and so on, although not all of these are likely to be found in one company.

The E. I. du Pont de Nemours & Company has committees of the board of directors. There are no outside directors on this board; it is an active board which meets once a month. Figure 20 shows the administrative organization of this company.

The use of committees is a controversial subject. Some executives who are completely opposed to their use charge them with wasting time, producing compromises instead of clear-cut decisions, stifling individual initiative and lessening individual responsibility. It has also been said that committees talk about what the members should be doing.

Others, however, seem to find the committee system a valuable device for coordinating both activities and points of view when the committees are properly organized and administered. Gordon concluded[8] that in large corporations executive decision-making is often a matter of group action by committees of executives which have partially supplanted individuals in formulating decisions. Management committees are either functional or general management committees with the latter more widely used in dealing with problems of production, engineering, sales, prices, labor relations, and new products and processes.

Outside, Independent Staff. *Trade associations.* Organizations or associations formed by independent businesses in particular industries to promote their common interests are called trade associations. Although trade associations collect and distribute information of various kinds, there is no precise uniformity in their objectives and procedures. Among other activities, they collect and provide data on costs and prices, credit information, product standardization, new products, new uses for products, sales promotion, and markets. In performing this work they may have an influence on management. Since dominant groups in a trade association or the executive secretary of the association may control its policies and recommendations as well as the information collected and made available, it is possible that one or more member companies may occasionally consider some aspects of the work of a given trade association as not in its best interest.

Management Consultants. Many firms spend fairly large sums for the advice of independent management consultants who make investigations and provide impartial recommendations. Such consultants are also called business consultants, business counselors, and consulting management engineers, while those specializing in labor relations are called

[8] *Op. cit.*, p. 79 ff.

labor relations or industrial relations consultants. Although there are management consulting firms, individuals such as management professors are often engaged even when they are not attached to consulting firms.[9]

Management consultants may be engaged by companies which cannot afford highly specialized staff officers to perform such services on a permanent basis. They may be utilized when a company has grown fairly large under the dominance of its founder and needs internal reorganization. They may be desirable to help resolve conflicting views of important personalities. Another factor leading to the use of management consultants has been the rise of labor unions and government regulations of various kinds. Although some companies claim that the advice they received was not particularly useful, the services of the management consultant are widely used and the work is fairly remunerative.

Coordination and Control

The coordination of activities is necessary for various reasons. Occasions may arise when the interests of one functional department collide with those of another. The sales department, for example, may be interested in adding additional products which the engineering and production departments claim would be too costly. The engineering department may develop possible changes in the product which the sales department says it cannot sell. The sales department may wish to push sales into geographical, income, or distributive areas which would result in increasing credit risks. Differences of these kinds have to be resolved by the president or by committees of management in order to coordinate the work of the company in line with policy.

The need for coordination becomes especially important as a business becomes larger and the highly specialized functional activities cannot be personally controlled by the president or general manager. Although the extent to which management should be decentralized must be decided, coordination and control must be provided for regardless of the extent of decentralization.

Incentives. Since control as such does not achieve the greatest efficiency, there must also be incentives. Although financial incentives are important, there are also nonfinancial and social or group incentives. Incentive wage payments will be taken up in a later chapter. However, the more important nonfinancial incentives will be briefly noted here.

Nonfinancial incentives are considered fairly important by employees. Some of these incentives have to do mainly with the environment, and especially with fellow employees. It has been found that the most im-

[9] Charles L. Quittmeyer, "Faculty Consulting Practices," *The Journal of the Academy of Management*, Vol. 3 (April, 1960), pp. 41–50.

portant nonfinancial incentives are interesting work, job security, the chance of advancement, the company's attitude toward employees, working conditions, the supervisor, the vacation policy, and working hours. The importance of such nonfinancial incentives should never be underestimated. Urwick summarizes the nonfinancial incentives which are sought into three basic groups as follows: (1) individual identification with the institution and its purposes; (2) opportunity, or help and encouragement to grow; and (3) equity, which is justice seasoned by a sense of humor and by reflection that should guide those who have to exercise authority.[10]

Morale. Discipline involves obedience to rules, regulations, and instructions. In a good organization discipline is automatic because authority is clearly delegated and understood, while the employees have a high degree of morale because of adequate leadership. Morale is the general attitude of employees toward their work, their superiors, and the company. Confidence and loyalty which reflect good morale develop from good leadership, the maintenance of satisfactory human relations, incentives, integrity and honesty on the part of managers and supervisors, good organization and control, and the existence of clear-cut policies. The lack of one or more of these factors, the unsatisfactory selection of supervisors, too many supervisors, and similar factors help to destroy morale.

Bureaucracy. It is possible to overemphasize the form of organizational structure. Since excessive preoccupation with an effort to achieve a theoretically symmetrical organization chart may lead to ignoring more satisfactory combinations, it is important to recognize that organization should be based on the requirements of the particular business and of the personnel available. Organization should exist solely to serve a business rather than as an end in itself. Only when there is a need for a particular form of organization should it be used. An organization should also be able to adapt to changing needs. As Folts pointed out, "An organization which finds change difficult is usually an agglomeration of vested interests, bureaucracies. The business they control exists to serve their individual ends, not they to serve the business as a whole."[11]

Although the personalities of dominant individuals may influence an organization, this influence should be minimized in order to achieve good organization. Moreover, although it is desirable to encourage decision-making at as low a level as possible in order to take advantage of specialized abilities developed at such levels, there may be excessive in-

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[10] Lyndall F. Urwick, "How the Organization Affects the Man," *The Management Review*, Vol. 46 (July, 1957), pp. 54–61.

[11] Franklin E. Folts, *Introduction to Industrial Management*, McGraw-Hill Book Company, Inc., New York, 1938, p. 541.

efficiency as a result. Again, although informal organization reflected in the development of relationships cutting across strictly established lines may contribute to more productive work, it is essential to have an awareness of such relationships. As Urwick wrote, internal influences pushing upward may create difficulties, as is shown by the fact that there are those in every organization whose idea of self-adjustment is to adjust matters to suit themselves.[12] There may be ". . . obscure struggles to establish an undefined status, struggles in which the combatants are often unconscious of what they are really snarling at each other about."[13]

It is important to recognize and offset so far as possible any tendencies toward bureaucratic inefficiency, inflexibility, and resistance to necessary change as it becomes apparent. This is particularly essential in the larger enterprise in which the chief executive is far removed from the lower ranks of the executive hierarchy where many policies are actually initiated. The inherent tendency for bureaucracy to expand, particularly in government or public administration, was obvious to some observers for a considerable length of time, but it remained for C. Northcote Parkinson to summarize the procedure in the formulation of what he called *Parkinson's Law*. In his popular book by that name,[14] he gave a number of examples, including some statistics, showing such developments as the rise in the number of British Admiralty desk jobs in the face of a decline in the size of the fleet and the number of officers in the Royal Navy. Another increase in personnel appeared in the Colonial Office in the face of a decline in colonialism. Although similar developments in the United States have not been publicized in so popular a book, casual observation indicates similar examples.

Parkinson implied that his Law would be found at work in any organization. In business, however, its operation is considerably offset by the proper use of organization techniques and controls, including budgets, while the profit objective exerts an important influence, for it is obvious that appropriations for deficits will not be forthcoming by legislative enactment. At the same time, it must be kept in mind that we have for the most part been experiencing a long period of prosperity with only comparatively light setbacks, and such a period may encourage what may later be regarded as unnecessary excesses.

Management Responsibility. As a result of its strategic position, especially in large corporations, management has accepted a responsibility in the nature of a trusteeship not only to stockholders, but also

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[12] L. Urwick, *Scientific Principles and Organization* (New York: American Management Association, 1938), p. 14.

[13] *Ibid.*, p. 15.

[14] C. Northcote Parkinson, *Parkinson's Law* (Boston: Houghton Mifflin Company, 1957).

to labor, the public generally, and consumers specifically. To these might be added suppliers, creditors, the community, and government. The growth in the strategic position of management has been accompanied by the development of professionalization facilitated by the rise in the study of business at the colleges and universities as well as by the efforts of companies to develop future executives.

Conclusion. Human factors necessarily enter into the building of an organization and adapting it to necessary changes. It is therefore essential to bear in mind that the development of a successful organization involves more than the application of techniques.

QUESTIONS

1. Distinguish between administration, management, and organization.
2. How does one go about deciding on an organization structure?
3. What are the duties of the major executives? How is executive responsibility exercised in large corporations?
4. Illustrate the operation of the exception principle by describing a system in operation at your college or university.
5. What are the respective advantages and disadvantages of line organization and line and staff organization?
6. How may the functional staff organization be said to have evolved out of the concept of functional foremen?
7. What is the relationship between incentives and morale?
8. What do you understand by bureaucracy? Under what circumstances can it develop in a business?
9. How would you explain the source of authority in (*a*) business, (*b*) government, and (*c*) military establishments? Is it possible to reconcile these and to arrive at a generalization regarding the nature of authority?
10. In *The Law and the Profits* (Boston: Houghton Mifflin, 1960), C. Northcote Parkinson set forth Parkinson's second law, which states that expenditures rise to meet and exceed income. He applied this principle to government. To what extent might it be applied to business?

CASE: LaSalle Manufacturing Company

The wage and incentive department of the LaSalle Manufacturing Company employs a group of experienced industrial engineers who are organizationally located at the main office but who travel to the various plants located in different parts of the country and make time, wage-incentive, and related studies. They prepare reports and recommendations for changes. They also make audits, which report on their examinations and review what has been done. Since it is distinctly understood that the various plant-operating officers are not obliged to follow any suggestions made, the home office department is pure staff. However, copies of the audits are routed to the top vice-president in charge of operations.

1. Is this good organization?

2. Why should the wage and incentive department be so strictly viewed as staff?

3. Are there any disadvantages in the arrangement?

CASE: Pan American World Airways

The top management of Pan American World Airways decided it would be desirable to have management studies and evaluations made of the efficiency of operations at its airports. It was felt that there was a need for a thorough procedural audit of the major cost locations. The need seemed especially acute because of a recent merger of two operating divisions with slightly different ways of doing business within the framework of the whole corporation. It was desired to hasten the effective fusion of these units into one operating entity.

After considering various possibilities, including the use of outside management consultants, the management decided that an effective plan would be to make up small teams of experienced department or section managers to conduct such "audits." The composition of one of these teams consists of representatives of traffic, ground operations, supply, commissary, communications, and aircraft maintenance.

The method of operation is to go into a location and study each segment of the operation as to procedure (adherence to company policy), personnel quotas, ground handling equipment quantities, space and office furniture quantities and layout, and handling agreements with other parties. The basic approach is "If we were to start all over again in this location, how would we do it to guarantee the integrity of our service reputation within the bounds of good, sound business practice?"

Conferences are held daily (or nightly) at which the "expert" assigned to study a specific segment is himself subjected to "brainstorm-type" questioning by the other members of the team. This process is repeated until conclusions are gradually reached and recommendations made to top management in a coordinated report written by the appointed chairman of the team. This report is then given a "public" airing with headquarters department heads, who are given a further opportunity to ask questions of the team. Top management then instructs department heads to act on the recommendations of the team unless deviation can be justified by facts known at headquarters but not known at the time of the "audit."

1. What advantages or disadvantages can you see in this plan as against retaining outside consultants?

2. What conditions are present in this firm (and possibly industry) which might encourage favorable consideration of such arrangements as against the situation in other firms or industries?

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Chapter V

Locating the Business

WHEN reference is made to locating a business, it is necessary to keep in mind that this involves not only the location of an entirely new business, but also the establishing of a branch plant or the relocation of an existing business. Among the reasons for establishing new firms are new products, new processes of production, and expanding markets. Branches may be established for similar reasons as well as the desire for decentralization to avoid excessive concentration of labor, inadequate manufacturing space and insufficient labor supply in existing locations, concern about the employment of too large a proportion of the community's labor supply, and greater vulnerability to labor pressures when the operations are too concentrated. Relocation is undertaken for such reasons as insufficient space for expansion, unsatisfactory labor relations in existing areas, excessive rental costs, traffic congestion and the difficulty of loading and unloading at the plant, municipal regulations, and the desire to be nearer to principal markets.

The achievement of the lowest cost of production and distribution which is affected by transportation, material costs, labor, power, land costs, and taxes is a fundamental goal in locating a business. The relative advantages of different possible locations must be weighed in terms of the differences in operating and transportation costs.

Some of the other factors, the influence of which cannot be calculated exactly, are climate, the availability and quality of the water supply, fire-fighting and sanitation facilities, educational facilities, the type of local population and government together with their attitudes toward business, and the tax structure.[1]

Historical Trends in Location. A brief reference to the economic history of the United States shows how the various factors influenced

[1] Cf. Benjamin Chinitz and Raymond Vernon, "Changing Forces in Industrial Location," *Harvard Business Review*, Vol. 38 (January–February, 1960), pp. 126–136.

the location of industry in general. Since early location depended on water power and transportation, industry was perforce located in the coastal areas. The canals and turnpikes as well as the steamboat followed natural geographic routes, with the main direction north and south. With the coming of the railroads which connected the east and west, the westward movement was encouraged, accompanied by an increase in population and the development of wider markets.

Trade, markets, and cities located on easy routes of transportation. Colonial industry was on the coast while trade was also coastal and on rivers. Settlement inland at first followed navigable rivers since the limited overland transport which existed was primitive and costly, although roads were somewhat improved at an early period. However, the canals began to be important by 1830, the eastern railroads began in 1843, and the consolidation and westward extension of the railroads began in 1862. By the 1890's street and interurban railways were becoming important, although the latter soon declined rapidly.[2] By 1918 the motor vehicle had begun to cut into all other forms of transportation.

During the nineteenth century the development of cheaper and faster long-distance transportation by waterways and railways led to a tendency toward the concentration of particular types of manufacturing at advantageous points. This concentration of production in given areas was accompanied by an increase in output which resulted in the development of specialized techniques in such areas. The labor supply also became specialized in some of these geographical centers. The developments were facilitated by the displacing of water power with power machinery, which was being increasingly exploited. The railroads made it possible to reach the necessary coal to be used as fuel. Later, the development of electric power became a factor leading to regional concentration in power areas, although the possibility of long-distance transmission made possible a certain amount of dispersion at an early date.

In these centers of concentration, the development of a larger labor supply, the economies possible from the specialization of related firms in the industry, and the lower transportation costs resulting from the large volume of traffic were among the factors encouraging further concentration. Of course, historical accident was in some instances a factor in getting certain industries started in one place as against another, while in others the accessibility to bulky and perishable materials was a factor.

Since natural resources are scattered throughout the country and the economic limits of some centers were reached, a tendency toward the

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[2] Cf. John F. Due, "An Empirical Study of Abandonment Decisions," *The Journal of Finance*, Vol. 14 (September, 1959), pp. 361–372, for interesting differences in the decisions of various men in meeting the decline of the particular interurban railroads for which they were responsible.

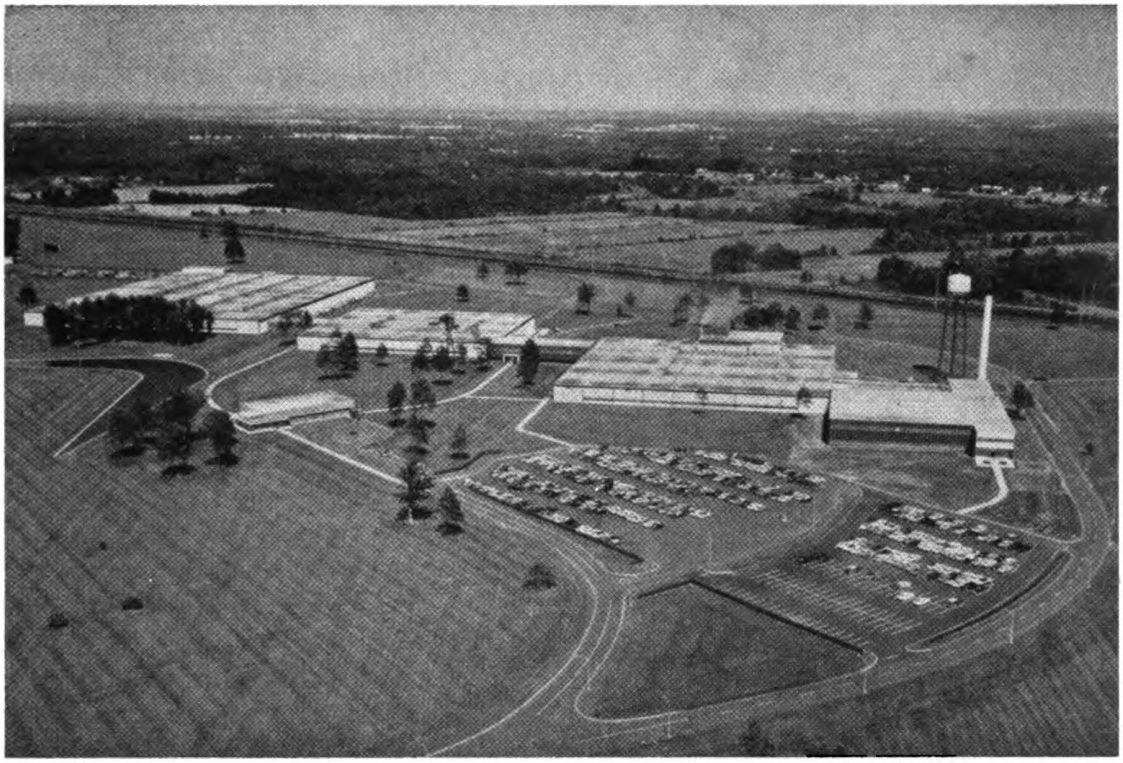
dispersion of industry eventually appeared. The mobility of labor, the high labor costs in old centers, and the very fact that companies had become financially stronger and no longer dependent on local capital were other important factors leading to dispersion and decentralization, particularly in the twentieth century.

Moreover, the rise of automobile, bus, and truck transportation was of the utmost importance since motor transportation is adapted to the short haul and therefore increases the number of places to which transportation can be supplied. This development permitted the scattering of plants and encouraged location in and around large cities rather than near railroad districts exclusively.

The passenger automobile was the significant factor encouraging the rise in suburbs, which began on a large scale in the 1920's. The popular Sunday drive within a radius limited by available time and the speed of the earlier automobiles suggested the desirability of living in the country, and within a short period the country had become the suburbs. While the automobile drive into the country originally stimulated interest in the suburbs, the suburbanites did not for the most part drive to work in the city, especially since convenient railroad transportation was available. Although population movements into the suburbs were comparatively limited during the depression period of the 1930's and the war and immediate postwar period, construction of housing on an ever widening scale soon led to such great increases of suburban populations that widespread problems of transportation, water supply, school facilities, and so on, developed in many areas.

Since centers of larger cities were becoming too congested, there were certain early tendencies toward the movement of plants to the suburbs. This was encouraged by the rise in the availability of electric power which made possible the use of low, spreading buildings since shafting and belts were no longer necessary. Wide and attractively kept grounds became a feature of the new plants. In the expansion of industry during and after World War II these trends became intensively accelerated as more and more suburban location developed, with extensive commutation by automobile from the suburban employees' homes to their plants. Figure 23 is an example of a modern suburban plant.

The problems of the cities themselves became intensified as plants, stores, and other establishments moved away and as hitherto unimagined motor-traffic congestion, together with deterioration of housing, demanded attention. Since railroad commuter lines were abandoned as they lost traffic, a sufficient number of remaining riders descended on bus lines to add to the traffic problem. At first, efforts were directed to traffic problems and the relieving of congestion at access points by constructing belt lines into and around cities. In some instances these were



— Johnson & Johnson

Fig. 23. A large manufacturing plant located in a suburban area.

inadequate after only a few years as the urbanized areas spilled over the roads around cities and left them within that area which, except for political boundaries, became otherwise part of the city.

Attention was soon directed to housing also, and cities undertook urban redevelopment on a very large scale. However, the magnitude and complexity of the problems encountered were such that the question was raised as to whether they could be satisfactorily surmounted. It became clear that consideration had to be given to coordinating problems extending over the entire metropolitan area, including former suburban areas and new suburbs extending much farther out in all directions of the compass.[3]

Although these problems were most pronounced in large metropolitan areas, they also appeared in smaller cities and even in communities within metropolitan areas. In some instances, plans were undertaken to exclude traffic from downtown shopping centers with gardening and trees established in such areas and pedestrians permitted to move freely over the former streets now closed to vehicular traffic.

Westward Trends. In addition to the foregoing trends, there has been some tendency toward location in the South, but particularly to-

[3] Although the literature on this subject has been expanding, the Committee for Economic Development's *Guiding Metropolitan Growth* (August, 1960) is of interest since it represents the views of an organization of businessmen.

ward the West and Southwest. In recent years canneries, plywood plants, prefabricated housing plants, pulp and paper mills, paperboard plants, and powdered-metal plants were constructed in the Pacific Northwest. In California, expansion was not confined to the metropolitan coastal areas but extended to the Sacramento and San Joaquin Valleys. In addition to food-processing plants established in both valley and coastal cities, steel mills and automobile assembly and parts plants were also established. Location near expanding markets and sources of supply were factors in these trends.

International Business. In recent years the field of international business has been attracting increasing attention. Some large companies have for various reasons been establishing branch plants in foreign countries. Among the factors leading to such decisions are the desire for diversification, for expanding or retaining overseas markets in the face of import restrictions, and lower operating costs abroad. Needless to say, since there are risks in direct investment abroad, careful consideration of the political and economic climate is essential. Thus, if a plant were to be located abroad to sell a good deal of its output in Africa, a manufacturing location in Europe might be preferred.

The post-World War II tendency to eliminate trade barriers and to establish larger economic units was reflected in the establishment in January, 1958, of the European Common Market (European Economic Community) which is the outstanding example of such units. American business firms made direct investments in the member countries in order to expand their markets by taking advantage of the tariff preferences. At the same time, it was recognized that a problem might arise if such larger marketing units set up tariff barriers against each other. Since the aim has been to expand international trade, proposals were made to reduce United States tariffs, but at the same time it was recognized that competition from abroad would raise problems for some industries located within the United States.

The practice of licensing overseas producers has been expanding considerably. Under such arrangements, royalties are paid to the United States firm granting the license. These royalties range from less than 1 to more than 35 per cent of sales, but the average is about 3 or 4 per cent. Among the advantages of licensing arrangements are the opening of markets abroad for component parts where the licensee is primarily an assembler, acquiring new ideas, and possible opening of the way for later direct plant investment. Although such license arrangements avoid the immediate problem of direct investment, they entail certain risks ranging from ordinary cheating to foreign exchange restrictions preventing the collection of earnings.

Factors in Location

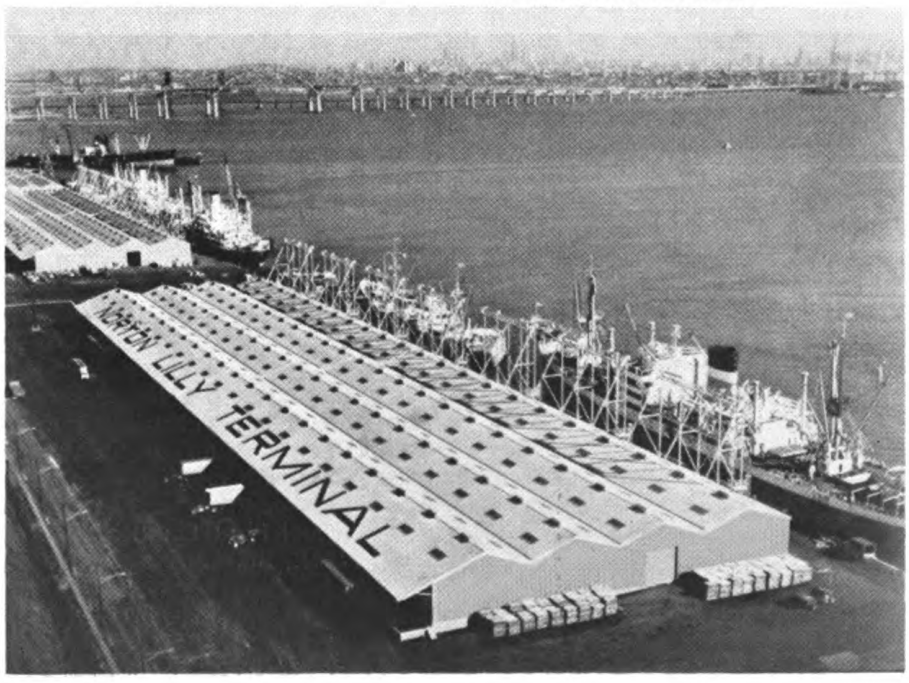
Transportation Costs. Transportation costs are basic and strategic in location except when it is necessary to locate near the sources of raw materials, as in the extractive industries, where the emphasis cannot be focused primarily on such costs.[4]

Transportation costs both on the raw materials from their source of supply and on the shipments of the finished products to market must be considered. Bulky, fragile, and perishable raw materials with high transportation costs suggest location near the source of supply. On the other hand, plants producing bulky and perishable finished goods have to be located near their markets because the finished goods are more valuable than the raw materials and therefore have higher freight rates. The problem is to compare the costs of transporting the raw materials against those of transporting the finished goods. Since there are many factors influencing transportation rates in addition to the general rule that bulky raw materials are transported more cheaply than lighter weight and more valuable materials, freight tariffs must be studied and compared. The general transportation rate structure as well as preferential rates and special privileges must be taken into account. The possibilities in water, truck, and railroad transportation require consideration and

[4] Maurice Fulton and L. Clinton Hoch, "Transportation Factors Affecting Locational Decisions," *Economic Geography*, Vol. 35 (January, 1959), pp. 51–59.

Fig. 24. Salt-water port facilities provide the link between trans-oceanic and domestic shipping.

— Aluminum Company of America



comparison.[5] Figure 24 is an example of modern salt-water port facilities.

Labor Costs and Labor Supply. The variation in labor costs in different areas may be a significant factor in location, since labor is not yet universally organized in unions with standard rates for entire industries with scattered plants.[6] The existence of an adequate supply of labor is important, however, whatever the wage rates may tend to be. In regional areas of specialization the available experienced labor encourages further location there. The development of a supply of workers for heavy industries gives rise to a labor supply of women who are available for work in light industries. A labor supply used in seasonal work may be available for other work in off-season periods. Of course, since the situation at any given moment is subject to later change, it is essential to study trends and try to anticipate future developments. The fact that labor happens to be relatively cheap, for instance, does not mean that a considerable increase in the demand for labor will not raise the rate, or that union pressures will not arise.

There are practically always some kinds of labor available in large cities. For several years during World War II thousands remained unemployed in New York City, for example, while the labor market elsewhere had become extremely tight. It is generally believed, however, that labor relations may not be so peaceful in large cities as in other communities.

Although the labor supply in smaller towns is usually not so diversified, the total labor force, especially including women, may not be fully employed. Workers in smaller communities may be more adaptable to training for new and different types of jobs than those in large cities because of a generally less specialized background and wider experience on different types of work. With fewer alternative opportunities at hand, they may be more interested in learning new jobs. For these reasons, also, labor relations may be more favorable than in large cities.

Regional Factors. All companies in an industry are not necessarily located in the region or city of concentration if there is one. Some industries are, in any event, widely dispersed. But when an industry has concentrated in one or more regions, it is essential to look into the feasibility of locating a new firm of the same or of a related kind in such

[5] Charles E. Landon, "Freight Traffic on the Ohio River," *The Financial Analysts Journal*, Vol. 17 (May–June, 1961), p. 51 ff., points out that location on the Ohio River has been encouraged by lower freight rates on subsidized waterways than on railroads. The appended editor's note suggests that the large companies locating there do not pay for the use of taxpayer-financed construction and maintenance of inland waterway improvements and cheaper power, so that in the major shift of industries to such subsidized areas a limited few gain with resulting far greater social costs in areas abandoned and encouragement to further socialization.

[6] Martin Segal, *The Labor Market and Plant Location*, The Amos Tuck School of Business Administration, Hanover, N. H., Bulletin No. 25, November, 1960.

a region.[7] Even if the original reason for locating in a given area no longer exists, as in cases where raw materials have been exhausted and have to be secured elsewhere, there may nevertheless be other factors suggesting the need and desirability of locating there. There may be an available trained labor supply, financing may be facilitated because of the familiarity of banks with the type of business, marketing arrangements may exist which can be readily made use of, and, finally, machinery and equipment manufacturers who make the necessary equipment will either be located nearby or have necessary distributors of the equipment as well as parts for replacements.

Centralization and Decentralization. As many firms grew in size, the problem of maintaining proper control manifested itself, and there was considerable stress on centralizing the management of various aspects of the business. However, with the passage of time and the still greater growth, complexity, and geographic dispersion of some firms, it became clear that policies of decentralization might be more desirable. In some instances the problem concerns decentralization of management, while in others it may also include decentralization of some or all of the individual functions.

Decentralization of a firm's plants makes it possible to take advantage of labor supplies in different areas, or favorable sources of raw materials, or available markets for certain products. Regional assembly plants, for example, make possible considerable savings on freight costs. Specialization of production by plants as well as other advantages of geographical specialization may be available even to relatively small firms. In general, the advantages derived from decentralization of management arise from the fact that the delegation of responsibility and authority to subordinates in the field relieves top management of the burden of directing routine operations, and frees it for the more important problems of planning, policy-making, and control.

Industrial-Development Corporations. In some communities industrial-development corporations or foundations have been established to attract businesses. An industrial foundation is a corporation provided with funds by public subscription or donation and created for the purpose of encouraging the industrial development of the community by providing services of a financial nature to new or established firms. These foundations are privately sponsored community agencies which make investments out of their own funds, bring enterprises in need of capital to

[7] The term "region" may be variously defined for different purposes. Much has been written on this subject. A recent discussion is of interest: "Regionalism in the United States," *Current History*, Vol. 40 (May, 1961). See also Donald J. Bogue and Calvin L. Beale, *Economic Areas of the United States* (New York: The Free Press of Glencoe, 1961).

sources of funds seeking investment, or otherwise aid business in obtaining capital. Among the services provided by these foundations are the buying, developing, and selling of industrial sites, the buying and building of plants for sale or lease, the providing of funds for loan to or investment in industries, and the giving of managerial, engineering, and other counseling services to small business. In their consideration of location, some businessmen have been attracted to communities having these foundations even though they themselves do not intend to use the facilities because they consider the very fact of their existence as an indication that such communities are interested in promoting business. Others like the idea of being able to lease buildings from the foundations without constructing their own plants. In some communities so-called industrial parks have been established under local government or private sponsorship, with plants and grounds attractively laid out as an inducement to new industry.[8]

Other Factors in Location. The availability of adequate power cannot be overemphasized. Municipal regulations of various sorts, zoning requirements, and state and local taxes[9] are important. The fact that land may be donated or sold at a favorable price, especially in smaller communities, may be taken into account, but it should not be the deciding factor. Nor should tax concessions for a period of time be considered too seriously in making a decision. The possible importance of local markets may be particularly important for smaller producers.

Factory legislation, which is a responsibility of the states, is an important consideration in some instances. In some states this legislation is rather advanced, whereas in others it is not. Factory legislation covers such matters as working conditions, hours, safety devices, and plant facilities. The scope of such laws may be illustrated by the provision for the inspection of plant facilities. Since the requirements may extend to such features as the proper aisle space, the inspector could find, after the plant has actually been constructed and laid out, that the requirements of the regulations have not been met. Obviously such a finding might be likely to raise serious difficulties for the company and it is therefore clear that regulations in this and other areas should be looked into in advance.

In larger cities rail, water, and truck transportation are readily available. In New York and some other large cities, space in old loft buildings in the heart of the city is utilized by firms in light manufacturing industries. These buildings provide a combination of low rentals per square

[8] Richard T. Murphy, Jr., and William Lee Baldwin, "Business Moves to the Industrial Park," *Harvard Business Review*, Vol. 37 (May–June, 1959), pp. 79–88.

[9] Cf. "Taxes and Plant Location," *New York State Commerce Review*, Vol. 14 (September, 1960), pp. 1–5. Although this article reflects interest in New York State, it is a general survey and contains references to other comparative tax studies.

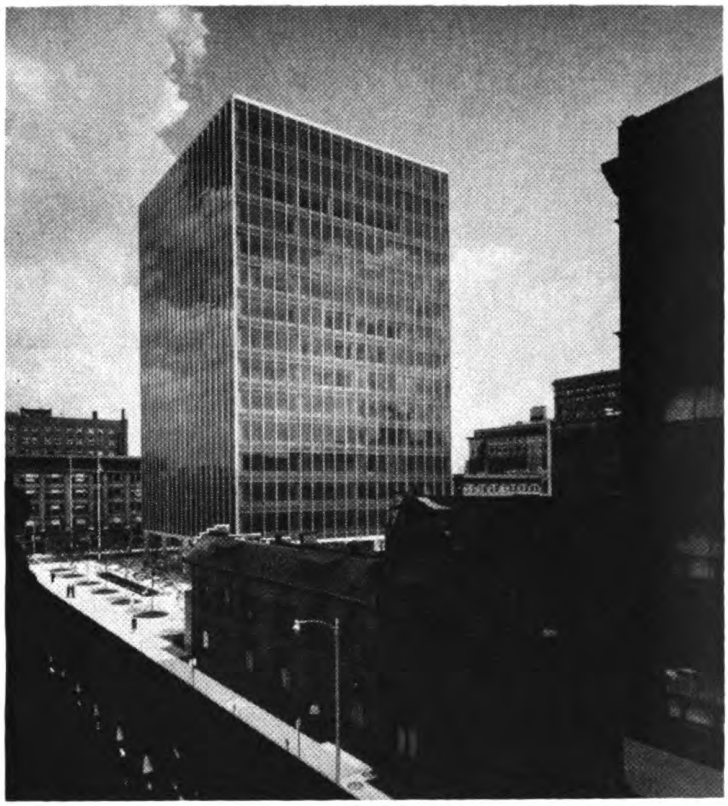


Fig. 25. A modern office rises in sharp contrast to the 19th century buildings around it.

— Libbey-Owens-Ford

foot, accessibility to a large body of skilled and unskilled labor, good transportation, and availability of supplies and services. Although their exteriors are not attractive in appearance, many of these buildings have been modernized within. Their sturdy construction permits the installation of fairly heavy equipment. A number of these buildings which were formerly used for manufacturing have been converted into showroom and office facilities. Figure 25 shows a new building in New York City in contrast with surrounding nineteenth-century buildings.

Widespread educational and entertainment facilities are an inducement to locate in a city. Land is expensive, however, and taxes are generally high. Some of the advantages of large cities are available in suburbs without the accompanying disadvantages. Truck transportation is readily obtainable and spur tracks are usually feasible. Land is not only more readily available in such areas, but it is also cheaper, and taxes are lower. However, since some suburban areas do not look with favor on industry, it is essential to find one which does.

In small towns an even larger supply of land is available, and there are sometimes idle buildings. (Figure 26 is an example of a small-town plant.) Taxes are also lower. While it is sometimes said that educational and leisure-time facilities tend to be limited, this statement is not entirely accurate, at least with respect to many smaller communities. Elementary and high school facilities and instruction are frequently of

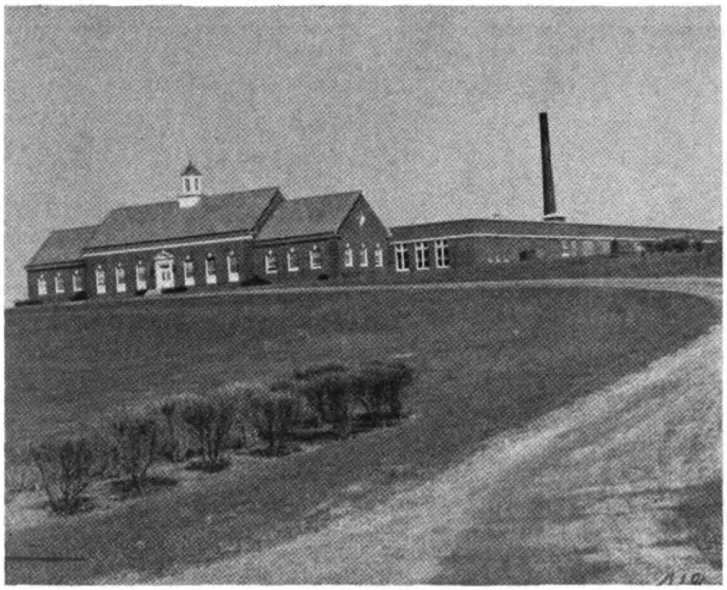


Fig. 26. A small-town plant for manufacturing flashlight batteries is effectively designed to blend in with the architectural style of its Vermont location.

— Vermont Development Commission

a high quality. While higher educational facilities are provided in larger cities, it is accepted as customary that capable high school graduates from rural and small-town areas will attend college elsewhere. In many areas leisure-time activities are immediately available or accessible within a relatively short distance. Although the entertainment of the theater, night clubs, and expensive dining out are lacking, while the costly cultural facilities of large libraries and art galleries are also not available, there are likely to be many other leisure-time activities which are highly valued by those living in such areas. Such activities include fishing, hunting, gardening, bowling, boating on lakes and rivers, swimming, skiing, ice skating, and other winter activities in many areas. Whereas people living in large urban communities sometimes travel considerable distances within their areas, it may be said that in general reasonably prosperous individuals outside such areas become accustomed to travel over even greater areas and have in some ways more diversified experiences than many, if not most, individuals living in and around large cities.

Although there are always certain processes of change under way and it is frequently not easy to notice them or appraise them adequately, they should be sought out if possible. Among such changes are population movements, changes in the quality of the population and the labor force, changing techniques as in transportation, and changing raw materials.

If a business started in the home town of its founder is successful, it may be concluded that there was sufficient economic justification for it to locate there and that the essential basic factors in location must have been met. Many who establish new firms do so on the basis of personal considerations, and do not make explicit choices of the region or community in which to locate. There is no reason for not locating according to personal desires if the business meets a need and will be profitable.

Location Procedures. Location may be decided upon by a personal trip of the president or partner to inspect existing buildings, especially when it is desired to rent or purchase a building rather than to build a new one. Real-estate firms may be consulted for information and assistance and reference may be made to current real-estate advertising in newspapers or advertising can be placed there. State development commissions provide facilities for assisting in location problems, even for small new businesses. Chambers of commerce as well as railroad and public-utility industrial departments stand ready to render assistance.

Decisions regarding the location of most small and medium-size firms are not likely to be made as carefully as might be desirable. On the other hand, it is to be expected that as a general rule the executives of large firms establishing branch plants will show considerable recognition of the problem and devote very careful reasoning to it. Decisions on the location of branch plants are thus likely to be based on a preliminary consideration of the general region followed by the selection of a specific community. Although the president will have an interest in the selection, the work will more often be delegated to specialists. Production managers or division heads are frequently designated to make the search. Firms establishing branches are also likely to make greater use of development commissions, chambers of commerce, and real-estate agents. Some seek the assistance of management consultants to survey their location problem and make recommendations. Others use sources of information available from banks, railroads, and power and light companies.

Multiplant firms with centralized administrative offices use the specialized knowledge of different departments. The marketing department makes market surveys and chooses a location best suited to serve the market; the purchasing agent determines sources of materials; the legal department makes a study of labor laws, tax laws, and miscellaneous recommendations. Such studies by the different specialized functional departments are then analyzed by the president and other executive officers, who use them as the basis of recommendations to the board.

The location procedures of firms making relocations are likely to be varying combinations of those followed in locating new firms and branch plants.

Community Survey. In deciding on a location, it is essential first to choose a general region and then explicitly to choose a specific community. Among the factors in choosing a region for a new business are personal considerations if the organizers desire to maintain their residences nearby, the type of available labor, nearness to material supply, nearness to markets, and possibly acquaintance with local jobbers who furnish the initial markets. Among the factors in choosing a region for

a branch plant is its production relationship to an established plant, as when a branch is established to assemble parts fabricated in the parent plant or to perform a step in the production process which starts or ends in the parent plant. In addition, management connections, regional marketing possibilities, nearness to raw materials, the availability of suitable plants, and occasionally personal considerations may play a part. Decisions of firms making relocations are frequently based largely on marketing considerations, although personal considerations, transportation costs on incoming materials, the labor supply, and the availability of a suitable plant may be factors.

After a general region has been selected for location, the communities which will not meet the major requirements are eliminated from further consideration, and the remaining ones are made the subject of indirect investigation in the course of which others are eliminated. When the possible sites have in this way been brought down to relatively few, surveys may be prepared to assist in making a final choice. If such surveys are to be useful, they must be competently made and carefully checked.

In selecting the particular community, those starting new businesses frequently do so on the basis of personal considerations such as contacts necessary to secure capital, manufacturing space, and labor. The community location of branch plants may also be decided on the basis of an available building and satisfactory labor, although production or management relationships are more important.

Technical Economic Surveys. Sometimes costly and extensive technical surveys are made to determine the location which would result in the lowest unit cost of producing and distributing the product. The general factors taken into account in such analyses are those already discussed, including the nature of the product and the manufacturing process in relation to nearness to markets, the accessibility of raw materials, the labor supply, and the power supply. The capital outlays as well as the cost factors involved in alternative locations are compared. Estimated costs of incoming freight, fuel, power, water, plant site, building, and outgoing freight are determined for the assumed volume of output at the alternative possible sites, and are compared to see whether there are any significant cost advantages in one of the sites as against another. Since such surveys cannot reveal some possibilities, it is important to note that they may not necessarily be as useful as they appear. For instance, on the basis of a very expensive and technical survey a costly blast furnace was located at a site which very soon proved highly unprofitable because of a change in transportation methods and rates for pig iron from southern furnaces into the market the new plant was expected to serve. The fact that every location problem

presents its own peculiar difficulties requires emphasis, for otherwise too much stress might be placed on technical mechanical procedures.

Conclusion. In economics the study of location theory has resulted in fairly elaborate and to some extent intricate analyses by the relatively few economists who specialize in this field. However, the basic factors involved have been covered in the present chapter.

It is obvious that decisions on where to locate require considerable time and effort because the investment in buildings and equipment which is made after the selection of a location is usually quite large in amount.

QUESTIONS

1. What types of moves are included when we speak of locating a business?
2. Outline the historical trends in location.
3. Why are transportation costs basic in location decisions?
4. What are the significant factors to be considered in connection with labor supply?
5. Why should regional factors be given consideration in deciding on location?
6. What special problems are associated with centralization versus decentralization?
7. What is your opinion of the value to business of industrial development corporations?
8. What are the advantages and disadvantages of cities, suburbs, and small towns, as the location of a business? Compare the relative advantages for two firms in different industries.
9. How do you account for the location of the colleges and universities in your state?
10. Compare a community survey with a technical economic survey.

CASE: Altman Office Machine Company

The Altman Office Machine Company had its main office in New York City when it merged with the Lawrence Company located in a small city in Ohio five years ago. The new company reorganized its national marketing structure into four geographical divisions in order to decentralize operations. The headquarters staff was substantially reduced as a result. This was a factor in the decision to move the headquarters to an attractive suburb in Westchester County, north of the city. The new location was in a comfortable split-level red-brick building on a 16-acre site. The rent was about $3 per square foot. The company developed good relations with the community and a number of the executives and employees lived there.

With the passage of time, certain problems which seemed to arise were brought to a head by the inconveniences of a severe winter, during which unusual snowstorms resulted in closing on several occasions.

The management had noticed the lack of so-called linkages in the suburb. Linkage is a term used to cover commercial services essential to a business

concern which, although native to a large city where they are in considerable supply, must be imported to the suburb. Among these linkages were engineers, lawyers, specialized accountants, blueprint and photostat shops, studios and artists for advertising and sales promotion, recreational facilities, restaurants, and barber shops. The company estimated that the cost of such services came to about $4 per square foot.

The possibility of returning to the city arose when a long-term lease at about $6 per square foot became available in a newly constructed building.

1. Should the company move back to the city?
2. Would the $1 saving per square foot in the new building perhaps be spent for some other purposes?
3. What other effects of the proposed move might be considered?

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UNIT 3

THE PRODUCT

Chapter VI

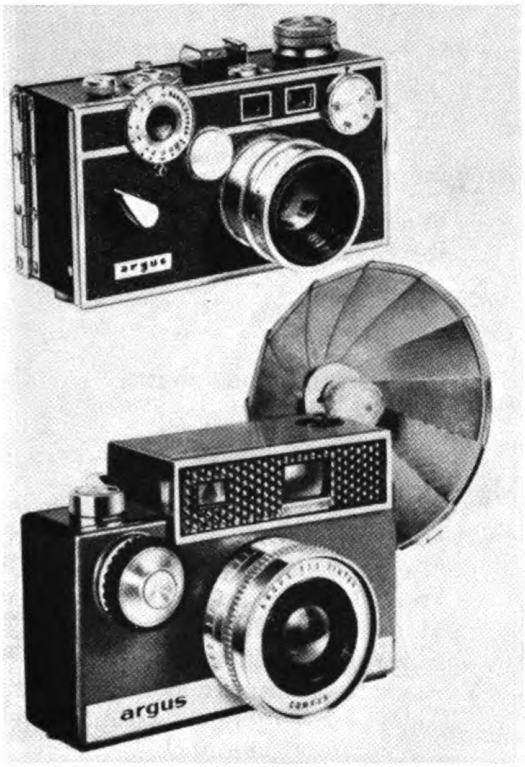
Developing the Product

THE underlying consideration in selecting or developing products is, of course, their possible profitability.[1] Research programs for product development, which were begun on a small scale by isolated companies in the period just prior to 1900, gradually became more widespread until today research and development programs are commonplace in many firms and industries. It is of interest to note that, although research outlays increased considerably before and during World War II, the most spectacular increases came after 1950 in considerable measure because of increased government and other sponsorship of new products, some of which were not in existence and therefore required research. Although new products have emerged in increasing volume as a result of industrial research, it will be noted from the following discussion that some product development is possible without extensive research.

Meaning of Product Development. Product development may mean the acquisition of new products, the improvement of present products, or the creation of entirely new products. Improvements on existing products, which are the source of most new products, may be based on the utilization of new or different materials or of improvements in appearance, styling, or packaging. The development and commercialization of entirely new products is a slow process which often takes a number of years. Figure 27 shows a 1936, 1938, and 1960 model of a 35mm. camera, the last being an electric-eye camera with a coupled range finder.

Sources of New Products. Although a new product may be the result of research, significant suggestions for new products may come from a variety of other sources, including executives, salesmen, and other employees. Although some companies find it desirable to have a "new product" planning committee, others set up special design and research departments to take the lead in finding new products. It is also possible

[1] John T. O'Meara, Jr., "Selecting Profitable Products," *Harvard Business Review*, Vol. 39 (January–February, 1961), pp. 83–89.



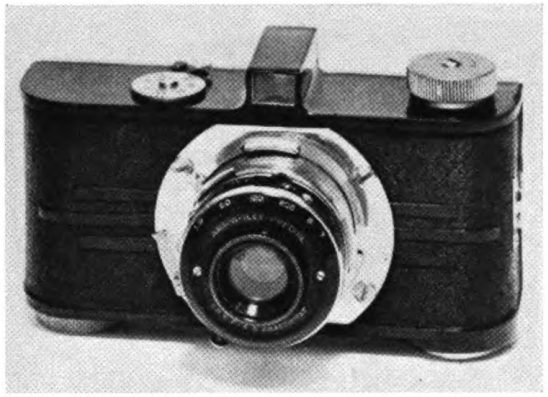


Fig. 27. Three 35mm. cameras: 1936 model (above), 1938 model (upper left) with range finder, and 1960 model (lower left) with electric eye.

— Sylvania Electric Products, Inc.

to acquire new products from other firms for further processing if the available equipment can be adapted to this purpose.

A number of leading companies have in recent years established "new product" or "product planning" departments, looking toward future new products.[2] The concept of product planning includes considerations of financial, manufacturing, and marketing matters. Decisions must be made on the market area and the market channels through which the products will be distributed, the method of promotion and personal selling, pricing, and finally the campaign to launch the new product on the market. It is necessary to decide on brand names, trademarks, packaging, labels, and service.

The following is a checklist of major sources for new-product ideas:[3]

I. *Company staff, experience*

Research and engineering staffs.
Sales staff.
Market research department.
Sales reports.
Employee suggestions.
Customer suggestions, inquiries, and complaints.
Accounting department records of adjustments, sales returns, and allowances.
Service department's record of repairs.
Analysis of sales records covering parts.

[2] S. C. Johnson and C. Jones, "How to Organize for New Products," *Harvard Business Review*, Vol. 35 (May–June, 1957), pp. 49–62.

[3] U. S. Department of Commerce, *Developing and Selling New Products*, 2 ed. (Washington, D. C.: U. S. Government Printing Office, 1955), p. 6 f.

II. *Distributors*

Brokers.
Factory distributors (manufacturers' agents).
Wholesalers or jobbers.
Retailers.

III. *Competitors*

Customers of competitors.
Competitors' products.
Mail order catalogs.
Exhibits and trade shows.
Foreign products.

IV. *Miscellaneous*

Firms for sale.
Firms relinquishing lines.
Inventors.
Patent attorneys and brokers.
Manufacturers of parts and accessories.
University and institute laboratories.
Suggestions from the public (or industry) as result of advertising.
Commercial laboratories.
Industrial consultants.
Management engineers.
Product engineers.
Market research agencies.
Advertising agencies.
Trade-magazine writers and editors.
Trade associations — executives and laboratory personnel.
Banks and other financial sources.

V. *Government agencies*

United States Department of Commerce:
- Patent Office.
- Office of Technical Services.
- Business and Defense Services Administration:
  - Industry Divisions.
  - Office of Distribution.
- Bureau of Foreign Commerce.
- National Bureau of Standards.

Small Business Administration.
Government Patents Board.
Department of Justice: Office of Alien Property.
Department of Agriculture.
Other Federal Agencies.

A formal classification and listing of sources of new-product ideas are not as directly suggestive as an indication of how companies got ideas for new products. In this connection, see Figure 29.

Design. When the idea of a product is conceived, or in some instances when a new product is developed by research, design may be necessary. Figure 28 illustrates changing designs in still photo projectors. Both design and research which are staff work may be combined in one department. In fact, the type of the company's products may be such that only one of these two procedures is required. Although research and design involve independent staff work without authority over production,

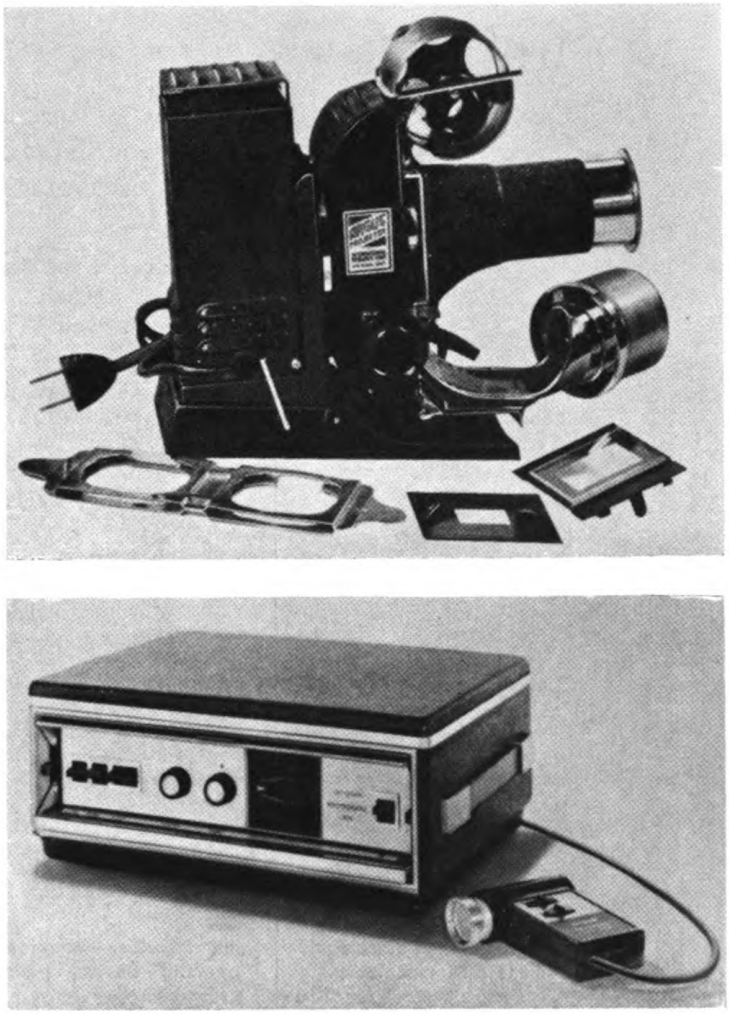


Fig. 28. Evolution of a still picture projector — 1936 (top) and 1961 (bottom).

— Sylvania Electric Products, Inc.

those engaged in such work have access to departments such as production, marketing, and purchasing whose work demands that they take an interest in new products.

In connection with design, there may be a separate engineering design department, the head of which is of equal importance to the heads of the marketing and manufacturing divisions. In designing a new product, it is first necessary to make preliminary sketches after the original idea is conceived; then to make models and detailed drawings; and, finally, after the materials have been specified, it is usually considered desirable to manufacture and check a small lot. If the small number manufactured are found satisfactory, the final drawings are made up for use in the actual production process.

Although the design of a product is basically an engineering matter, the cost of producing it for sale as well as the market appeal to customers cannot be minimized. Design engineers have been known to tend to be perfectionists, with little regard to the feasibility of making

the product at reasonable costs so that it can be sold at competitive prices. In addition it is possible that existing equipment will not be suitable for the manufacture of the proposed product on a sizable enough

Fig. 29. How 26 manufacturers located ideas for new products.*

Company	New product	Source of idea
Meat packer	Onion soup	Executive's wife.
Do	Canned chicken product	Salesman.
Manufacturer of industrial equipment.	Steam-producing unit	Advertised sale of manufacturing rights.
Tinplate converter	Breadbox	Market research agency assigned to study new product possibilities.
Electric appliance manufacturer.	Foot warmer	Customer inquiries.
Manufacturer of golf equipment.	Golf bag "toter"	President of company.
Manufacturer of service equipment for garages.	Hoist for garage	Garage mechanic contacted during survey of product users.
Chemical company	Deodorant for garbage	Advertising agency, which learned of local use.
Chemical and film company.	Detergent	Laboratory.
Die casting company	Line of dejuicers	Company executives.
Manufacturer of plastic product.	Film viewing device	Inventor.
Manufacturer of kitchen utensils and gadgets.	Kitchen gadget	Register of patents available for licensing or sale. (U. S. Patent Office.)
Chemical products company.	Insecticide	List of Government-owned patents available for licensing.
Manufacturer of office equipment and machinery.	Index device, envelope opening device, pencil gripper.	Office managers. Also jobber and wholesaler catalogs.
Canner	Apple juice	Food broker.
Appliance manufacturer	Electric bottle-warmer	Customers.
Film company	Film	Engineer.
Landscape supply and equipment company.	Fiber glass blanket to place around tree to keep down weeds and retain moisture in soil.	Register of patents available for licensing or sale.
Container manufacturer	Re-use container	President of company (noticed waste of materials).
Plumbing equipment and supply manufacturer.	New washer	Sales report.
Manufacturer of hardware.	Bedroom door knockers. Also miniature jewelry door knockers.	Executive in considering idea of reducing size of regular door knockers.
Pottery manufacturer	New vase	Museum exhibit.
Plastic products company	Plastic shield for wall light switch.	Inventor.
Do	Film slide viewer	List of needed inventions published by a bank.
Chemicals manufacturer	New type detergent for automatic washing machine.	Market observation showed need for sudsless detergent.
Engineering consultant	New type air regulator valve.	Observation of industry need not previously satisfied.

* U. S. Department of Commerce, *Developing and Selling New Products*, 2 ed., 1955, p. 5 f.

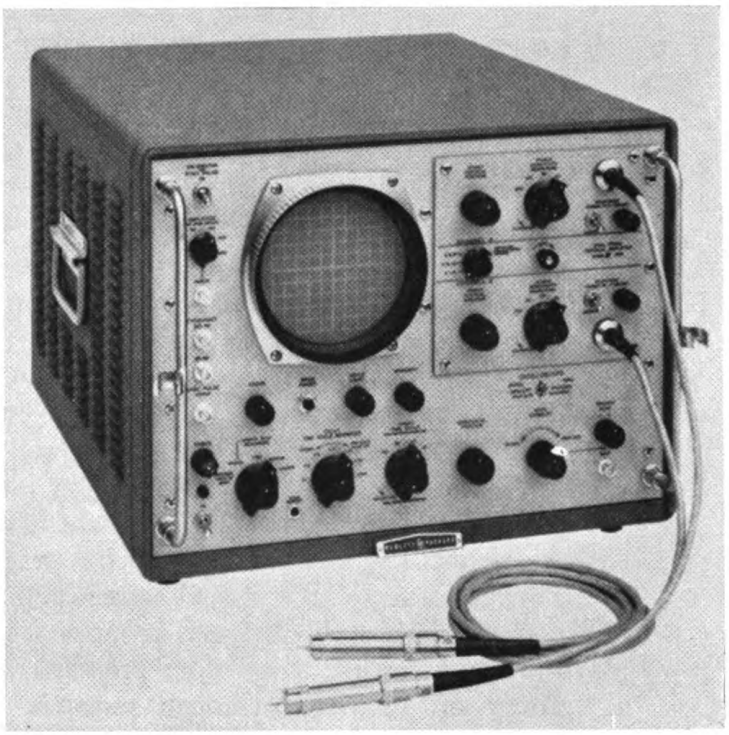


Fig. 30. A research-developed product which measures and displays electrical phenomena.

— Hewlett-Packard Company

scale. Consequently, it is desirable that design engineers consult with other interested departments such as marketing and manufacturing.

Research. Research may be classified as pure and applied. *Pure research* is that which is done more or less for its own sake, without too fine a regard for its practical possibilities, although its results may ultimately be basic to the later possibilities of practical applications. Business firms do not ordinarily make direct provisions on their own premises for the kind of basic scientific research which might be called pure research, since this is generally regarded as a function of universities and foundations. Since the importance of this kind of research is, however, widely understood, some firms make contributions in support of it. The dividing line between pure research and that with more practical possibilities is sometimes not exactly clear.

The research in connection with practical applications is *applied research*. It is this kind of research in the laboratories of many firms which leads to the discovery of new products which, after further investigation into their commercial possibilities, often leads to their being produced for the market. Although research laboratories were to be found in the 1880's and possibly even before, they became a common part of many firms beginning around the turn of the century. Figure 30 is one recent example from among the many of a research-developed product.

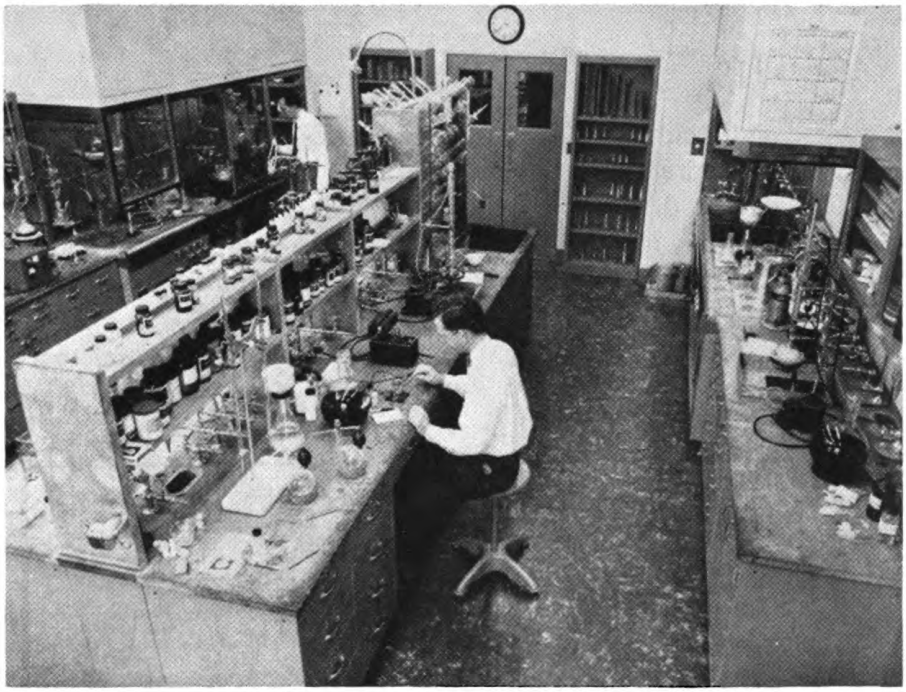
Industrial Research and Development. The vast increases in outlays for research and development in recent years have, as already mentioned, been encouraged and in many instances required under government con-

tracts.[4] In addition, however, the general attitude of industry as well as of the general public has been so favorable to research outlays that long-run social advantages may actually suffer. The pressure for immediate more-or-less practical results requires the employment of so many scientists in industry that there is some question whether this resource of scientific ability is allocated most effectively, or whether more of these talents should be applied to the training in universities of future scientists. Obviously, to the extent that scientists are employed in industry, they are not available as professors in graduate schools of universities.

Outlays for Research. Companies tend to follow either a quantitative or a qualitative approach in connection with their research program. The quantitative technique seeks to evaluate an entire research program through a single mathematical formula which is expected to show the maximum the company can profitably spend on research during any year. The formulas in use include such factors as profits from products created or improved through research, savings from processes, methods, or raw materials improved or discovered through research, income from research-derived royalties, royalty payments to others eliminated by research, profits attributable to research-created goodwill, investments in research and development programs, and investments required to bring research to commercial fruition. Those who favor the quantitative approach maintain that the objective formulas present numerically the most accurate possible estimates of research costs and returns, and, since dollar figures and ratios are easily understood, they help persuade top management to give a proposed program the support it deserves.

Those who favor the qualitative approach say that formulas cannot be relied upon to evaluate research and that it is preferable to depend on broad subjective composite management judgments. In the procedures followed, a series of personal appraisals pyramids through the organization from bottom to top. Each technical executive judges the work only of those groups and persons reporting to him, relying on subordinates to evaluate work at lower levels. Some evaluations are part of technical management's daily job, while others are made during formal periodic program reviews, which are usually made each time a new research budget is developed. Then the executive committee reviews research progress during the period just past, decides which proposed projects and programs to support, and fixes the budget on the basis of these decisions. All operating and functional groups are represented on this committee, to insure a balanced research program giving every present and proposed

[4] Cf. Yale Brozen, "Trends in Industrial Research and Development," *The Journal of Business*, Vol. 33 (July, 1960), pp. 204–217.



— E. I. du Pont de Nemours & Company

Fig. 31. The two-man laboratory is a basic research facility.

product line the support it needs to fulfill its objectives within the company's overall operating plan.[5]

Although an increasing number of companies have their own research facilities (Fig. 31), many also use university facilities and commercial or independent laboratories to supplement their own laboratories. Educational institutions and research foundations are equipped to undertake specific subjects by using their staffs or assigning the project to graduate students. Fellowships, scholarships, and work-study plans for graduate students which are financed at a low annual figure are arranged on an elaborate scale.

A number of trade associations also engage in research. Some operate their own laboratories, while others serve as clearinghouses of information and agencies to obtain research for the industries they represent. The suggestion has been made that larger firms might help to promote the private-enterprise system by providing research assistance to small firms, and in at least one instance several large concerns in a middle-western city entered into an agreement to do technical research for a number of small businesses on a cost basis.

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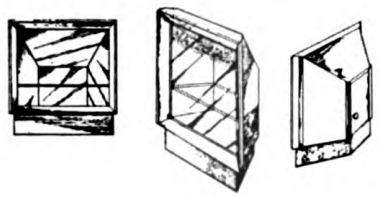
[5] The description of these company approaches to research was taken from James Brian Quinn, *Evaluating Research and Development: The Segmental Approach*, The Amos Tuck School of Business Administration, Hanover, N. H., Bulletin No. 22, September, 1959. The author is critical of both approaches and proposed what he called a segmental approach.

Patents. Patents are monopolies granted to the holders by the federal government for seventeen years. Patent attorneys must be employed to create descriptions not in conflict with other patents, and at the same time as broad as possible in order to prevent others from getting patents for articles with only slight modifications. Some companies have suc-

Fig. 32. Design patents. These drawings and specifications required by the Patent Office assure legal protection of an invention.

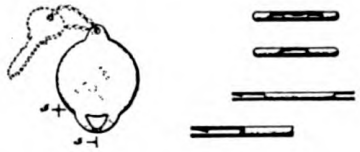
— U. S. Department of Commerce

172,022
DISPLAY CABINET OR SIMILAR ARTICLE
Wallace W. Harwood, New York, N. Y., assignor to August Rust-Oppenheim, New York, N. Y.
Application October 21, 1952, Serial No. 21,918
Term of patent 14 years
(Cl. D80—11)



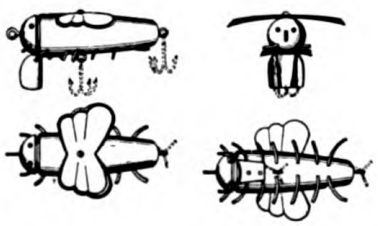
The ornamental design for a display cabinet or similar article, as shown.

172,023
COMBINATION COIN AND KEY HOLDER
William Thomas Henry, Socorro, N. Mex.
Application September 25, 1953, Serial No. 26,956
Term of patent 14 years
(Cl. D17—14)



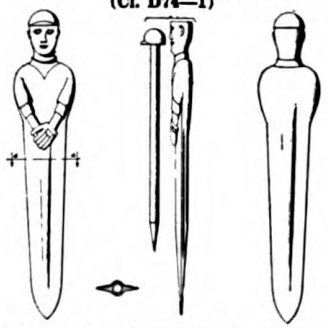
The ornamental design for a combination coin and key holder, substantially as shown and described.

172,024
ARTIFICIAL FISH BAIT
William E. Hogreff, Chicago, Ill.
Application July 20, 1953, Serial No. 26,047
Term of patent 14 years
(Cl. D31—4)



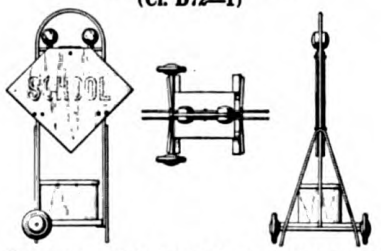
The ornamental design for an artificial fish bait, as shown.

172,025
COMBINED PENCIL, PENCIL HOLDER, AND PAPER CUTTER
Robert Hopstein, Brooklyn, N. Y.
Application February 4, 1953, Serial No. 23,443
Term of patent 14 years
(Cl. D74—1)



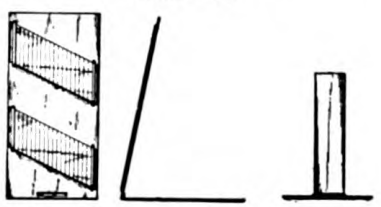
The ornamental design for a combined pencil, pencil holder, and paper cutter, as shown.

172,026
PORTABLE TRAFFIC SIGN AND SIGNAL LIGHT
Victor W. Hoye, New Castle, Pa.
Application October 20, 1953, Serial No. 27,242
Term of patent 14 years
(Cl. D72—1)



The ornamental design for a portable traffic sign and signal light, as shown and described.

172,027
REFLECTIVE SAFETY SIGNAL
Gustave A. Huber, New York, N. Y.
Application July 21, 1952, Serial No. 20,699
Term of patent 3½ years
(Cl. D72—1)



The ornamental design for a reflective safety signal, substantially as shown and described.

ceeded in prolonging the life of patents by litigation in which the original effective date is delayed or by patenting later improvements which have the effect of continuing the original patent, for all practical purposes. Figure 32 is a page of design patents in the *Official Gazette* of the United States Patent Office.

Scientists in the employ of large industrial corporations contract with their employers to assign inventions developed during their employment. Some corporations which acquire portfolios of patents may grant licenses to others permitting them to make and sell a particular product under the processes covered by a patent. These licenses state exactly which rights are granted and which withheld.

Innovation. While patents of new inventions are of interest, it should be noted that many patents are for one reason or another not exploited by manufacturing and selling the product. Only the actual exploitation of an invention constitutes an innovation. Innovations include not only the introduction of new products, but also the introduction of new production and marketing methods which give rise to more efficient and less costly operations for those introducing them. Successful innovations invite competition because the additional profits made by the innovators are also sought by those who follow. The noted economist, Joseph Schumpeter, developed his theories of business cycles in terms of innovation.[6] In recent years, some economists have given increasing attention to innovation.[7]

Controlling Research Costs. When money is appropriated for research into new products, it is essential to provide some method of controlling research costs. In doing this, estimates of the time and probable cost can be made, and on the basis of these estimates a budget can be set up to control the outlays and developments. Although the budget can be set up once the amount to be allocated to research has been determined, the actual cost is difficult to estimate in advance.

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[6] J. A. Schumpeter, *Business Cycles*, 2 vols. (New York: McGraw-Hill Book Company, Inc., 1939).

[7] Cf. Yale Brozen, "Business Leadership and Technological Change," *American Journal of Economics and Sociology*," October, 1954, pp. 13–30; W. R. Maclaurin, "The Process of Technological Innovation: The Launching of a New Scientific Industry," *The American Economic Review*, Vol. 40 (March, 1950), pp. 90–112; Maclaurin, "The Sequence from Invention to Innovation and its Relation to Economic Growth," *The Quarterly Journal of Economics*, Vol. 67 (February, 1953), pp. 97–111.

Maclaurin's *Invention and Innovation in the Radio Industry* (New York: Macmillan and Company, 1949) is of considerable interest for several reasons, including the clarification of the differing personalities, characteristics, and attitudes of the inventors discussed.

For a more extensive bibliography, see the selected and annotated *Bibliography on the Economic and Social Implications of Scientific Research and Development* prepared by the National Science Foundation (Washington, D. C.: U. S. Government Printing Office, 1959).

Profitability of Industrial Research. The profitability of outlays for industrial research is readily indicated by examples. One of the largest chemical companies reported that 40 per cent of its sales were accounted for by twelve new lines of products developed within the previous ten years. In 1959, Radio Corporation of America was reported to have estimated that 80 per cent of its sales were of products unknown ten years before. Du Pont forecast that at least 60 per cent of its 1975 sales revenue would be from products in their introductory stages in 1959 or still to be invented. A company producing building materials reported that 42 per cent of its sales were of products developed during the preceding decade. A paper company, which conducted research on its waste products, found that it could develop a line of plastic by-products which promised to be a more profitable source of income than its old product. Research on Bakelite led to its application to more than fifteen thousand uses.

Although these examples could be multiplied many times, it should be kept in mind that there is always the possibility that profitable results will not ensue especially in the shorter run. Moreover, when expenditures are made for such purposes it is not particularly possible to correlate the outlays with either immediate or remote gains although an occasional single development may be of sufficient value to warrant the continuance of relatively large outlays for industrial research.

Financing New Products. The successful introduction of a new product to a steady general market requires not only considerable time and marketing ability but also financial resources sufficient to sustain the efforts. A new product may require not only outlays for new or additional machinery and equipment but also the financial capacity to withstand the cost of defending a patent against an infringement.

Manufacturing New Products. Production problems of different kinds also frequently arise. In addition to the question whether existing machinery, equipment, and techniques are adequate, there is also the matter of the extent of the manufacturing department's familiarity with the necessary processes and its ability to cope with problems which might arise. It is not only a question of managerial capability, but also that of the existing labor force if the work is considerably different.

Marketing New Products. Since the obvious ultimate objective is sales, marketing problems arise at once. The question is not only one of immediate sales, but also whether the product will have an expanding volume market and a long future. Glass fruit and cake knives, for example, failed to attract sustained and expanding demand. New competition must be expected if a product is successful. The introduction of the safety razor, for example, was followed by considerable competition. The adequacy and capacity of the existing sales force as well as

the distribution methods require study when a new product is being considered.

The design of the product is an important factor in marketing; and appearance, the appeal to the different senses, the dimensions from the users' point of view, and the timeliness of the product are important aspects of design. The importance of packaging has in recent years increased considerably. A good package protects the product in shipping and storage, adds to the convenience in handling, and advertises the product. Since the engineering, production, shipping, purchasing, and marketing departments have an interest in packaging, a packaging committee composed of representatives of these departments may be considered desirable. The various problems involved in packaging become apparent when one considers the factors which have to be taken into account when a fruit-juice manufacturer tries to decide whether to use glass bottles or cans.

If a brand name is used, it should be short, simple, and easy to spell, read, recognize, and remember. It should also be one that will not get out of date. In some lines in which products are identified by the name of the producing company and the companies also give specific names to the different products of their assorted line, the latter names do not receive and hold customer attention to anywhere near the extent the company name does. In such cases, the name of the company as a brand name of the goods commands the more stable price over time. Examples are automobiles and typewriters, in which the company name is more important to the buyer than the model names with which the companies have only indifferent and at best short-period success in advertising.

A marketing survey in which cost, price, and volume are factors should be made in order to determine the prospects of sales. In addition to a survey of customers, the opinion of men on the job, supervisors, executives, and distribution agencies may be sought. In making a market survey, pictures or samples of the product are often considered helpful.

Conclusion. Product development has been receiving considerably increased attention. Many companies are not only directly engaged in rounding out diversified lines of products but they are frequently also acquiring other companies for this purpose. Of course, it is still possible to develop and successfully introduce a single product.

QUESTIONS

1. What do you understand by product development?
2. Mention and discuss several likely sources of new products, other than formal research.
3. Look up the financial pages of a newspaper like *The New York Times* to see whether you can find descriptions of new products actually introduced.

The Saturday issue of the newspaper mentioned usually contains information on newly patented items which have not yet gone into production and sales. Where else could you find descriptive examples of new products?

4. Decisions on outlays for research involve choices in the employment or utilization of scarce resources. Discuss.
5. Distinguish between pure and applied research. How can the dividing line between the two be determined?
6. How do you think outlays on research can be best determined?
7. To what extent might it be desirable to decide the amount to be appropriated for research as a percentage of sales? Would there be any limitations in following this procedure?
8. What is the significance of innovation?
9. How should research costs be controlled?
10. What examples can you find of single products successfully developed and introduced in recent years?

CASE: General Patent Development Company

In his position with a wartime government agency, Roy Allen, a lawyer, began to speculate about the considerable number of unused patents among the more than 50,000 issued each year by the United States Patent Office. Actually, only a few were applied to commercial products and processes. Allen realized that companies engage in research to improve existing manufacturing operations, to improve products or find new uses for present products, and to discover new products. He reasoned that in the course of complex industrial research and development programs chance discoveries of perhaps hundreds or even thousands of new products and applications were probably made each year as an incidental result of industrial research, perhaps along the lines of the chance discovery of penicillin. These new developments, he thought, were often patented and then not commercially exploited.

He therefore sought to interest several friends with experience in business and law in the idea of organizing a corporation to act as middleman in finding patents with potential commercial value and then, in turn, finding individuals or companies interested in and able to make practical use of such patents. The holder of the patent, it was expected, would either license its use or sell it outright, with the proposed new corporation receiving a percentage of the royalties paid.

The General Patent Development Company was organized to operate in the manner Allen had outlined. Within a short time, many nationally known corporations made various patents available on a contractual basis for potential users.

A little later Allen hit on a related idea. This was that, if business competition could be expected to increase as he believed it would, the company might well branch out into seeking out new products of any type at the request of corporate clients who would be charged a basic fee.

1. If Allen's original reasoning seems sensible and even obvious, why was the idea not more widely thought of?

2. To what extent is it possible that government contracts giving rise to greater research activity might have accelerated the type of patents Allen described?

3. Is Allen's idea for the proposed new aspect of the firm's business sound?

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Chapter VII

Simplification, Standardization, and Diversification

Simplification

SIMPLIFICATION means the elimination of excessive varieties, sizes, and shapes. When a plant grows over a period of time without too careful control over inventories of materials and supplies, and sometimes even over the number of kinds of products made, and it is finally realized that such a condition exists, a program of simplification is in order. The necessary extent of a program of simplification will depend on the degree to which the plant has grown and the extent to which inventories and equipment are spread out.

In carrying out such a program it is often found that an excessive variety of different sizes and shapes has been accumulated as a result of acquiring parts and supplies for different products without having given sufficient thought to the possibility of using some already in use. Once the decision to buy any unnecessary part was made, the practice became established, and the different supplies may even be found to have become customarily stored in different parts of the plant. By studying the uses of the different supplies and parts in relation to their size and composition, it may be possible to eliminate many of them, and this may also apply to some equipment. Frequently, also, the number of products being made and held in stock may be found to be unnecessarily diversified. This is particularly likely to arise when salemen's suggestions have been followed. Since some of the varieties of products may be almost alike, it is often possible to substitute one product for a group of products which are really only slightly different from each other. If the superfluous varieties of parts, supplies, and products can be eliminated, the amount tied up in inventories can often be considerably reduced, while the costs of buying, storing, and producing can also generally be reduced.

Although a program of simplification with the object of reducing costs may be undertaken as an end in itself, it is frequently a preliminary to a program of standardization. Simplification is in fact practically a prerequisite to a program of standardization, which is much more thoroughgoing than one of simplification.

Standardization

Standardization and Its Objectives. Standardization involves the setting of specifications on the basis of careful investigation to determine those which are most desirable. The objective is to set up standard specifications for each of the different materials, parts, processes, and products. Although the standard is the goal aimed at, some allowances must be made since completely accurate standards cannot be attained in most cases. Although standards are a matter for engineering determination, the production control, manufacturing, and purchasing departments are also involved. Although the interchangeability of parts and mass production are impossible without standardization, production-time standards and standard equipment are also necessary.

The various standards are requirements which make possible the efficient control of production. Standard material can be bought in volume more cheaply, standard equipment is used more efficiently, and a standard quality product is an improved product.

Standardized Product. The achievement of a standardized product, which is a fundamental requirement of mass production, is interrelated with other factors. Since heavy investment in machinery and tools is essential in many industries, the capital investment not only makes volume output possible but altogether necessary if the fixed costs are to be covered at relatively low prices in mass markets.

Although the design of the product must be standardized, the final design is not necessarily a first step in standardization because it may be affected in some measure by materials and parts decisions, as well as by the available equipment and plant if additional investment is impracticable.

Materials Standardization. The factors in the standardization of materials are type, quality, and reliability. The quality of material to be used in production is related to the type of the final product and the price line in which it is to compete. The best quality materials for three-dollar fountain pens are different from the best quality for ten-dollar pens. In both cases the best quality for the particular product is determined upon and standardized, but this does not mean that some consumers will not consider three-dollar pens as being made of a lower quality material than ten-dollar pens. Although the grades of material

are different, the best quality material is in each case that which meets the specifications.

Materials may be changed with the passage of time, and with the development of possible substitutes for which it is always essential to be on the alert. Shortly after the end of World War II, the purchasing director of the Ford Motor Company took the Ford car apart piece by piece and part by part to make an investigation into each item, in order to determine the possibility and feasibility of using cheaper substitutes to reduce costs wherever possible.

The United States Bureau of Standards makes thousands of tests every year and compiles lists of manufacturers prepared to supply material in accordance with certain specifications, and to certify to the purchaser that the material complies with the requirements of the specifications. Although these tests were formerly made exclusively for government departments, they are now made for industry.

Parts Standardization. Parts have been standardized and reduced in number by the exercise of leadership on the part of an influential firm in the industry. The most frequently cited example of this is the activity of the Walworth Manufacturing Company in reducing the number and variety of fittings and valves. However, standardization may be achieved by industry agreement, as in the automobile industry where bolts, screws, sheet steel, and other items have been standardized.

Individual companies may also standardize parts used in repairing machines which they have produced and sold. Although this is helpful when it is done as it is in the case of automobile parts, where it promotes the efficient use of automobiles, there are instances where users are exclusively dependent on manufacturers for parts such as screws which could be so standardized as to be readily available in hardware establishments. Although it is probable that such a policy is designed to develop and maintain a steady parts business, it is doubtful whether it is in the general interest or even, in the long run, in the interest of the producer.

Specifications. Materials, parts, and supplies may be described by brand names, specifications, blueprints, grades or samples, or some combination of these. Specifications are by physical or chemical characteristics or by material and methods of manufacture. Some specifications are set by the company's manufacturing or research department, and the various standards organizations have developed standard specifications which can be used. Descriptions by blueprint are used for machinery and equipment which are to be specially constructed. Description by grades becomes possible when grades have been set up by an agency in which buyers and sellers as a whole have confidence.

Company Standards Organization. Company standards may be classified as technical and managerial. Technical standards cover production

processes, materials, and products while managerial standards are concerned with such matters as organization, worker performance, and system.

Many companies have standards organizations as a staff function under a top engineering officer. Formal policy committees, which include top men from engineering and production with the purchasing officer frequently included, plan in broad outline the standards organization. The standards department acts as the sponsor of meetings of committees appointed by interested departments for the formulation or revision of standards. Companies which do not have a standards department proceed by means of consultation and conference. Standards manuals may be prepared, kept up to date, and distributed through the organization. These manuals cover standards for procurement, including standard purchase specifications for materials, supplies, equipment, and parts; for engineering, such as general engineering standards, standard design and drafting practice, and standard test materials; and manufacturing standards covering standard component parts and part numbers, tools, manufacturing processes and methods, finishes, fits and tolerances, safety practices, and finished product specifications.[1]

Standards Organizations. Although the Federal Bureau of Standards was established as early as 1901, the real impetus to the wide development of interest and progress in standardization came with World War I, when the War Industries Board, which was faced with the problem of conserving equipment, material, and labor, turned to the effort to reduce variety and set up standards. To cite but one example of the results, rear gearings for farm tractors were reduced from 1736 to 16.

Since interest in standardization persisted following the war, the Chamber of Commerce of the United States turned attention to the subject in 1920, and in 1921 the United States Department of Commerce set up the Simplified Practice Division, which was at first concerned mostly with the reduction of superfluous sizes and varieties of commodities as a means of reducing costs. In 1927 the scope of the activities was enlarged to include the preparation of quality standards to make them more acceptable to the trade and to promote sound commercial practices in their manufacture, marketing, and application.

Although interest and progress in standardization continued, it received a second and stronger impetus from World War II, and after the war the trend toward standardization was further pronounced. Among other developments were standard specifications for metals and other materials, standard methods of testing finished products, and standards for rating, testing, construction, tolerances, and performance of electrical equipment. The initiative was even taken to attempt to develop overall stand-

[1] National Industrial Conference Board, Inc., New York, *Industrial Standardization: Company Programs and Practices*, Studies in Business Policy No. 85, 1957.

ards for forms, records, machinery, and office equipment.

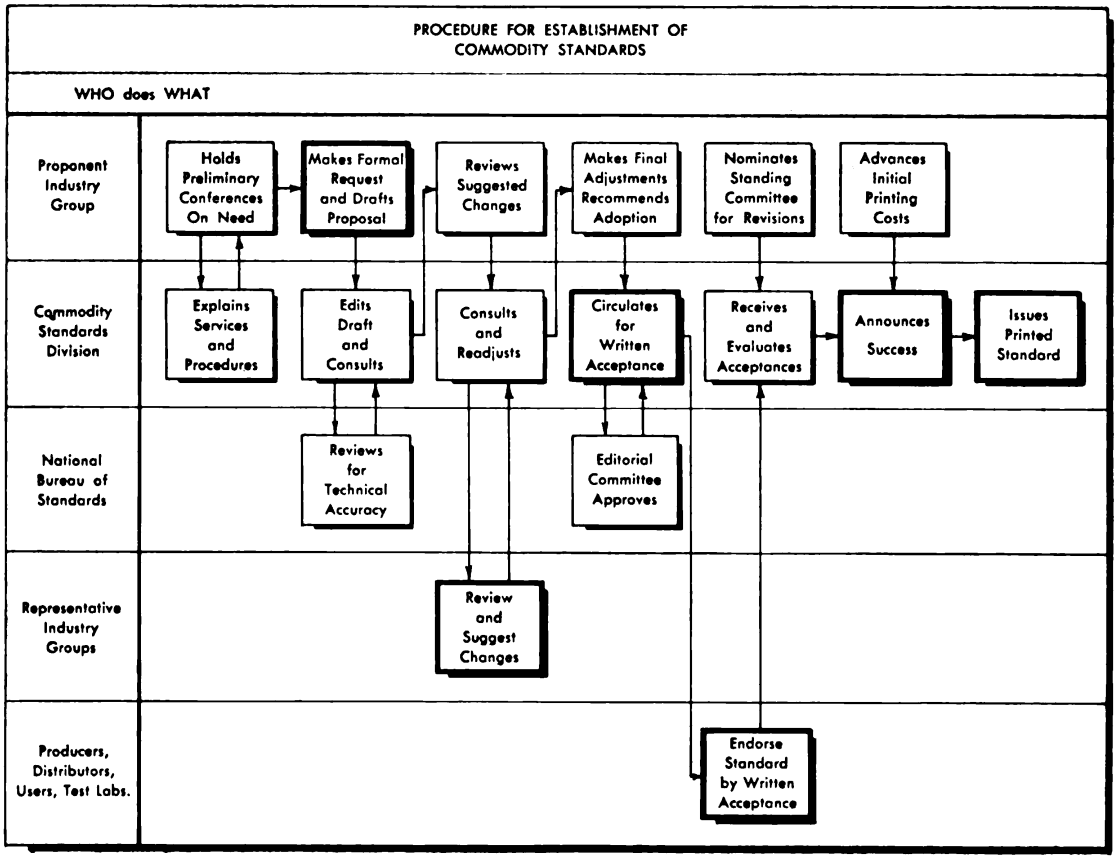
Among the organizations interested in developing standards are the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the American Society for Testing Materials, the National Electrical Manufacturers Association, the National Machine Tool Builders Association, the Association of American Railroads, the American Gas Association, the Society of Automotive Engineers, the American Petroleum Institute, and a good many others, including underwriters' laboratories. The American Engineering Standards Committee was created for the purpose of developing standards by the American Society of Mechanical Engineers, the American Society for Testing Materials, the Society of Automotive Engineers, and a number of trade associations and other groups interested in promoting industrial standards.

Most of the various standardization efforts are coordinated and facilitated by the work of the American Standards Association, which was formed in 1918. This association is affiliated with the International Organization for Standardization, which includes in its membership similar national standards organizations of a number of different countries.

Industrial Commodity Standards. When an interested trade group asks the Commodity Standards Division of the Department of Commerce

Fig. 33. Establishing commodity standards.

— U. S. Department of Commerce



to assist in preparing a standard, the Division first determines whether the desired standard would be feasible and in the public interest. Then it consults with other interested groups and develops a specific proposal. Drafts of the proposed standard are circulated for industry consideration, with a request for comments and suggestions. When a consensus is reached on the desirability of the standard, and on any needed modifications, individual manufacturers, distributors, and users throughout the country are asked to show their approval by returning statements of acceptance to the Division. When the acceptances show general concurrence in all segments of the industry, the Division announces the standard and prints copies, one of which is furnished each acceptor and numerous cooperating organizations. The standard lists the names of the firms that accepted it and provides a standing committee of the industry organization to consider later revisions. Figure 33 is a flow chart of the principal steps in the procedure for the establishment of commodity standards.

These commodity standards are of two types: (1) "Simplified Practice

Fig. 34. Examples of reduction in variety of selected items.

— U. S. Department of Commerce

SOME EXAMPLES OF VARIETY-REDUCTION

Effected through Simplified Practice Recommendations developed under the procedure of the Commodity Standards Division of the U. S. Department of Commerce.

Title	S.P.R. No.	S.P.R. Year	Reduction in Variety From	Reduction in Variety To	Percent Reduction
Adhesive plaster	85	47	26	15	42
Cans for fruits and vegetables	155	49	200	32	84
Cast-iron radiators	174	47	33	17	49
Coffee grinds	231	48	Dozens	3	..
Convectors	238	50	1,000,000	1,002	99.9
Copper and copper-alloy rod	241	50	(1)	103	..
Cotton Jersey Cloth and tubing for work gloves	194	48	11	3	73
Cut-tacks and small cut nails	47	49	428 sizes	185	57
			423 pks.	127	70
Delivery cases for milk bottles	236	49	Dozens	5	..
Eaves trough, conductor pipe and fittings	29	49	110	79	28
Files and rasps	6	47	661	377	43
Flat veneer products, spoons, forks, etc.	230	48	29	8	72
Galvanized woven wire fencing	9	47	2,072	200	90
Glass containers for cottage cheese	148	47	24	4	80
Loaded paper shot shells	31	50	4,067	262	94
Medical and surgical hypodermic needles	224	47	55	22	60
Pipe fittings (iron, brass and bronze)	185	47	8,566	2,969	65
Pipes, ducts & fittings (warm air heating)	207	49	5,080	1,225	78
Plumbing fixture fittings (housing)	227	47	(1) finish	3	..
			(1) gage	1	..
Rotary files and burs	233	48	2,000	468	72
Surgical dressings	133	49	5,000	61	99
Vises (machinists' and related kinds)	229	48	14	8	43
Wire rope	198	50	352	182	48

Note: (1) Too numerous to count.

Recommendations" and (2) "Commercial Standards." Their adoption and use are voluntary.

Simplified Practice Recommendations. These give the sizes, kinds, and types of specific stock or staple manufactured articles which are called for in the greatest volume because of their general usefulness. They make possible a choice, in accordance with generally recognized trade practices, between "standard" items that are widely available from distributors' stocks and "specials" which may require factory orders and more costly production and handling methods. Some recommendations give standard methods, such as methods of packaging.

Production and marketing of the recommended varieties, and their application by users, are particularly well adapted to current needs and practices. General utilization of recommended varieties or methods avoids wasteful overdiversification, and enables producers and suppliers to give better service to their customers on staple items. Figure 34 gives some examples of reduction of varieties under the procedures described. Figure 35 reproduces parts of a simplified practice recommendation for standard sizes of ice-cream cartons and molds.

Commercial Standards. Commercial standards give technical requirements for materials, construction, dimensions, tolerances, testing, grading, marking, or other details. The objective is to define quality levels for products in accordance with the principal demands of the trade and to provide for close adherence to the qualities thus defined. Uniform methods and practices are established for achieving and determining compliance. A wide variety of products is covered, including apparel, building materials, chemicals, mechanical equipment, plastics, and wood products.

Commercial standards are most effectively used in conjunction with purchase orders and sales contracts. When a standard is made part of such a contract, compliance with the standard is enforceable by the buyer or the seller, along with other provisions of the contract.

Purchasers may order products that comply with commercial standards and determine for themselves that their requirements are met. More often, manufacturers refer to the standards in advertising, invoices, and labels of the product. Such use of labels is an effective means of assuring the purchaser that specific products comply with a standard. Commercial inspection and testing programs are also employed, together with grade labels, hallmarks, and certificates, for greater effectiveness. Such assurance of compliance promotes confidence and understanding between buyers and sellers.

Diversification

Undesirable Diversification. In general, diversification, which involves

Standard Sizes of Pint, Quart, and Half-Gallon Rectangular Ice Cream Cartons and Molds

SIMPLIFIED PRACTICE RECOMMENDATION R252–60

[Supersedes R120–40 and R252–54]

Effective July 15, 1960

1. PURPOSE

1.1 This Simplified Practice Recommendation gives the sizes and dimensions of ice cream cartons that are recognized as standard. The purpose of the recommendation is to serve as a guide for manufacturers, distributors, and users desiring uniform measure cartons of the capacities and shapes described herein.[1]

2. RECOMMENDATION

2.1 *Half-gallon rectangular ice cream cartons.*—The standard dimensions are shown below and apply to linerless cartons.

Type of half-gallon carton	*Dimensions, inches*
No. 1 Squat	
Inside dimensions	3½ x 4 15/16 x 6 61/64.
Die-cut dimensions	See figure 1.
No. 2 Tall	
Inside dimensions	3 x 5 x 7 15/32.
	See figure 3.

2.2 *Pint and quart brick ice cream cartons.*—The standard di- mensions are shown below. The cartons are to be

Type of carton	
No. 1 U.S. S	
Inside	

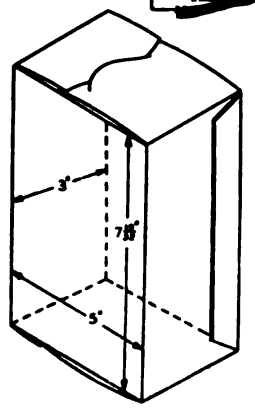


FIGURE 3.—*No. 2 half-gallon cartons, tall type.*

ACCEPTANCE OF SIMPLIFIED PRACTICE RECOMMENDATION

Standard Sizes of Pint, Quart, and Half-Gallon Rectangular Ice Cream Cartons and Molds

Date_____

Commodity Standards Division
Office of Technical Services
U.S. Department of Commerce
Washington 25, D.C.

Sirs:

We believe that the Simplified Practice Recommendation for Standard Sizes of Pint, Quart, and Half-Gallon Rectangular Ice Cream Cartons and Molds, constitutes a useful standard of practice, and we individually plan to utilize the recommendation as far as practicable in the (underscore as applicable)[1]

production distribution use other interest

of Ice Cream Cartons and Molds. We reserve the right to depart from it as we deem advisable.

Signature of Authorized Officer[2]

_____
(in ink)

ACCEPTORS

The manufacturers, distributors, users, and others listed below indicated in writing their acceptance of this Simplified Practice Recommendation prior to its publication.

ASSOCIATIONS

(General Support)

American Hotel Association, New York, N.Y.
Dairymen's Association, Ltd., Honolulu, Hawaii
Dairymen's League Co-Op Association, Inc., New York, N.Y.
Institute for Better Packaging, Chicago, Ill.
International Association of Ice Cream Manufacturers, Washington, D.C.
Oregon Food Merchants Association, Portland, Oreg.

FIRMS AND OTHER INTEREST

[illegible], Inc., Philadelphia, Pa.
[illegible], Ackley, Iowa
Clover Leaf Ice Cream Inc., Fort Thomas, Ky.
Cloverleaf-Pet Dairy Co., Salt Lake City, Utah
Cloverland Ice Cream Co., Winchester, Tenn.
Comly-Gilliam Carton Corp., Philadelphia, Pa.
Conneaut Creamery Co., Conneaut, Ohio
Container Corporation of America, Oaks, Pa.
Continental Can Co., Inc., New York, N.Y.
Continental Paper Products Co. (Subsidiary) Packaging Corporation of America, Denver, Colo.
Cornell Paperb[illegible] Milwaukee, Wis.
Crafts[illegible]
[illegible]

— U. S. Department of Commerce

Fig. 35. A simplified practice recommendation.

adding shapes, sizes, and new lines of products, is the opposite of both simplification and standardization. The stress on standardization emphasizes the ideal of a single standardized product or at least the minimum number consistent with absolute requirements. Standard materials, methods, machines, and labor conditions and time are the ingredients of the process resulting in the standard product. Frequently there is a conflict between such a goal and the sales force since the greater the variety of models which salesmen have to sell, the easier is their job of selling. Hence, they are easily influenced by what appears to them to be the desirability of adding slightly different products to their line in order to be able to persuade customers more easily. Such influences leading to diversification are undesirable and should be avoided. If there are no better reasons for diversifying, then the ideal of standardization should predominate.

Desirable Diversification. Although diversification is in general not to be recommended, there are nevertheless instances when diversification of products is desirable and may even be necessary. In seasonal industries for example, it may be desirable to add one or more new products in order to keep the plant occupied in off-season periods. A somewhat similar situation exists on a shorter-period basis when the weekly or daily production process involves recurring idleness of some of the labor and machines unless they can be assigned to other work.

Diversification may also be sought by acquiring other companies in different fields. Among the motives for doing so is the desire to spread risk, to utilize managerial abilities on a wider scale, and to complement existing lines.

A different but also justifiable reason for diversifying is the fact that parts may have to be made when they are not available in the necessary quantities, or when analysis clearly shows that their production will result in lower costs and corresponding profit advantages.

Although by-product development represents diversification, it should certainly not be avoided in most if not all instances. The failure to develop by-products might under certain circumstances result in losses, or at least in not as great a profit as possible.

Conclusion. Although standardization is desirable in many areas, it must be remembered that competition may frequently result in various forms of diversification. Many economists have deplored what they regard as excess variety, particularly in consumer goods, but those who consider innovation desirable in a dynamic economy are likely to be less positive in their views. If standardization of consumer goods became government policy, for example, considerable direction and control would be necessary, much variety would disappear, and some competing firms would have to go out of business.

QUESTIONS

1. Under what circumstances is a program of simplification desirable?
2. What are the purposes of standardization?
3. What is involved in the standardization of the product, materials, and parts?
4. In what terms are specifications set?
5. How can a company decide on the proper standards organization?
6. What were the major developments in the growth of general interest in standards?
7. Give some examples of undesirable diversification.
8. How does the government participate in the development of standards?
9. Under what circumstances is diversification desirable?
10. Suppose the government inaugurated a program designed to avoid confusion on the part of consumers because of excess varieties of brands, difficulty in comparing weights and packages, and so forth. What do you think would be significant results? Would such a program benefit labor?

CASE: Leder Company

A survey of the Leder Company's custodial system shows that direct labor costs are the largest item in custodial costs. There are 35 janitors and 2 foremen. Although materials and equipment cost less than direct labor, they are brought by individual janitors, who have varying amounts of inventories. No specific standards have been set for cleanliness in different parts of the plant nor are there any time standards for work. It is desired to reduce the cost of this type of work; but if the men were dispensed with, the work would have to be done by the higher-paid production workers in each area, and such men would not be as skilled as the janitors in this work. Hence, the possibility of any cost reduction depends on increasing the productivity of the individual janitor.

The management recognizes that any program which might be undertaken could affect morale adversely and therefore make matters worse. It seems desirable to develop arrangements which would avoid this but at the same time provide for standardization. It is thought that somehow the idea should be stressed that the janitor is a skilled worker doing an important job. The possibility of a training program has also been considered. A methods-improvement suggestion plan has also been mentioned.

1. How could the problems involved here be solved by introducing, in some kind of systematic fashion, the various elements mentioned?

2. Are there any other factors which might help to improve the situation?

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UNIT 4

THE PLANT

Chapter VIII

Providing the Physical Facilities

THE physical facilities of a plant comprise the building and grounds, machinery and equipment, including material-handling equipment, tools, and various furnishings such as tables, benches, chairs, bins, and racks. Since the building and equipment must be suited to the type of industry, the nature of the product, the raw materials used, and the type and nature of the production process are basic factors shaping the particular kind of physical facilities needed.

Buildings

Design. Traditionally, factory buildings have been long, narrow rectangles and combinations of the letter I, such as C E F H I L T U. Although these can be enlarged up to a certain point, additional buildings can be put up instead of making extensions. An O shape (□) with a space in the center which is used for jails, forts, and college quadrangles is not suitable for industrial purposes because there is no use for the center space, unless an underpass is built from the outside street to the center for the passage of trucks to be loaded or unloaded in the center area. Although a circular building can be constructed, there is no point to building it around unused space. Solid block shape buildings with all the operations under one roof and on a single floor, which have become rather common, are more flexible than several separate buildings or combinations of the "I" type since the latter result in idle space, increased construction costs because of the number of walls, and a greater heat loss through the walls.

Height. One-story buildings requiring more ground area are adapted to suburban or small city areas where ground is relatively cheap. These buildings involve less cost for the foundation, while less space is lost for columns, sidewalls, elevators, and stairs. They make more natural lighting available to all sides of the building than there is to the lower stories of multistory buildings. They also permit considerable flexibility

in making changes in layout. Finally, the one-story building makes supervision easier. Against these advantages, however, there are the disadvantages of a greater first cost per square foot, while the larger roof area not only requires more outlays for maintenance but also raises heating costs.

Multistory buildings, which are feasible when the product and equipment are relatively light in weight and there is no serious question of floor loads, are especially adapted to locations where the land is limited and costly. They also permit gravity handling for suitable items. However, the greater the number of stories, the more important become the initial outlays for the foundation, as well as for the space and cost of supporting columns. Also, beyond five or six stories as an outside maximum, elevators must be provided.

Construction. Frame one-story buildings with tarpaper shingles or tin roofs used for temporary storage purposes deteriorate rapidly and the fire risk is considerable. Because of the development of equally cheap substitutes, they are not likely to be used on any extensive scale in the future.

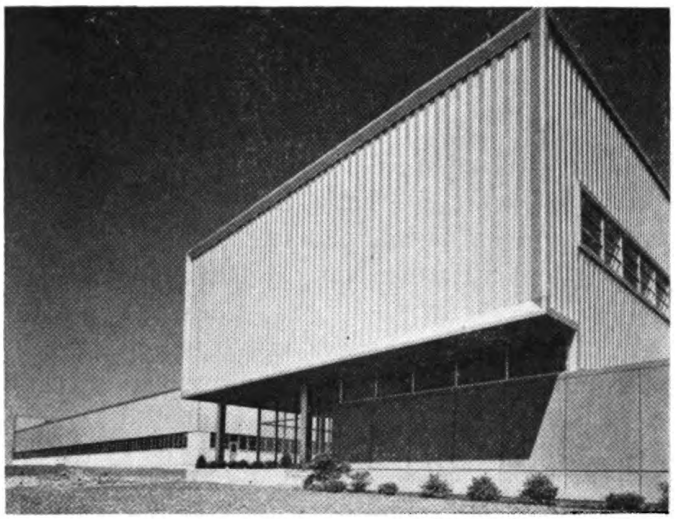
One-story steel expandable frame buildings with corrugated metal or asbestos walls can be put up rapidly at a low first cost, since the steel forms constituting the skeleton are standardized and can be easily procured. Although there is less fire risk than there is with wood buildings and the maintenance is low, they are hard to heat and they may be destroyed by fire sweeping through, with the heat buckling and melting the frame, at the same time destroying the equipment.

Structural-steel buildings with brick or concrete walls and concrete floors are multistoried and generally made to special design for particular needs. They are fireproof and durable, while their maintenance cost is low.

Reinforced concrete (reinforced with steel) buildings which are fireproof, permanent, and adaptable to many industries involve low operating costs although the cost of heating them is high.

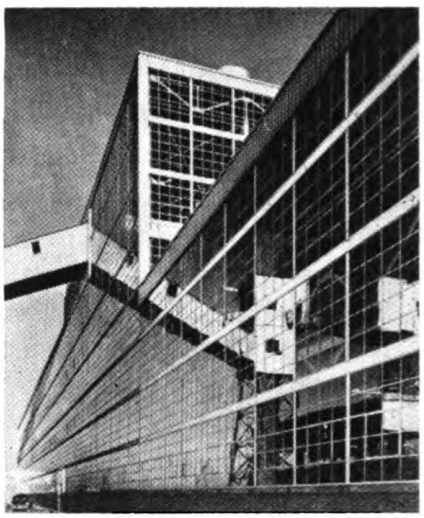
The slow-burning, heavy wooden or mill construction buildings still evident in New England were an advance in the effort to prevent serious fires. Although new buildings of this kind are no longer being constructed, it is probable that existing buildings will continue to be used for some time.

In many respects we are in a period of transition so far as buildings are concerned. Although the older generalizations regarding design, construction, and so on are in the process of being superseded, it is not exactly possible to make ready generalizations about present trends. New materials including cinder blocks, aluminum (Fig. 36), glass (Fig. 37), and stainless steel are being used, and many low buildings with spacious



— Aluminum Company of America

Fig. 36. A building with an exterior of aluminum. This metal offers low maintenance and upkeep costs.



— Libbey-Owens-Ford Glass Company

Fig. 37. A manufacturing plant featuring large areas of glass construction.

landscaped grounds are being constructed in suburban areas and smaller cities.

Roofs. In addition to the widely found flat-top roofs, several other kinds can be identified. Skylights, which were formerly used extensively, do not provide as much light as monitor or saw-tooth roofs of which they were probably the predecessor (Fig. 38).

Building and Layout. If it is possible to do so, it is desirable to build a plant around a layout; but if this is done it is essential to avoid too great a degree of specialization and see to it that this layout is sufficiently flexible to allow for possible changes in the product and processes. Since it would be preferable to make a layout first, it may not seem entirely proper to take up the question of location and factory buildings before taking up the subject of layout. As a matter of fact, even organization is related to layout since it is related to supervision. However, it is essential to be practical and to discuss each of these subjects independently or the discussion would become confused. Nevertheless, it is well to continue to keep in mind the interrelationship of these matters.

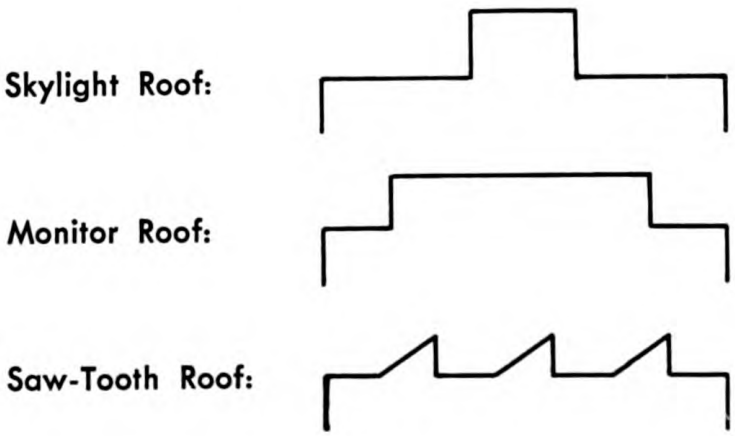


Fig. 38. Different styles of roof construction.

Since existing plants are often bought or rented and reconditioned, the layout must be to some extent accommodated to them. Clearly, however, if this appears too difficult or costly or if it will materially increase production costs, further search for a building is essential.

Cost. In general, the cost of the building plus the cost of the land will give the total cost. The cost of land includes not only the initial price, but also the costs of any necessary paving, fences and gates, drainage and flood control, and title search. There is also the cost of the necessary lighting of buildings and grounds for protection, for outside work at night such as platform loading or unloading, and for any night outdoor advertising. The cost of the building includes, in addition to the initial cost, outlays for any necessary rearrangements and for such additions as may be needed in connection with heating, lighting, and air conditioning.

In making a comparison of the costs of two or more existing buildings, it is essential to compare the cost of usable square-foot areas. The square-foot area lost because of walls, columns, stairs, and so on must be subtracted from the gross square-foot area for each available building being considered. When the price for the usable square foot of building plus that of the square foot of land is determined for each building and site, the amounts for the alternative possibilities can be compared to determine which one is most favorable. An analysis of this kind would be part of the technical survey which was discussed in connection with location.

Plants are sometimes leased from insurance companies or other investors. In recent years a number of companies have had plants constructed for their use and then sold them to insurance companies, after which in turn they leased them back under what are called leaseback arrangements. The reasons given for these leasebacks vary but include such factors as the freeing of capital for other purposes and tax advantages arising from the fact that the rental charge is higher than depreciation. The practice of leasing various types of equipment has been increasing.

Since most companies have relatively few transactions in real estate, competent legal advice is essential even when leasing a plant. Although it is generally realized that property should not be bought without a title search, there may be a tendency to overlook the importance of such a search when a plant is rented, in which case it might be found that the property is not available for the use for which it is intended, that zoning restrictions prevent its availability for the use intended, or that a large mortgage makes it subject to foreclosure.

Building Services and Auxiliaries

Building services include electricity, steam, gas, lighting, heating, ventilating, air conditioning, and water, all of which are not only costly in

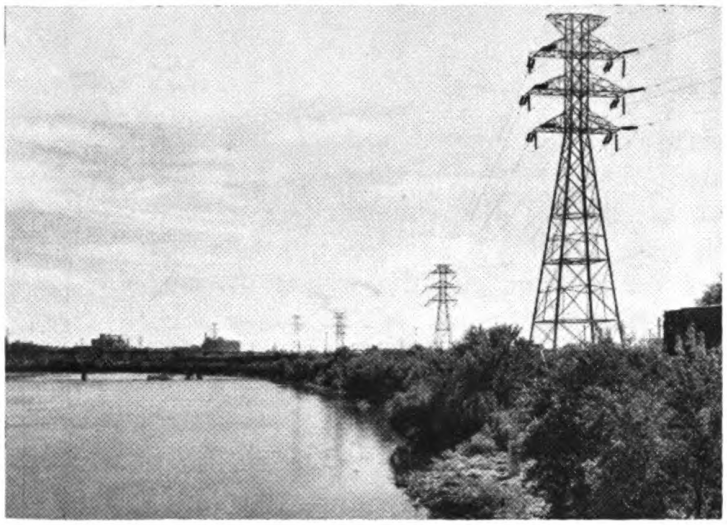


Fig. 39. Electric transmission lines bring electric power to a city.

— Northern States Power Company

their initial installation but expensive and difficult to change later. If the building were being constructed around the layout, provision would be made for them as an accompaniment of the layout. Since we are considering buildings at this point, however, the auxiliaries will be taken up here.

Power and Heat. Steam and electricity are the most commonly used sources of power, although compressed air and gas are also used. Electric power may be generated by the plant itself or it may be bought from the public utility company, in which case it is called central station power. When a plant is located at a considerable distance from the utility generating plant, there is the possibility of interruption of service because of the effects of storms on overhead transmission lines over the open country (Fig. 39). Although electricity bought from the public utility is ordinarily cheaper and more dependable than that generated in the plant, emergency generators are frequently kept available against possible interruption of central station power.

When electricity is used for power to drive the machinery, the system can be combined with the lighting system by using step-down transformers for the lighting.

If steam is used for heat and power, a system of piping and insulation is an essential consideration. When compressed air or gas is used, the pressure and volume are important, and conveniently located outlets must be provided.

Lighting. Although the importance of proper lighting was not always understood, it is now generally understood that proper lighting has certain important results. It contributes to maximum production which is otherwise impossible to achieve; it makes it possible to attain the necessary accuracy of workmanship which is impossible with inadequate lighting; it makes possible more efficient utilization of floor space; it contributes to morale and helps to keep down labor turnover; and it permits

the continued utilization of the services of older and experienced employees who might otherwise have to be put on less productive work. Poor lighting causes eyestrain and contributes to accidents. It has been estimated that poor lighting is the cause of 5 per cent of industrial accidents and a contributing cause of 20 per cent of such accidents.

The amount of natural lighting within the plant depends on the type of construction, the height of the building, and whether there are adjoining buildings. Surfaces on walls, roofs, and other buildings reflect light into the building. The type of side windows affects the amount of light coming in through the sides and roof. Light is increased by skylights, monitor windows, and saw-tooth roofs. Skylights, which are least efficient in increasing the amount of light, are frequently not cleaned sufficiently often, although the importance of periodically washing all windows is worth mentioning. Monitor roofs with vertical windows afford better light than those with sloping windows.

Even if the maximum possible amount of natural lighting is achieved, artificial lighting is still necessary during some hours of the day, especially during the winter months as well as on cloudy and rainy days, and obviously if there is a late shift. The system of artificial illumination consists of the general lighting arrangements and the supplementary arrangements. In the general lighting system, which illuminates the whole floor or room, the lights are above the work and somewhat uniformly distributed, the spacing of the light units and the lamp wattage being based on the light requirements, the size of the floor or room, reflections, and the production equipment. Supplementary or local lighting, consisting of lamps placed at workplaces where additional local lighting is necessary, must be provided.

In addition to the ordinary tungsten-filament lamp there are also the mercury-vapor lamp, whose high luminous efficiency is too intense for many purposes, and fluorescent lighting, which provides the nearest approach to daylight, is about three times as efficient as incandescent lamps, and generates less heat, but involves a higher first cost.

Artificial illumination must be not only of sufficient quantity or intensity, but also of proper quality. The necessary quantity depends on the degree of accuracy and fineness of the work to be done. Quantity of light is measured in footcandles. A footcandle is the intensity of illumination produced on a surface by a standard candle at a one-foot distance. The output of electric light bulbs is expressed in lumens. A footcandle intensity requires a quantity of light equal to one lumen per square foot. The quality of light in terms of diffusion and steadiness is important, and direct or reflected glare should be avoided.

The color of walls, ceilings, and machinery should be considered in connection with illumination since dark colors absorb light while suitable

lighter colors reflect it, not only intensifying illumination but also increasing contrasts. The selection of suitable colors of paint has come to be regarded as of considerable significance. Since illumination and color selection call for expert attention, the services of specialists are necessary.

Heating System. In deciding on the heating system, heat gains and losses must be taken into account. Heat transmission, which is a factor in heat losses and gains, depends on the area of the exposed wall, roof, and ceilings, on the differences in temperature on both sides, and on the heat-conducting properties of the particular surface. Other sources of heat are air infiltration, motors, lights, and people. The heating system is now decided upon in conjunction with air conditioning.

Ventilating System. Ventilating systems are either natural, natural and partly mechanical, or mechanical. The natural method makes use of air currents, whereas the mechanical methods use mechanical equipment to draw air into the plant while exhaust fans and ducts remove bad air. The older ventilating systems are being replaced by air-conditioning systems which are being installed in new plants at the time of their construction.

Air Conditioning. Air conditioning, which technically means the maintenance of the inside atmosphere at any required temperature, humidity, and purity, includes heating and ventilating, cooling, humidifying or dehumidifying, and cleaning or purifying the air by an air washer or filter. Although a complete air-conditioning system does all of these things, the term is frequently loosely used to cover one or several but not all of these objectives.

The advantages of air conditioning are widely recognized. Not only does it make for the comfort and efficiency of employees and tend to improve their health, but it also helps to improve the quality of the product and protect goods in storage. In some geographical areas it is essential if production of particular commodities is to be undertaken, because without it the uniform quality of the materials used in production could not be preserved while the equipment and processes must also frequently be kept under standard conditions.

Since completely perfect air-conditioning systems cannot be achieved when there are windows, a few plants have been built without windows. The possibility of building such plants with uniform conditions throughout the day and night is now at hand, as a result of the great improvements in both artificial lighting and air conditioning. Buildings of this kind are quite costly since they not only take longer to design and build, but require a higher initial outlay because of the necessary equipment. It should also be mentioned that some of the employees who do not like the standard conditions for long periods eventually seek some time out of doors to enjoy natural conditions.

Noise Control. Excessive noise has the effect of reducing efficiency because it contributes to fatigue, affects employees' morale adversely, and may help to cause accidents. Although it is sometimes thought that little can be done to reduce or eliminate noise, the fact is that a good deal can often be done once attention is directed to the problem. Some noise can be eliminated at the source by mounting machines on pads and by adjusting, repairing, and oiling them. Sometimes a change in machine design is necessary. Noise can also be reduced by treating ceilings, walls, and floors with sound-absorbent materials.

Sanitary and Other Facilities. The provision of adequate sanitary facilities not only promotes health but also assists in achieving better labor relations. A supply of good drinking water must be available at conveniently located points. Improvements in the sanitary care of lockers, washrooms, showers, and toilets have materially changed plant conditions for the better in recent years. When women workers are employed, separate facilities of various kinds are necessary and restrooms must be provided. Although the basic requirements in connection with sanitary facilities are governed by the state factory laws and the regulations made under those laws, these laws and regulations stipulate only minimum requirements, which may not represent the highest standards. In such cases companies make provisions beyond the minimum requirements.

Machinery and Equipment

Major Equipment. Major equipment includes generators and boilers, construction equipment, transportation and material-handling equipment, and the machinery used directly in production (Fig. 40). The substantial financial outlays as well as the importance of such equipment in achieving and maintaining low-cost operations make its selection a matter of the first importance since a decision regarding such equipment commits the company to a given method of production and operations. In terms of cost the initial cost is not the only factor demanding consideration, since maintenance and repairs, obsolescence, insurance, and the effects of any idle time resulting from particular equipment must be taken into account. Since the cost of equipment gives rise to the annual fixed depreciation charge, the possibility of timing of purchase in relation to price trends should be given consideration. A major factor in deciding on one piece of equipment against another is the estimated cost at which the number of units can be produced by each.

Selection of Major Equipment. The selection of major equipment is the concern of a number of departments. The treasurer is responsible for the basic financing. The methods engineer, who must also determine the tooling required for machines, may make studies and recom-

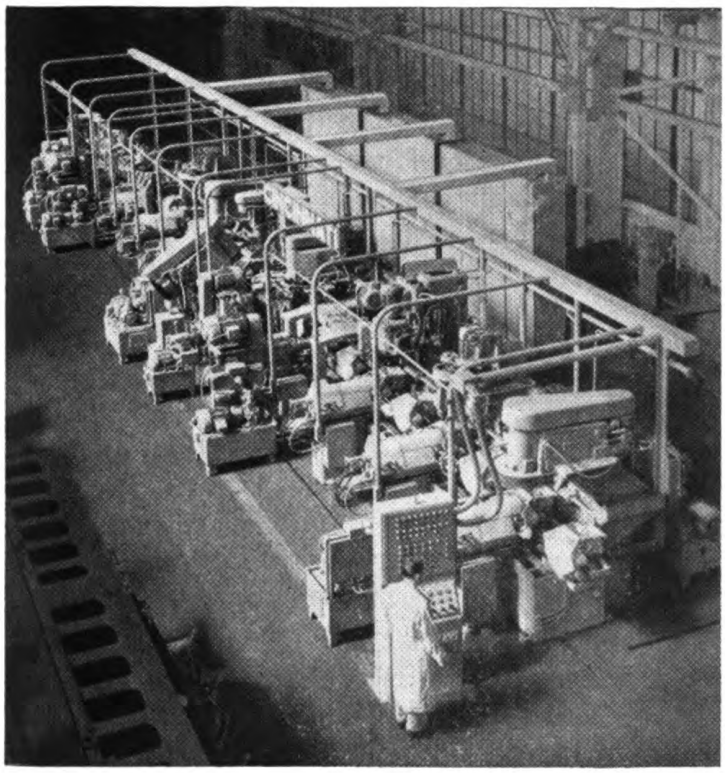


Fig. 40. A twenty-five station transfer line for automatically milling, drilling, and boring automotive transmission cases.

— The Cincinnati Milling Machine Co.

mendations to the chief engineer. In larger enterprises a tool and equipment engineering department may do the work of the methods engineer. Committees may be utilized for the purpose of arriving at decisions regarding the acquisition of major equipment. The manufacturing department is interested in the capacity and reliability of machinery. The purchasing department, which seeks out vendors, clears salesmen to the operating executives, and negotiates the purchase after a decision to buy has been made, may also take some part in arriving at the decision regarding the type of equipment to buy.

Equipment is frequently bought directly from manufacturers, who often assist in providing technical services, especially in connection with large installations. If new equipment and machines are replacements, the question arises whether the old equipment can be traded in, sold to used-equipment dealers, or sold for scrap.

Power-Driven Machinery. At one time all the machines in a factory were driven by one source of power and later they were divided into groups, each group driven by a separate motor by means of shafting and belting. Machines are now equipped with individual motor drives, which simplify their installation and make it relatively easy to relocate them. The necessary outlets on the walls, columns, floor, or ceiling are easily provided. In older plants belt drives are still found and some newer machines with individual motor drives have belts for transmitting power to some parts of the machine.

Machines are equipped with motors making it possible to operate them to capacity, and they should be worked to capacity in order to get the greatest volume at the lowest unit cost. Although manufacturers of machinery provide information on the limits of capacity, it may be necessary to calculate machine capacity if a machine is put to a new use.

General and Special-Purpose Machines. Although general machines are the basic machine tools which can be used for general purposes, some are general-purpose for particular industries. General-purpose machines, which are produced in large quantities because there is a comparatively wide market for them, can at certain times be bought secondhand on favorable terms, depending on the level of general business activity. The use of general-purpose machines may require a smaller number of machines than if special-purpose machines are used, because of the greater flexibility in putting them to different uses. Although the maintenance cost is less, a more capable and costly labor force is necessary to operate general-purpose machines than to operate special-purpose machines, while at the same time the output is less. Sometimes special adaptations of general-purpose machinery are made to convert it to special-purpose requirements.

Special- or single-purpose machines are made to specifications with a single purpose in mind. Such machines make for a more uniform quality of the output; they require less skilled labor; they result in greater output; and they produce a large volume at lower unit cost. Since the cost of acquisition of special-purpose machines is high, its purchase is warranted only when the cost can be spread over a very large output. Special-purpose machines have been successful in the automobile industry, where the volume of production and sales of a new model justify their use within a fairly short time. Under other conditions their use is not justified unless there are few style changes and their cost can be charged against the output of a longer period of time.

Special-purpose machinery has been the cause of difficulty when used in the early stages of a new industry. Such machinery was used with disastrous results to some companies in the early years of radio and the electric refrigerator. Since the general style and engineering features of refrigerators had not been determined by customer acceptance, the costly single-purpose machines used in their production soon became obsolete, as new models of refrigerators won customer approval and more economical methods of production were worked out.

Capital Budgeting. Although decisions regarding the acquisition of new and additional equipment, as well as the replacement of existing equipment, should be the responsibility of top management, this is not always the practice. Many top management men have not been interested in and frequently do not understand capital equipment analysis.

Investment decisions for the purchase and replacement of equipment are frequently made on the basis of what is called the short-payoff requirement. The short-payoff requirement is based on the idea that a new piece of equipment should pay for itself within a short period of time such as two or three years. This requirement, which has no rational basis, developed out of machinery salesmen's selling arguments which were eventually adopted as a rule of thumb by manufacturing executives when buying equipment. Just how short the payoff period should be could obviously never be established, so that decisions are made on the basis of varying numbers of years depending on who makes the decisions. It should be clear that under this method machinery replacement could be deferred indefinitely under certain circumstances.

Since capital budgeting has been receiving increased attention in recent years, there is some improvement in the approach to this subject. Despite much discussion, however, many decisions continue to be made under the short-payoff rule, and there is otherwise no unanimity as to the most desirable approach.[1]

A decision to invest in productive equipment should be based on the idea of maximizing the return on the investment which arises from its use in producing goods for sales which give rise to revenues over time. Offsetting these revenues are operating and maintenance costs which arise because of production of the goods. The difference between these is the return on the investment. The difficulties in calculating the future values involved constitute the basic problem.[2]

An important approach to acquiring equipment is the discount method, under which the rate of return on a project is the rate at which the sum of the stream of after-tax earnings, discounted annually according to present worth, equals the cost of the equipment.[3] The cash flowback after taxes over the years is discounted until it equals the present worth of the investment. The objective is to calculate the present value of a sum of money which must be invested today at compound interest in order to have earned that sum at the end of the life of the equipment. Investment is indicated if the present value is greater than or equal to zero. A timetable of all expenditures and revenues predicted for the investment over its life must be prepared. It is, of course, difficult to project such figures far in advance, and there is the question of what interest rate to use.

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[1] "Economics of Machine Selection and Replacement: A Bibliography," *The Engineering Economist*, Vol. 6 (Spring, 1961), pp. 51–57.

[2] Cf. Ross G. Walker, "The Judgment Factor in Investment Decisions," *Harvard Business Review*, Vol. 39 (March–April, 1961), pp. 93–99.

[3] Cf. John A. Griswold, *More For Your Capital Dollar*, The Amos Tuck School of Business Administration, Hanover, N. H., Study No. 18, January, 1957.

The Machinery and Allied Products Institute's research director, George Terborgh, turned attention to the matter of capital equipment replacement some years ago[4] and developed a formula for this purpose.[5] It is probable that Terborgh's work contributed a good deal to the subsequent increased interest in capital equipment analysis. The original formula was later revised and published in *Business Investment Policy*.[6] The objective of the new MAPI formula is to determine how the business would profit with and without the machine or equipment, and how much saving there would be in the next year with the investment. The method can be applied to depreciable assets for replacement, improvement, and expansion. The different earning-rate patterns based on the effects of deterioration and obsolescence, together with the effects of any one of the methods of depreciation accepted for income-tax purposes, are considered. The MAPI method is set up so that the longer a project is postponed the greater will be the return from it. The relative return is obtained by comparing a potential replacement with its best alternative in the plant. The best deferment alternative is that one relative to which a return from a project is lowest. These relative returns become the ranking factor. Five factors enter into the determination of the relative return: net investment, next year's operating advantage, next year's capital consumption avoided, next year's capital consumption incurred, and next year's income-tax adjustment. From these five factors, the next year's after-tax return from a project can be determined. As worked out, this method is easy to understand and apply by means of forms and charts which have been prepared.

Machinery Replacement. Partly as a result of research undertaken by machinery manufacturers and partly as a result of changing demands, changes and improvements in machinery have been frequent. High-volume output at efficient cost levels requires a willingness and ability to scrap worn-out, obsolescent, and inadequate machinery and tools. The cost of repairing existing machines, the possibility of greater output from new machines, the necessity of meeting competition, and possible cost reductions must be considered in deciding on replacement of existing machinery and equipment.

As already mentioned, the short payoff is still the most widely used method in deciding on equipment replacement. Machinery replacement is also sometimes made without sufficient analysis in the belief that the new equipment will overcome problems which actually require other solutions.

[4] George Terborgh, *Dynamic Equipment Policy* (New York: McGraw-Hill Book Company, Inc., 1949).

[5] *MAPI Replacement Manual* (Washington, D. C.: Machinery and Allied Products Institute, 1950).

[6] Machinery and Allied Products Institute, Washington, D. C., 1958.

In his study of replacement procedures, Terborgh found that equipment replacement policy was not well organized in many companies. The operating executives were too busy trying to get maximum production out of existing equipment to have any time for replacement studies. Most companies did not have an equipment engineer making replacement studies, they did not have regular periodic review made of their equipment situation for the purpose of improvement and modernization, and they did not budget their equipment outlays ahead.

He also found that many technical production executives believed on the basis of their experience that it was difficult to get favorable action on replacement recommendations unless the estimated advantages could be shown to be spectacular, especially at times when the financial position of the company was less than the best. Although they made initial recommendations, final decisions were made by the president, the board, or the executive committee. Since many companies carried proposals involving an outlay of as little as $5,000 to the top-management level for final decision, ultimate authority rested with officials not having intimate familiarity with the technological details involved. Production men felt that financial managers were usually not close enough to the production departments to realize that the company's existence might depend on utilizing more efficient machines which by cutting costs and increasing production would successfully meet competition. Since many companies made only such replacement as internally available funds permitted, it is probable that such companies were frequently undermechanized, and therefore undercapitalized.

Equipment replacement decisions should be based on the procedures discussed above in connection with capital budgeting.

Tools. When the question arises whether to make or buy tools, the answer must be sought by determining why standard and readily available tools, which are usually cheaper than the cost of making them, cannot be used. Standard tools which may last for several years can be used from one machine to another. Special tools, the usefulness of which may be limited to comparatively short periods of time, can be used on only one job, model, or product and they are frequently very expensive. The general objective should be to use standardized tools and to keep them at a minimum consistent with needs.

The toolroom or tool department is the place where tools are designed, made, sharpened, or ground. The tool crib, where tools are stored and from which they are issued to jobs and later returned from the jobs after they have been used, can be located centrally or with decentralized cribs. In deciding on whether it is desirable to set up a single, large, central tool crib to serve all departments or whether it is preferable to

provide a central tool crib together with separate decentralized cribs for the tools of each department, the most convenient possibilities in issuing and returning the tools must be determined and this will depend on such matters as the production process and the general space requirements.

Tools are classified and identified by symbols in the form of numbers, letters, combinations of letters and numbers, or a mnemonic system. When its particular identification symbol is marked on each tool and the tools are stored in designated places on steel shelving, control is facilitated by a perpetual inventory of tools showing the amounts on hand and the quantity which should be on hand.

The symbols of required tools are specified on drawings and indicated on tool orders. The tools are checked out under production-control procedures and delivered to the manufacturing department in advance of starting the job. The tools are then returned after the job is completed. Although workers go to the tool crib to get the tools under some arrangements, under others the tools are delivered to them.

Standard Working Conditions. Standard working conditions are essential in order to determine proper standards of most efficient labor output. The building, equipment, and layout should facilitate the achievement of the greatest volume at the lowest possible costs under standard conditions. Since the particular operation determines in large measure the type of workplace and the working conditions, it is possible to refer only to certain general factors regarding standardization of the workplace. Although a standardized workplace is more or less dictated by the mechanical requirements of assembly-line operations, for some types of work considerably more attention must be given to the desirability of standard tables of the best and most efficient size and height, and if chairs are used they must also be of efficient standard height and design. Standardized boxes, holding parts for hand-assembly operations, also facilitate the attainment of standard conditions.

Maintenance

Maintenance or Plant Engineering Organization. Since the buildings, machinery, and equipment are subject to the action of the elements and the wear and tear resulting from operations, maintenance is necessary in order to keep the plant in satisfactory condition by repairs and renewals. Although the maintenance may be combined with the engineering or production department in small plants, the maintenance department is organized as a separate function in larger plants, which have a separate plant engineering department headed by an executive called the plant engineer who reports to the works manager or plant superintendent. The

foremen in the department are in charge of the various specialized workers, including electricians, machine repairmen, pipefitters, carpenters, and workers in the repair shop.

Although maintenance work cannot be standardized in the same way as production processes can be, the program as a whole can be standardized. While the size of the maintenance force is dependent on the scope and character of the company's operations, control of the number of men employed must be sought by spreading out the work as far as possible by means of advance scheduling, with allowances for unanticipated breakdowns in estimating the volume of work and the necessary number of men. Since maintenance cost can be quite high, increasing attention has been given to the possibility of incentive wage plans for this work.

Maintenance is sometimes related to the volume of output in the sense that it is deferred when operations and output fall off. This practice is dangerous because when output should be increased at a later date the physical equipment may not be in a sufficiently satisfactory state to produce efficiently and competitors following a less shortsighted policy will be in a superior position.

Classes of Maintenance. Maintenance work falls into two classes: (1) repairs necessary to remedy unanticipated breakdowns and (2) preplanned preventive maintenance. The object of preplanned maintenance is to correct by means of *scheduled* maintenance, involving inspection to detect and correct minor defects before they develop into major repair jobs or breakdowns, possible sources of difficulties before they actually arise. Periodical inspection of the equipment will help considerably in preventing breakdowns. The alternative to inspection maintenance, which requires a minimum of interference with and interruption of production, is that difficulties not detected in advance may develop into breakdowns with long and costly stoppages.

Scheduling Maintenance. In setting up the maintenance schedule an annual program is projected by determining the total number of hours for preventive maintenance and adding the estimated hours required for emergency repair work. By scheduling the hours ahead, they can be leveled off more or less evenly over the year to avoid peak periods and make it possible to keep the maintenance staff at a steady level.

Although emergency repairs sometimes have to be fitted in as they occur, the maintenance-work program for a particular day is planned toward the end of the preceding day and the job tickets may be distributed to the different foremen before closing time.

Records. The schedule of work ahead provides for (1) the preplanned preventive maintenance, (2) fitting in certain jobs which may not be of the utmost urgency but cannot be delayed too long, and (3) immediate emergency requirements. Because of the nature of the work

Fig. 41. Center for scheduling work.

— Acme Visible Records, Inc.

indicated by (2) and (3), it is clear that the annual schedule must be flexible and subject to adjustments. Although the jobs to be done may be brought to attention at the proper time by means of a tickler file showing by dates when they are scheduled, it is sometimes desirable also to schedule and check on a maintenance job which takes several days or weeks by means of a Gantt chart or similar devices (Fig. 41).

In order to be able to schedule maintenance ahead and to keep adequately informed, it is desirable to have adequate equipment records. These records may consist of a card for each unit of equipment with information showing its location in the plant, its cost installed, the cost of any additions, the nature of any changes, its condition, and matters relating to its disposal. If property records are to be of the greatest usefulness, units of property should be defined so that these records may provide a suitable history of the units of equipment. Units of property replaced should be credited to fixed assets and charged to the allowance for depreciation, while maintenance and the replacement of only parts of units of property should be charged to cost. Although separate cards may be kept for each of the units of property and for its maintenance, it is desirable to combine the information on one card for each unit of equipment.

In fields other than public utilities and railroads, in which adequate property records underlie the rate base used as the "fair value" on which a "fair return" is permitted, property accounting has generally not been very satisfactory. However, since the much higher income taxes of recent years and possible insurance economies have stimulated greater interest in maintaining better plant and equipment records, considerable improvement has taken place. Such records can be kept by means of accounting machines.

Job Orders. To provide a method of control, maintenance work should be done on the basis of written job orders, each of which is numbered and has space for entering a brief description of the job together with the signature of the person authorizing it. Maintenance and repairs

requested by the operating departments are authorized by the responsible official. The regularly prescribed routine inspection maintenance originates in the maintenance department, subject to prior understandings made with the operating departments at the time of scheduling. After the job has been completed the time spent and the materials used are entered, to provide information for cost-accounting distribution.

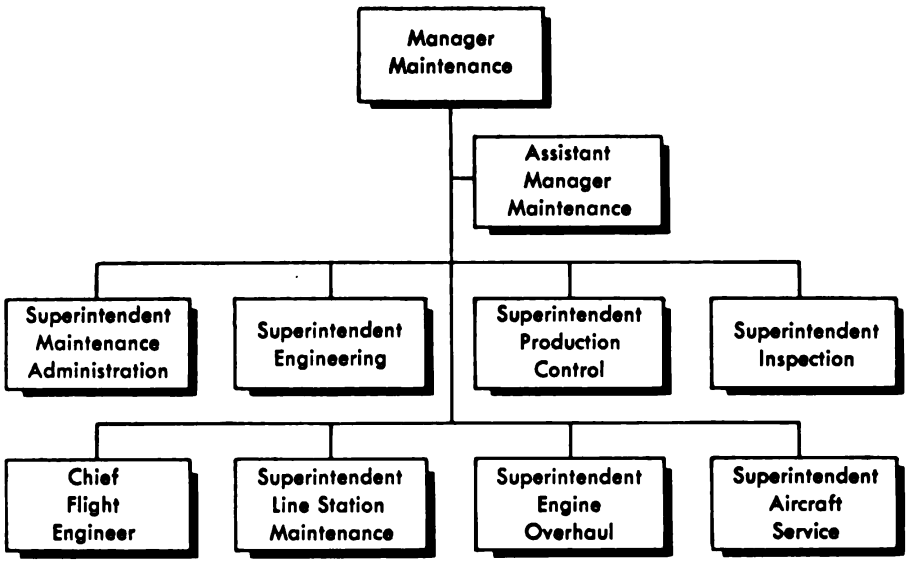
Work Sampling. Work sampling is a method of determining where losses of efficiency occur. It requires an adequate number of random observations of the maintenance workers throughout the plant several times a day, every day. It involves the gathering of data on such matters as the time spent on various activities, travel time, on-the-job delays, and excess time in transit or in the toolroom. Although it does not in itself improve efficiency, the data developed put pressure on supervisors and higher management to do something about any inefficiency. It is evident that a work-sampling program has to be carefully introduced. It must be presented in such a way that it will be accepted by supervisors and workers, who must be convinced they are not being spied upon.[7] Work sampling can also be applied to other types of nonrepetitive work.[8]

Contract Maintenance. Under contract maintenance, arrangements

[7] "Work Sampling in Maintenance," *Factory*, Vol. 117 (December, 1959), pp. 72–76.

[8] Cf. Wallace J. Richardson, "Work Sampling Today," *Factory*, Vol. 117 (September, 1959), pp. 122–127.

PAN AMERICAN WORLD AIRWAYS
OVERSEAS DIVISION
ORGANIZATION CHART — MAINTENANCE DEPARTMENT



— Pan American World Airways

Fig. 42. Maintenance organization chart of an airline.

05.07.42 SUPERINTENDENT, PRODUCTION CONTROL

DUTIES AND RESPONSIBILITIES

Is responsible to the Manager, Maintenance for the scheduling of aircraft and engines into the shops for routine and special maintenance work, for the development of manpower requirements, for the provisioning of spare parts, for provisioning of modification parts and for aircraft and component work record keeping as required by Company and Governmental regulations, and for assignment of aircraft to flight schedules. This responsibility applies to the Atlantic and Pacific areas of the Overseas Division. In the discharge of this function he selects, trains, and supervises personnel who:

1. Using operating plans developed by others, make current and long-range projections of engine and aircraft service requirements and shop manpower requirements, to minimize peaks and valleys in workload.

2. Assign aircraft to flight schedules to obtain best utilization and to provide a steady work flow to the shops.

3. Develop detailed work schedules for all service crews and overhaul shop at the Idlewild Base.

4. Review service and overhaul work completion records to insure their completion and file the records for the periods and in the manner required by applicable regulations.

5. Keep time records for all aircraft and components as required, and schedule the work on equipment so as to utilize to the maximum, but not exceed the allowable time.

6. Monitor material usage and recommend stock level adjustments to the Division Supply Manager.

7. Provision spare parts for new type aircraft, engines and components.

8. Are responsible for "in Shop" transportation and operation of "in process" parts control booths.

9. Maintain scheduling and workload liaison with the Latin American Division and Customers of the Overseas Division.

10. Provide Tool Crib Service to the shops and hangar crews, route tools to shops for maintenance, process requisitions for original requirements for tools specified by others and requisition replacement tools as required.

11. Maintain parts catalogue information booth for use of Hangar and Ramp Aircraft Service Maintenance personnel.

END

05.07.42 December 28, 1960 A-G,I,L,M,S,T

— Pan American World Airways

Fig. 43. Duties and responsibilities of a maintenance superintendent.

may be made with outside contractors to do maintenance, repair, and renovation work on a job or project basis.[9] The advantage claimed is that costs are lower because it is not essential to maintain a year-round maintenance force. Contract maintenance appeals to contractors interested in this type of work, as well as to the craft unions in the building and construction industries. However, industrial unions which include in their membership maintenance workers already in the plants object to this as a threat to the jobs of their members as well as to the jurisdiction of the union. This example of jurisdictional disputes thus reflects a limitation imposed by unions on management decision-making.

Maintenance in Nonmanufacturing. Maintenance is, of course, essential in all types of businesses. It is perhaps particularly instructive to take note of what is involved in air-line maintenance at an airport as indicated in Figures 42 and 43. Figure 42 is a chart from the organization manual of an airline company which shows the maintenance organization for an airport. Figure 43 is another page outlining the duties and responsibilities of the position called "superintendent, production control." Note that this is control of maintenance production. It should be pointed out that the material presented here is incomplete and is designed in part to be illustrative of titles which we shall later see used in somewhat different although related ways.

Conclusion. Although physical facilities are obviously important from the point of view of capital investment, it is always essential to keep in mind that the people who will as employees occupy and use them spend much time in the environment. Hence, a good deal of effort should go into the question of how to make these physical facilities contribute to successful human relations.

QUESTIONS

1. Explain the important factors in the design and height of buildings.
2. What are the trends in the construction of buildings?
3. What are the chief factors in deciding on the cost of buildings?
4. Which building services can be discussed in terms of air conditioning and why?
5. Who should be responsible for the selection of major equipment?
6. Distinguish between single- and general-purpose equipment. What are the advantages and disadvantages of each?
7. What procedures should be followed in replacing machinery and equipment?

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[9] "The Facts about Contract Maintenance," *Factory*, Vol. 117 (July, 1959), p. 170 ff. This article is followed by a discussion of its payoff against cost, labor problems, and labor relations.

8. Are standardized working conditions likely to lead to fatigue, monotony, and loss of morale?
9. How should maintenance be organized?
10. How would you go about considering the relationship between physical facilities and human relations?

CASE: Fortune Machine Company

In reviewing the Fortune Machine Company's production program, it was decided to investigate the status of the company's machinery more thoroughly than before. The machinery was both standard and specialized. Some of the grinders, lathes, and milling machines were more than fifty years old and a number of them were belt-driven. The investigation indicated that about 500 standard machines would have to be replaced in five years. The specialized equipment wears out more quickly than the standard equipment.

The works manager proposed that the old standard machines be replaced over a five-year period. He had the costs calculated and proposed a special appropriation to be prorated over a five-year period to replace the old machines. At the end of this period, the average age of machines would be, he pointed out, between five and ten years and obsolescent equipment would have been eliminated. The specialized machinery which was subject to more accelerated wear should be, he suggested, surveyed annually to determine replacement requirements, the cost of which should be covered in the regular budget.

1. Do you think this program is satisfactory? If not, how could it be improved upon?

2. How can the company avoid an accumulation in the future of equipment which is too old?

3. What financial problems might be associated with the equipment replacement program?

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Chapter IX

Making the Plant Layout

As HAS already been pointed out, it would be best to build a plant around a predetermined layout. Although this is not always feasible, since the layout must frequently be accommodated in some ways to the building, the following discussion is generally in terms of making the layout without regard to an existing building.

General Factors in Layout

An effective layout (Fig. 46) has a distinct effect on costs since it helps to speed up production by facilitating the movement of materials, parts, and partly finished goods through the production process. Hence, in order to determine the best layout the overall production process must be analyzed, the process involved in each operation must be studied, and the flow of the work from operation to operation must be arranged in the sequence which will facilitate the smoothest possible flow of work with as little delay as possible. In a plant which makes a single product, it is sometimes possible to have each successive operation next to the preceding one; but where a number of products are made, and made or purchased parts are introduced into the production sequence at different points for assembly, the layout problems make the decisions on the final layout more complex.

In determining the layout, the type of products, the quantity of production, and the type of operations have a bearing on the decisions to be made, and some flexibility should be allowed for in order to permit possible future changes which might prove to be needed. Space must be provided for the movement of materials from step to step, for the different machines in the various centers of operations, and for storerooms and other service centers. Bottlenecks must be prevented by having the work flow in such a way that different parts come to the point

of assembly as needed, or else there will be idle time because some operations would have to be held up until others catch up. The location of receiving, shipping, and stores must be provided for in as logical a way as possible and the requirements of the power, heating, ventilating, and lighting systems must be taken into consideration.

The following is a checklist of mistakes which should be avoided in making the plant layout:[1]

1. Plant space wasted.
2. Little or no flexibility.
3. Too many long moves needed.
4. Space badly jammed up.
5. More men, loose supervision.
6. Inefficient utilities, services.
7. Big rise in building costs.
8. Poor accessibility.

Production Centers. The centers of operations just referred to are called production centers, and they are the fundamental units for which space is provided (Fig. 47). The space necessary for a production center

[1] Richard Muther, "Getting Your Best Plant Layout," *Factory*, Vol. 117 (August, 1959), pp. 68–73.

Fig. 46. A section of a machine-tool assembly area.

— Pratt & Whitney Company, Inc.

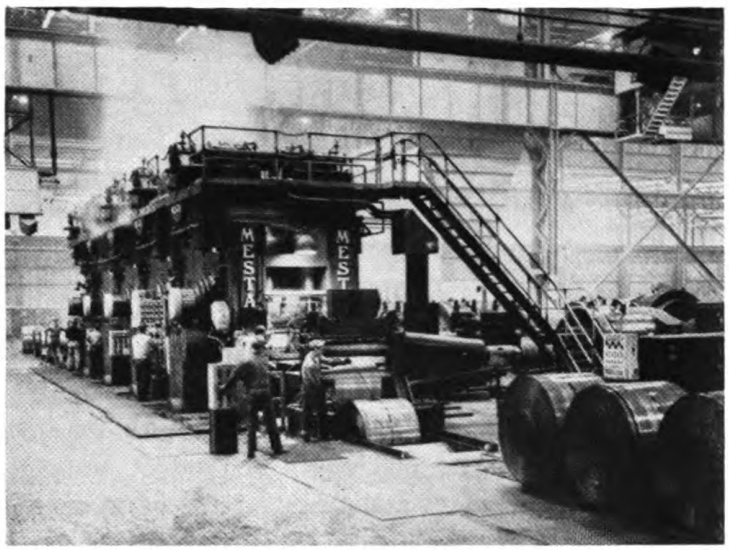


Fig. 47. A cold reduction mill moves steel through at 80 miles an hour.

— United States Steel Corporation

depends on the size of the machine or machines, any area needed for future machine maintenance, the amount of material which must be at hand, the requirements for getting material into and out of the machine, finished work, the auxiliary tools, the benches, tables, chairs, and cabinets, and the space to work in. Space must also be provided for conveyers, chutes, and material-handling equipment, including trucks, cranes, and other equipment (Fig. 48). Allowance must be made for aisles, for intraplant transportation, as well as for columns, partitions, elevators, and similar requirements. The size of a production center also depends on supervisory possibilities, since it is desirable that one person be in charge.

Each department is either coterminous with a production center or consists of several production centers. The criteria of departmentalization for production are such factors as the manufacture of particular parts, the assembling of given items, and so on. Depending on the type of production, the department may under some circumstances be set up

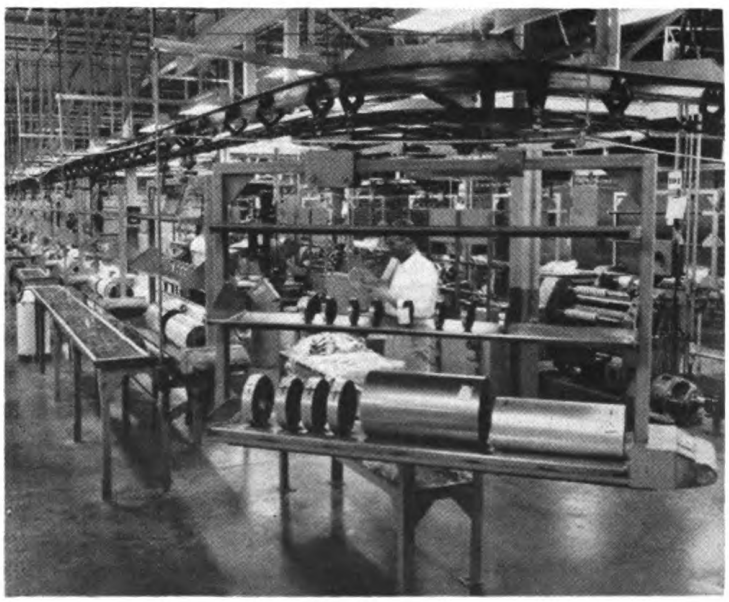


Fig. 48. Overhead conveyers move polyester film along a manufacturing production line to the shipping room.

— E. I. du Pont de Nemours & Company

with a prescribed maximum size, with additional departments to do similar work set up when the prescribed maximum size is reached.

Types of Production Processes. The type of productive activity dictates in some measure the plant layout which must be followed. The production process may be classified according to purpose as analytic or synthetic, although both types may be found in a plant. An analytic process involves a change in the form or physical property of materials as in metalworking, the extractive industries, and meat packing in which the raw material is resolved into its elements. A synthetic process involves the making of a product by putting together or assembling a variety of materials and parts as in automobile manufacture.

The production process may also be classified as continuous or assembly. In a continuous process a successive series of operations on the production line turns raw materials into the finished product. In the assembly process the components of the final product are made and brought together for assembly. Although components and parts may be made or processed along the line, some parts bought from outside companies are made available at the proper point in the production process, to be combined with other materials or parts. Where there are subassemblies the products of several subassemblies are brought together for final assembly.

Types of Layout. The two broad types of plant layout are functional layout and line layout. In the functional layout, the production process is divided into separate shops or departments, each of which performs a particular process. Under this arrangement, all machinery and equipment of a given kind is kept and operated in each such department. For instance, all drilling would be in one department, all grinding in another, and so on. In line layout, on the other hand, the machines and equipment are grouped in the sequence in which operations are performed.

Functional layout, which is sometimes called layout by process since each entire processing department is a step in the layout, has certain advantages. Possible changes in operations or the sequence of operations do not require changes in the layout. Since jobs can be assigned to any one of several similar machines which happens to be available, operations are not held up if a piece of equipment fails, because the work can be transferred to another machine. Under certain circumstances workers can be assigned to more than one machine if the machinery is automatic or semiautomatic and foremen become more skilled and efficient in their tasks. Functional layout is necessary when production cannot be entirely standardized and when highly skilled workers are employed in the different processes. However, there are certain difficulties and disadvantages in this form of layout. A relatively large amount of space is necessary; more time is required to make the product; the work in

process inventory may be excessive because there tends to be an excessive handling of the work; and there may be delays since the work travels over greater distances between departments. Because there are no definite mechanical channels through which the work must flow, difficulties may also rise in production control in connection with routing and scheduling, which require considerable attention to coordinate the work.

In *line layout*, which is sometimes called layout by product because the product is made and assembled in the continuous flow of operations along the line, the operations are performed in sequence. Since material handling equipment is so versatile that it can in effect move the material in an imaginary straight line along the process, the layout is not necessarily in a true straight line.

Because of the important advantages of line layout, it is the goal of those who desire to achieve mass production. Production time is shortened; less material handling is necessary because of the flow of work over direct mechanical routes; the floor-space requirements may be less; the definite sequence of operations reduces the problem of coordination and simplifies production control; and fewer skilled workers are necessary than in functional layout. However, certain disadvantages cannot be entirely overlooked. For one thing, the required investment in machines is relatively high. Furthermore, if one piece of equipment fails, the whole production line may have to shut down, since jobs cannot be assigned to the different specialized machines which simply become idle.

Manufacturing processes are frequently combinations of functional and line. The line form may be used in functional departments and the functional departments or shops may supply various parts for the line process.

Service Centers. The question where to locate storerooms, tool cribs, the toolroom, restrooms, washrooms, and lavatories frequently gives rise to some conflicting possibilities. Although they should be located as close to production as possible, it is clear that they cannot all be as close to all of the production centers as they can to some of them. In some instances, more than one service center of a particular kind can be provided. But the space utilized for service centers should usually be that which would not be so desirable for use in the production process itself. If such space is not as close to some of the production centers as might seem preferable, some compromises will have to be made.

The receiving and shipping departments, the engine room, and the restaurant or cafeteria, if any, must also be provided for. Production-control facilities and the factory office also have to be fitted in. If the general offices are to be located in or near the plant, space also has to be provided for this purpose.

Where Material Is Handled. Although the arrangements which best

facilitate material handling differ considerably, depending on the type of product and the necessary production process, certain generalizations are possible since material is handled in various steps of any production process. Provision must be made for the delivery of raw materials and parts to stores, for transportation of the raw materials and parts to the proper point in the production process as they are needed in production, for handling the work in process from one point to the next in the process, and finally for moving the finished goods to the shipping room.

Factors in Material Handling. Since material handling may be a large part of labor cost, it should be minimized as far as possible by using mechanical means and routines made as automatic as possible. Although the greatest economy is achieved by not handling material at all, this ideal situation is difficult to achieve completely. Nevertheless, efforts should be made to use the cheapest and simplest methods of moving materials without unnecessary handling. Since the equipment should be the simplest for the purpose, chutes to take advantage of gravity should be used whenever possible. When mechanized equipment is to be acquired, standard equipment should be given first preference since it has the merit of having demonstrated its usefulness on a considerable scale elsewhere. Since the right type of equipment does not insure its correct use, special attention should be given to the proper ways of operating it, with periodic inspection essential.

Material-handling arrangements are closely related to plant layout and both must be worked out together. In making the layout, allowance must be made for the necessary material-handling equipment and the aisle space for transportation. The expected methods and techniques of material handling must be taken into account in setting the production equipment in proper sequence. Although the most efficient layout is dependent on the related material-handling equipment, the layout defines the route of travel, and efficiency in material handling cannot offset the defects of a poor layout in which the sequence of operations, the production equipment, and stores are not laid out properly.

Although workers and portable machines are brought to the material in certain types of operations, it is common for the production machines to be stationary, with the workers and materials going to the machines, as in assembly-line operations where the workers are stationed at the machines to which the materials and tools are brought.

Materials and Assembly. Assemblies may be made on fixed-position assembly lines in which the workers complete the entire assembly at one place or else move from one position to another doing the same operation at each, or they may be made by continuous or intermittent moving assembly in which the work is moved to the worker who does one assembly in the specified time. Since continuous assembly makes

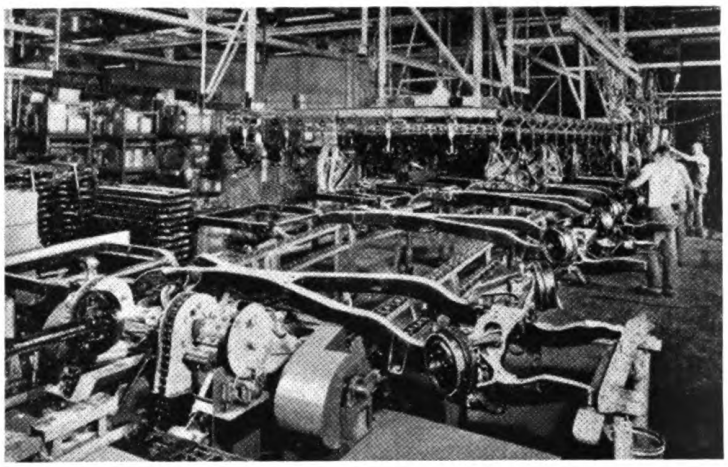


Fig. 49. An automobile assembly line — here front-end suspension units are being attached to the frame.

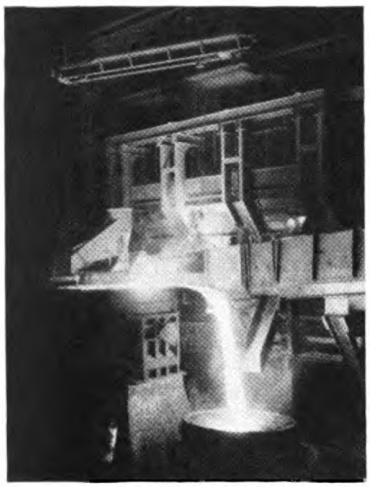
— Chevrolet Division
General Motors Corporation

possible a high degree of specialization, it is especially adapted to mass production and large volume (Fig. 49).

All assembly was formerly done by hand labor with parts being handled and fitted manually. Since this frequently resulted in bottlenecks, the problem of overcoming them was serious. Although the solution was first found in the automobile assembly, the continuous-moving assembly system is now widely applied. The early automobile makers were largely assemblers of parts who used existing machine shops, although they soon built special factories. The production of a standard-type car, such as Ford's Model T, was the assembling of parts made possible by the design and use of specialized machines, dies, and patterns. Although it was possible to subdivide the labor operations somewhat extensively, Ford assembly was until 1913 fixed-position or stationary assembly, in which five men at each of the hundred stations assembled parts brought to them by other workers. By the following year arrangements were worked out under which each worker specialized in one assembly operation and had the work brought to him by power-driven conveyers, so that he was kept occupied with the same task continually as he performed the work on the materials on the moving conveyer. In order to achieve this continuous or progressive assembly with continuous-flow production and orderly flow of the assembly, it was necessary to analyze and standardize processes and to arrange the machinery in a line layout. Material handling in situations like this becomes a much more closely related part of the production process than otherwise. However, expensive systems of mechanical conveyers depend for their effective use on a large volume of production.

Material-Handling Equipment. Although it is possible to classify material-handling equipment in various ways, such as by types of apparatus, by service performed, by material handled, by the mobility of the equipment, and by the kinds of industries using it, the following comments are made primarily to mention some of the more widely used equipment.

Heavy floor loads due to heavy machinery, material-handling equip-



— United States Steel Corporation

Fig. 50. Molten steel flows from a 275-ton capacity open-hearth furnace.

— Clark Equipment Co.

Fig. 51. Moving pharmaceutical products by means of an electric lift truck.

— Link Belt Company

Fig. 52. A belt conveyer operated in a tunnel beneath a highway to connect company facilities on either side of a highway.

ment, and the product require first-floor layouts if the cost is to be held down. Although freight elevators must be provided in multistory buildings, the force of gravity may be utilized for some purposes, in straight chutes for short drops and spiral chutes for longer distances. However, chutes are obviously not useful for fragile articles or very heavy loads, but are used for lowering boxes, cases, crates, barrels, and packages. Wheel and roller conveyers making use of gravity are useful for moving packages, while flat belt conveyers may be used for light assembly work or bulk materials. Power-driven, pneumatic, and hydraulic conveyers are also used for some purposes.

Fig. 53. Part of a mile and a half chain conveyer to handle cartons of milk.

— Link Belt Company

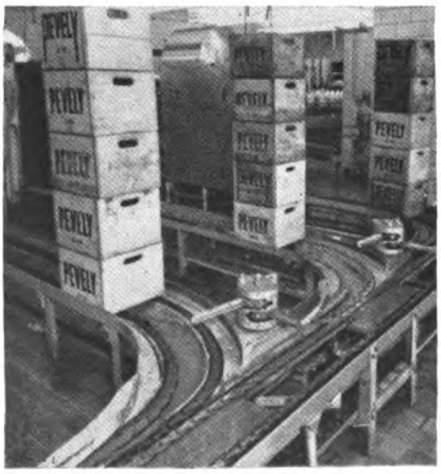
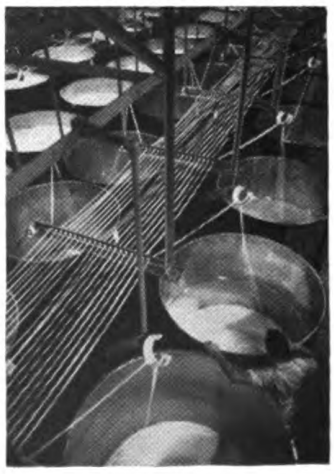


Fig. 54. A six-ton ingot being hoisted from a soaking pit by a tong-like crane.

— United States Steel Corporation

Fig. 55. Dacron polyester fiber in rope-like tow form moves toward a drawing machine.

— E. I. du Pont de Nemours & Company



Trucks, trailers, and freight cars are used to transport materials and parts from one plant to another. In heavy industries railroad tracks in the plant building for the receiving and delivery of products are level with the floor, but can be lowered to bring the floor of the cars level with the plant floor at points where material is loaded or unloaded. Similar arrangements may be made for truck roads inside the plant. Overhead cranes may be used to load or unload flat cars and open trucks and for other purposes. Overhead moving conveyers are often used to move heavy materials such as structural steel and granite. The use of cranes and overhead conveyers requires careful layout so that overhead space is kept clear. When hand trucks and power-driven lift trucks are used for shorter hauls within or between departments, the roads, aisles, and ramps must be laid out with an eye to the use of such equipment. Not only must adequate width be provided, but the material of which the floors are made must be considered. In order to keep traffic in line and prevent accidents, the aisles and work areas should be marked off with white paint.

Figures 50 to 55 show various forms of material-handling equipment.

Visual Aids in Layout

Process Charts. Since the most desirable layout arrangement is somewhat hard to imagine, and it is obviously impossible to arrange and rearrange actual machinery and equipment in order to arrive at the best solution, methods of visualizing layout on paper must be used. One of these is the operation process chart (Fig. 56) which shows the points at which materials are introduced into the manufacturing process and includes inspections and all operations except material handling. The

Fig. 56. Operations process chart.

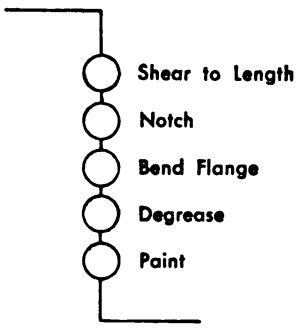
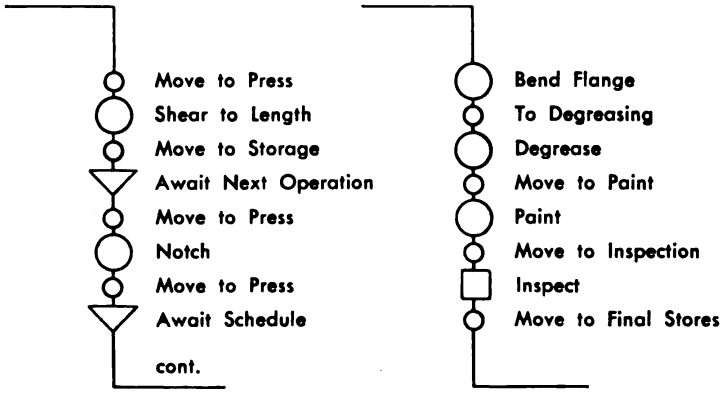


Fig. 57. Flow process chart.

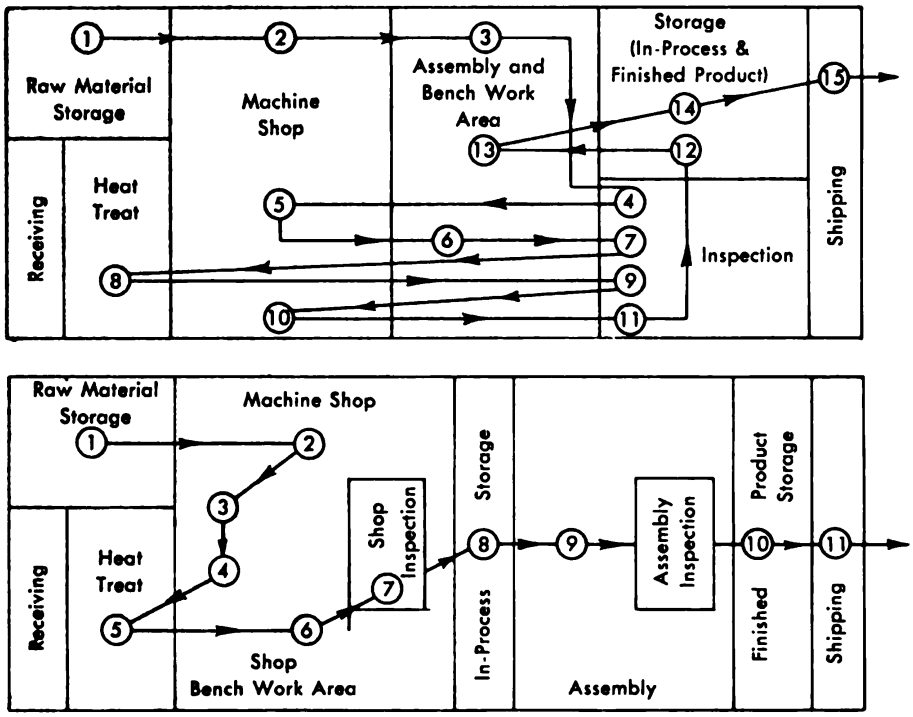


flow-process chart (Fig. 57) which shows graphically all the component operations through the manufacturing process, including the storage, delays, material handling, inspections, and moving of materials from operation to operation, may also indicate the time required for each step. While the operation-process chart subdivides the manufacturing process into its separate operations and inspections, the flow-process chart introduces details of storing, handling, and moving the material between manufacturing operations. Process charts are also widely used in connection with work simplification and methods improvement, as will be indicated in a later chapter.

A process-flow diagram, which is a sketch of the plant drawn to scale and indicating the flow of materials from department to department, may be prepared to supplement the process-flow chart. For a single-story building a process-flow diagram is a floor-plan sketch (Fig. 58), while for multistory buildings it is a perspective diagram of the building showing the sequence of the various operations by arrows.

Templates. Templates, making it possible to view the plant as a whole, are another assistance in arriving at a satisfactory plant layout. When cardboard or paper templates of machines, production centers, and service centers, drawn to a scale of ¼ inch or ⅛ inch to the foot

Fig. 58. Floor plan sketch of an old and a new layout.



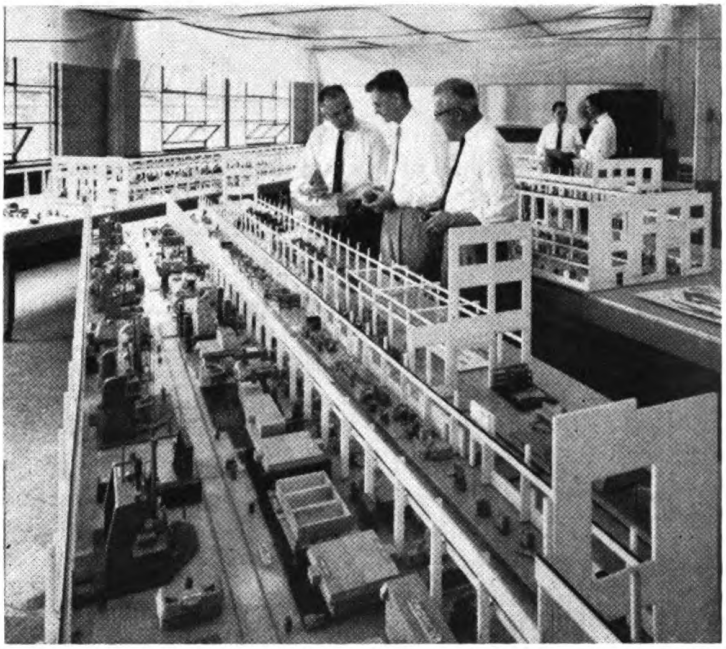


Fig. 59. A model plant that duplicates in miniature 1.5 million square feet of manufacturing space.

— Westinghouse Electric Corporation

are cut out, they can be laid out on a scale drawing of the floor area and arranged and rearranged until the best combination is found. To make certain that nothing has been overlooked, it is desirable to have the final layout reviewed by others, especially those in the manufacturing departments. After the layout has been finally completed in this fashion a diagram is made and a blueprint can be made.

Another method of making a layout is to make small wood or plastic models to scale. When placed in position they give a more realistic effect than the other methods (Fig. 59).

Conclusion. Since the layout provides distinct routes of travel for the work, a good one providing the shortest possible distances reduces the cost of material handling, keeps down the amount of materials and work in process inventories, saves floor space, simplifies production control, and makes possible the best utilization of labor and equipment.

QUESTIONS

1. What factors have to be taken into account in deciding on layout?
2. What has to be provided for in setting up production and service centers?
3. Describe the types of production processes.
4. What are the advantages and disadvantages of functional layout?
5. What are the advantages and disadvantages of line layout?
6. What are the problems in material handling, and what should be considered in solving them?
7. How should assembly be organized?
8. Distinguish between the operation-process chart and the flow-process chart.
9. How does the work flow in your college library?

10. Which of the methods of visualizing layout do you consider best, and why? In deciding on this, to what extent should the requirements of the particular industry be a consideration?

CASE: Bradford Printing Company

James Bradford has had a very successful career in developing his printing business from a one-man operation in his spare time to a 25-man shop located on the fifth floor of a loft building in the city. The business includes printing pamphlets and books. The employees are proofreaders, hand compositors, linotype operators, foundry workers, bookbinders, and several miscellaneous workers such as those handling shipping and receiving and the business-promotion man.

Bradford has not paid much attention to layout and is not at all sure it makes very much difference since there probably is not too much waste motion and inefficiency in a shop that size. However, although he understood the details and interrelationships of the work perfectly well himself, he developed the idea that for various reasons it might be desirable to develop a layout which would be readily comprehended by others, particularly if expansion plans should develop and additional capital might have to be attracted from outside. He would like to have someone other than himself indicate by a diagram or otherwise how the work flows and what an efficient layout might be.

1. Show how the work flows.

2. What kind of layout would be desirable?

3. How would you allow for possible future expansion, assuming there will be no space problem?

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UNIT 5

PRODUCTION STANDARDS

Chapter X

Planning and Controlling Production

PRODUCTION control involves, first, the determination of the most efficient and economic methods of making the product or providing a service and, second, the setting up of procedures to be followed in carrying out these methods. The first step of determining the most efficient methods is really planning, and it is often called production planning. The second step is production control as such. The whole process is often called production planning and control.

Development of Production Control. Before the development of modern systems of production control, bills of materials or specifications originating in the superintendent's office were taken to the shops and given to the foremen. Since orders were often handled only when customers and the sales department requested the product and the general tendency was to handle orders under pressure only as they became rush orders, the accompanying confusion was not conducive to orderly, systematic, and efficient production. With the passage of time, master schedules based on prospective sales or on actual sales orders and showing the dates on which important features of the production program were to be completed were prepared with the shipping dates controlling production.

The next step in the evolution of production control was the development of a manufacturing order system under which progress reports were prepared to indicate both orders behind the scheduled time, and the reason for the delay. Expediters or follow-up men, sometimes called stock chasers, not only followed up and corrected delays after they occurred but also, and more importantly, anticipated and prevented delays before they occurred. Expediting may be organized by following an order through the plant or by having the work of each department followed up by an expediter in the department. Some of the features of the system described in this paragraph are still in use.

Production Planning and Control Department. The production planning and control department is sometimes called the planning department, the production-control department, or simply the production department. The production-control department does not in any way engage in manufacturing operations itself. It issues the orders which are the authorizations to the operating departments to do the work, and it checks on the progress of the operations. The department is a functional staff department under the jurisdiction of the top manufacturing executive. It is coequal with the factory management departments, which are line-operating departments.

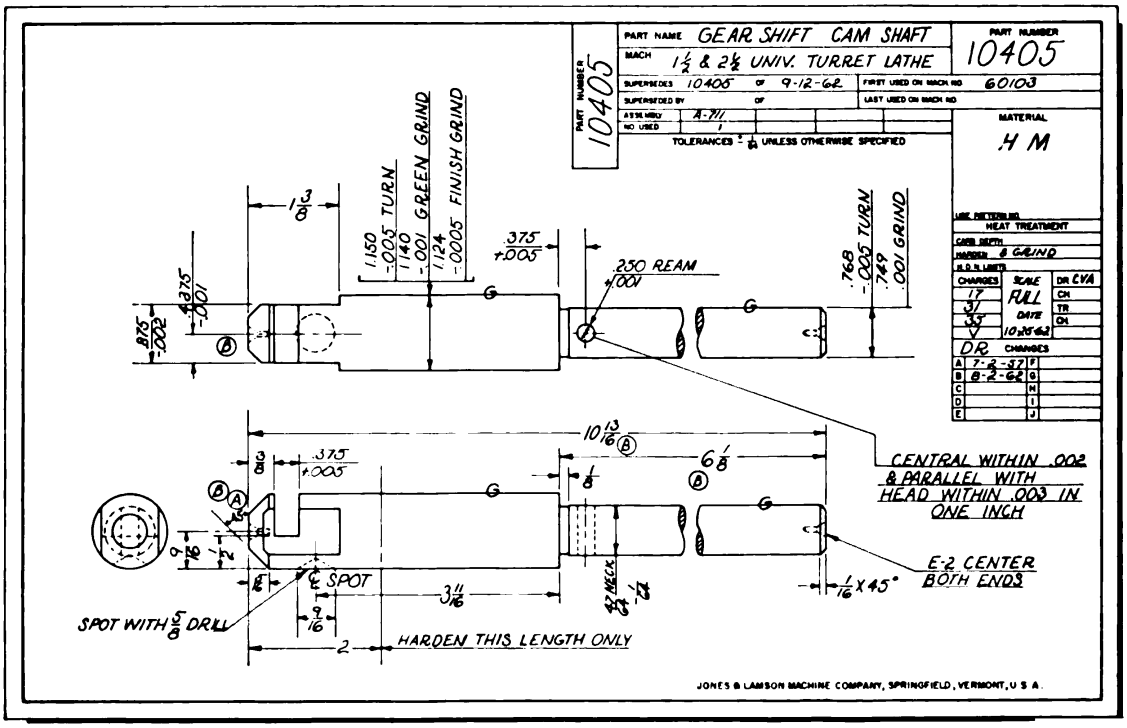
The work of the production-control department relieves the heads of operating departments of responsibility for nonoperating details and thus permits their concentration on factory operations. The burden of preliminary planning, follow-up, and recording duties is removed from the foreman, who is thereby freed to get the work done, to deal with workers, and to help develop them.

Although planning and control may be centralized, in large mass-production plants decentralized systems are widely used. Under a decentralized system, the central planning and control office coordinates the individual planning units, which are located in each of the operating or manufacturing departments, where the details are worked out.

Production Planning. Before production control as such can be provided for, advance planning is necessary. Production planning involves

Fig. 62. Drawing of a part to be made.

— Jones & Lamson Machine Company

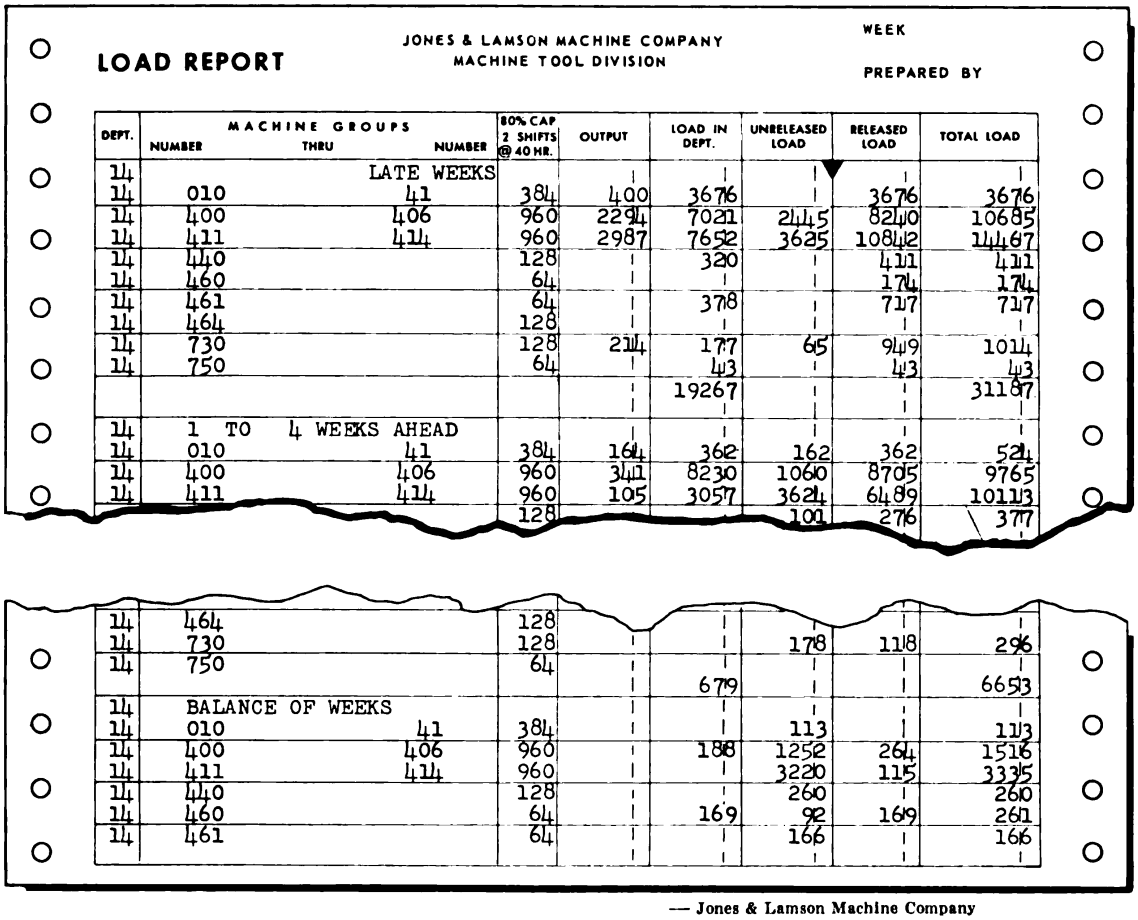


the analysis of what work to do, how to do it, where it is to be done, and when. Research, product development, and product design are in effect a first step in production planning. Although engineering design is not necessary in some industries, such as canning, it is essential in the machinery, metal, wood, and plastic industries. Product specifications are, however, necessary for such products as manufactured foods, drugs, chemicals, dyes, and paints. Whatever the situation, the product to be made must be analyzed into its component parts in order to determine exactly what is required in order to make it according to specifications in the most efficient volume of output. Factory layout, material-handling arrangements, tools, labor standards, materials standards, and assemblies must be provided. The necessary information is brought together on drawings, tool lists, material lists, schedules, instruction cards, and so on. Figure 62 illustrates a drawing of the specifications of a part to be made.

The particular type of manufacturing process influences the kind of planning which is possible and necessary. In continuous-process manufacture, where there is no break in the flow of work and materials are added or by-products removed, less planning is necessary than in repetitive operations, where hundreds and even thousands of parts are made and brought together in subassemblies and assemblies. In job order or custom manufacture the possibility of advance planning is limited by the fact that planning depends on the receipt of orders and under some circumstances it can begin only when the order has been received or in some instances only when a number of orders have been accumulated. Many manufacturing programs are further complicated by the fact that they are combinations of the basic types. The scale of the operations also influences the extent to which planning is necessary.

Production Analysis. A fundamental in planning is production analysis, which is done by process, methods, or production engineers. In analyzing production, manufacturing capacity and the time required for operations must be carefully determined by operation study, which involves analysis of the product, the layout, material-handling methods, plant transportation, jigs, fixtures, tools, storage of materials and tools, the machinery, and the standard setting-up and operating times. The operation study includes process analysis, which involves subdividing the manufacturing process into its constituent operations and material movements so that each operation and handling of materials can be studied to determine its necessity and effectiveness in furthering the process. In making this analysis, process charts are used.

The quality of the product to be made determines the quality of the required materials, and influences to some extent the possible rate of utilization of the equipment, the productive capacity of which must be known in order to control the production process. The quantity of



LOAD REPORT

JONES & LAMSON MACHINE COMPANY
MACHINE TOOL DIVISION

WEEK

PREPARED BY

DEPT.	MACHINE GROUPS NUMBER	THRU NUMBER	80% CAP. 2 SHIFTS @ 40 HR.	OUTPUT	LOAD IN DEPT.	UNRELEASED LOAD	RELEASED LOAD	TOTAL LOAD
14		LATE WEEKS						
14	010	41	384	400	3676		3676	3676
14	400	406	960	2294	7021	2445	8240	10685
14	411	414	960	2987	7652	3625	10842	14467
14	440		128		320		411	411
14	460		64				174	174
14	461		64		378		717	717
14	464		128					
14	730		128	214	177	65	949	1014
14	750		64		43		43	43
					19267			31187
14	1 TO 4 WEEKS AHEAD							
14	010	41	384	164	362	162	362	524
14	400	406	960	341	8230	1060	8705	9765
14	411	414	960	105	3057	3624	6489	10113
			128			101	276	377
14	464		128					
14	730		128			178	118	296
14	750		64		679			6653
14	BALANCE OF WEEKS							
14	010	41	384			113		113
14	400	406	960		188	1252	264	1516
14	411	414	960			3220	115	3335
14	440		128			260		260
14	460		64		169	92	169	261
14	461		64			166		166

— Jones & Lamson Machine Company

Fig. 63. Machine load report.

the materials and their availability must also be determined. The possible quantity and quality of the output can be determined by the analysis of machines, tools, and methods. Labor and setup times are available from time studies. The size of the lot which it is most economical to produce depends on costs and plant capacity as well as on anticipated demand. Some companies have developed formulas for determining economic lot sizes.

Machine-capacity analysis to determine the productive capacity of the machines is a necessary part of the study of operations. Information on the number of units which can be produced within a given period of time is needed not only for routing but also for machine loading, which is part of scheduling the operations. In making an analysis of machine capacity, the character of the machines, the kind of work to be done, the kind of materials worked on, and the setting-up time must be taken into account.

Machine loading (Fig. 63) is done on the basis of machine-capacity analysis. Loads are expressed in hours, as in a machine shop, or in number of units of output, as in other industries. The machine load is the num-

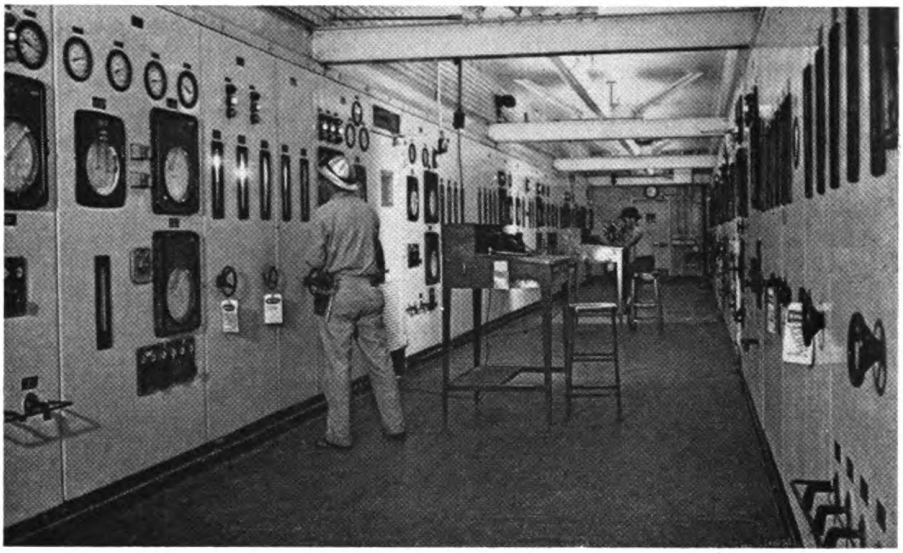
ber of hours of work assigned to each machine or group of similar machines beyond the current date. New jobs are added and finished jobs are deducted daily. When the load or quantity of work which can be assigned to each machine is known, jobs can be assigned in sequence for completion at a future time which can be specified in advance. Moreover, controls can be set up so that each machine can be supplied with a continuous flow of jobs.

By proper analysis of the data on the various matters mentioned in this section, it is possible to determine the time and sequence of operations. Such analysis is reflected in the preparation of operation sheets, which become standard plans showing the sequences and times of the different operations.

Operation Sheets. When the sequence of operations has been determined, an operation sheet, or master route sheet, is prepared showing for each part, subassembly, and assembly, the lot size, the materials, machines, fixtures, and tools used, the location of the machines, the required operations, and the rate at which the job is to be done. The time necessary for the operations is also shown, labor time being derived from the instruction cards prepared for workers. Operation sheets are standard plans of performance for making the different parts and assemblies. Each operation sheet is a permanent record of the sequences of all the separate operations in making the part which it covers. These operation sheets are used in preparing route sheets, which are made up for specific production orders or for the production of a future period. When the items to be made require different combinations of parts, the operation sheets for the different parts have to be combined accordingly.

Use of Symbols. It is customary to use symbols to designate all materials, parts, patterns, drawings, machine tools, operations, locations, and products. The symbols used in drawing up the papers involved in the planning process, as well as in filling out the forms used in production control, should be uniform throughout the organization. Symbols are shorthand designations in numbers or letters to represent or designate the different items in a classification. They should be mutually exclusive with each one completely differentiating the item it represents from all other items. The system of symbols should also be capable of expansion. The development of a satisfactory system of symbols requires considerable thought.

A classification is the organizing of items in groups. The system of symbols may be so developed that the first component is the general class within which the item falls; the second, the principal subclass; the third, a division of the subclass; and so on. Thus, if *L* is lathes, *LE* may represent engine lathes, and *LE–20* would be 20-inch engine lathes.

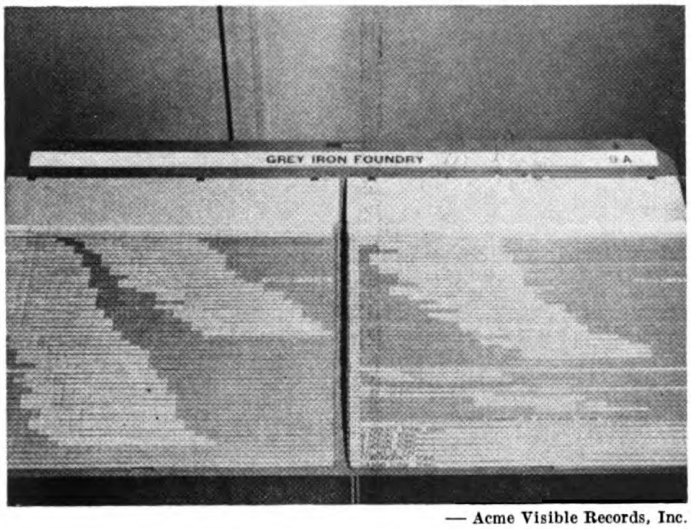


— E. I. du Pont de Nemours & Company

Fig. 64. A control room where an operator, remote from production unit, observes the flow of processes, interfering only at the signal of an emergency.

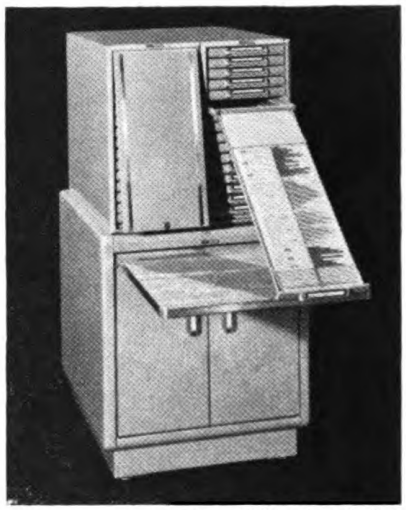
A system of symbols may be alphabetic, numeric, mnemonic, or graphic. In an alphabetic system in which the first letter is the general class and successive letters represent subclasses, *A* to *E* might, for example, be expense symbols; *F* to *W*, product symbols; and *X* to *Z*, construction symbols. The letters *I*, *O*, and *Q* should be avoided to prevent confusion. A numerical system, in which a series of groups of numbers is separated by dashes, may be used. Mnemonic systems which may be used to designate locations, equipment, machinery, products, and subdivisions of the product are designed to assist the memory and are usually letters, although numbers may be used after the letters. Examples of graphic symbols or signs are therbligs and those used on process charts. Colors may also be used as symbols.

Elements of Production Control. Production control involves routing, scheduling, and dispatching. Assuming, for example, that a production budget is prepared after the sales budget has been set up for the year or half year, operations can be planned accordingly. Routing is planning where the work will be done and what the sequence or order of operations is to be. In some continuous-process plants (Fig. 64) as well as in all mass-production plants, the day-to-day routing function is negligible because the route is fixed in advance. Nevertheless, work is always under way on the problems of layout and routing for new models and changes in models. Plants producing to customer order or in lots, on the other hand, have continual routing problems. Moreover, in some plants some products are made continuously while a number of parts are not. Whatever the situation, the routes for materials, parts, and



— Acme Visible Records, Inc.

Fig. 65. Production control board for a department.



— Acme Visible Records, Inc.

Fig. 66. A visible card index system for production control.

assemblies must first be established by the methods department and then followed.

Scheduling is planning the amount of work to be done and the time when each phase is to start. The amount of work to be done and the order of work depend on the rate of output of the different departments as well as on that of the plant as a whole. In scheduling, the starting and finishing times are set for each operation.

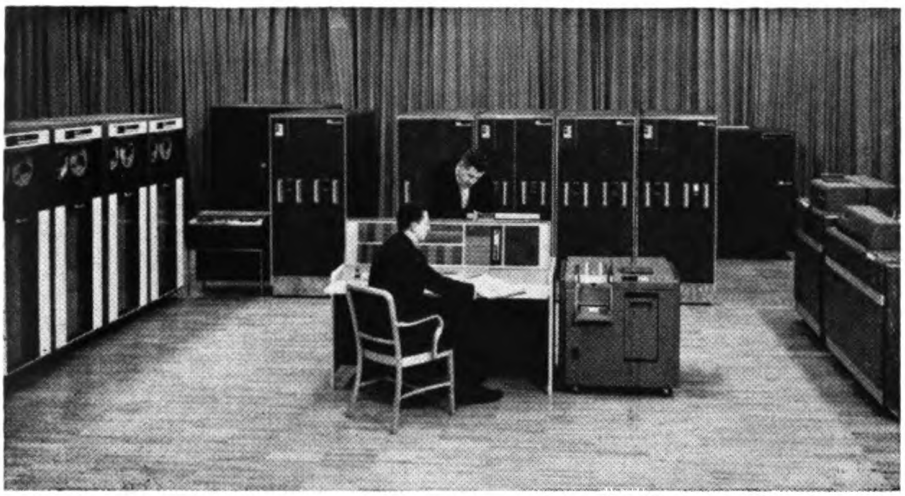
Dispatching involves the releasing of the actual orders necessary to start production and then following up to see that schedules are being met by the proper utilization of materials, machines, and workers. The various orders released include those for the issue and delivery of materials from stores, tool orders, job orders, and inspection orders. After the orders have been released, continued observation and attention are necessary in order to achieve the scheduled quantity and quality of output. The progress of production is recorded and continuous comparison is made between planned and actual results. One method of doing this is by the use of a Gantt chart, on which the steps in production are listed vertically on the left-hand side, while the time is indicated horizontally across the top. The time within which each operation should take place is then indicated by a light horizontal line alongside the operation, while the actual time which is being taken for the operation is entered as a heavy horizontal line parallel to the light line showing how much time should be taken. This procedure permits ready comparison between the scheduled time and the actual performance time. Gantt charts are used for various control purposes, including the recording of schedules of work ahead for a department or plant, machine performance, worker

performance, and progress of work through a department or plant according to operations, sequences, or machine performance.

Other methods showing the planned work and its actual status are also used in production control. Several types of production-control boards are used to show the status of work for the whole plant. In large companies such control boards are in the central production-control office, and separate control boards showing the work in process and the work ahead of machines and workplaces are also kept in the different departments (Fig. 65). Hook, pocket, or grooved strip boards may be used. On production-control boards, the parts of products are listed vertically on the left-hand side of the board and the departments or machines are listed horizontally across the top. Cards or tickets are moved to the right as the work progresses. A tape or string board provides for listing the production steps at the left and for recording the progress of work by moving the tape or strings with colored pegs horizontally across the board. Instead of control boards, index cards may be used in production control. Visible index systems have overlapping pockets or envelopes containing cards which may be readily identified (Fig. 66).

Electronic Machines. Machine methods, in which punched cards are used to record and control all phases of production, inventories and costs, and in which various statements can be machine-prepared from these cards to show the status of the different aspects of the production process at any time, are being increasingly used. The systems are adaptable to all types of manufacturing processes and may be integrated with electronic data-processing machines which go beyond the mechanized operations just mentioned to include analytical work by machine. The data are fed to the machines, which are capable of reading, storing, classifying, and evaluating information and then making logical decisions based on predetermined standards. In connection with inventory control, for example, they can be used to determine economic ordering quantities, lead time, which is the number of days required to manufacture the economical ordering quantity or the time required for the delivery of parts purchased from an outside vendor, and the minimum inventory level to be maintained above planned requirements. Electronic data processing is not confined to inventory control but may be used to provide daily reports on such matters as production and costs, to evaluate plant and equipment periodically, and to help make other management decisions.

The automatic control of machine tools by means of numbers stored on punched tape or cards, magnetic tape, or some other storage medium is called numerical control. Data and instructions are given to the computer, which stores them in numerical storage locations. The coder can give the machine an instruction, and the computer makes use of the



— International Business Machines Corporation

Fig. 67. A data processing system for controlling and feeding instructions to machine tools.

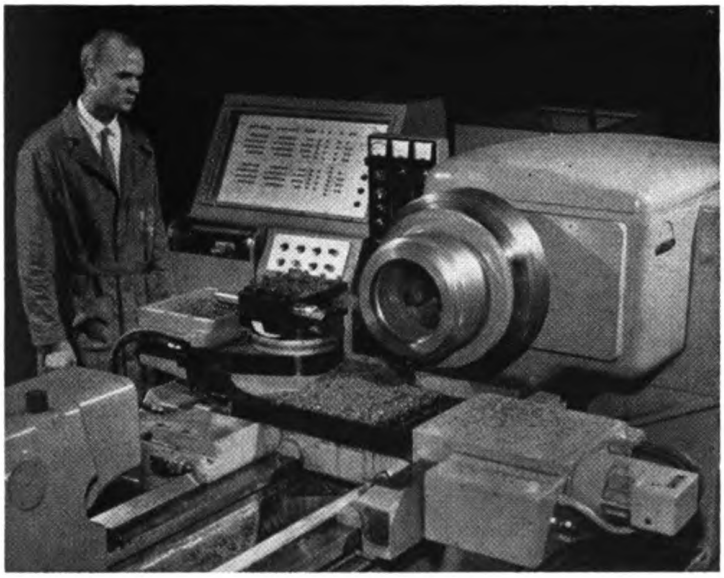
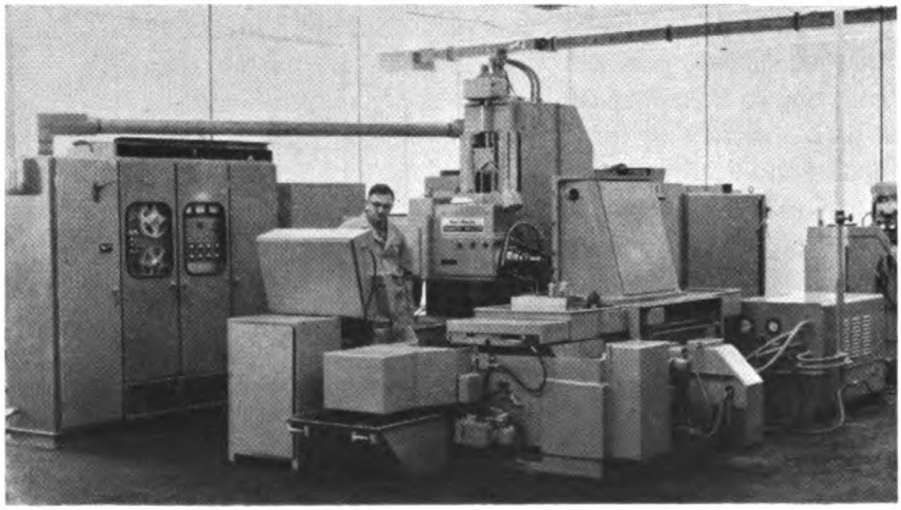


Fig. 68. An automatically controlled lathe in operation.

— The Monarch Machine Tool Company

Fig. 69. Tape reading, numerical control system for automatic contour milling of two- or three-dimensional shapes.

— Pratt & Whitney Company, Inc.



stored program to do an entire series of operations. It is instructed what to do by means of the operating code, what to do it on or to (called address), and what to do next (called address of the next instruction). Figures 67 to 69 illustrate and briefly describe what several of these machines do.

Machines of this type are being produced in increasing volume and diversity. It is possible that some of the firms entering this relatively new line in order to achieve innovation profits will be absorbed by others with an outcome described by economists as oligopoly, meaning an industry with only several firms.

One of the problems sometimes encountered with automated lines of equipment is that if one unit in a line goes down the entire line does so. While automation has been rapidly increasing, complete automation will not prove economical in many situations. The optimum use of these machines depends on the extent to which it pays to invest in them as against machinery operated by workers.

One of the interesting recent developments is the increasing use of simulation techniques, with the aid of computers. It is possible to analyze a process or operation by manipulating models of it in order to decide on the most satisfactory alternative. The computer can be programmed to carry out very complicated processes in alternative ways and a selection can be made of an accurately computed alternative.

Routing. After planning and analysis work has been done, it is possible to arrange for the control of production covered by a production order. The first step in production control is routing, which involves assigning the definite order of operations, selecting the proper machines or production centers, specifying the tools, and sometimes designating the personnel to do the work. Routing must follow the layout. Route sheets (Fig. 70) are prepared from the operation sheets. Each route sheet prepared for each part to be made under a production order shows the number of pieces to be made, the number of pieces in a lot, the delivery date, the materials, the machine time, and the sequence of operations. In other words, the route sheets indicate the necessary operations and the places where they are to be performed. Work is posted to machine load charts and work schedules from the route sheets which are also used as progress reports on which completed operations are checked.

When a standard product is being made, the operation sheets can be used without making separate route sheets and, in such cases, operation sheets may be called route sheets.

Scheduling. Scheduling is the development of a timetable for the different jobs which have to be done under the production order. The time necessary for the various component operations must be allocated so that the different parts arrive at the place of assembly on time. When

Routing Sheet For	Material	Part Number	Sheet 1 of 2
Gear Shift Cam-Shaft 1-1/2" & 2-1/2" Univ. Turret	1-1/4" Diameter HM-HR	10405	

Date Typed	Method by	Ch'ked by	Supersedes / Superseded by	Est. by Standards	Checked by
4-8-57	Blais AJS	LAB.		WJB	

Oper No.	Dept. No.	Type Mach.	Time Set-Up	Time Each
		10405		
1	14	404		
2	14	404		
2.5 3	17	670		
4				
5				
6	26	310		
7	24	560		
8				
9	24	560		
10	22	130		
11				
12				
13	17	690		
14				
15	30	640		
16				
17	17	810		
18	26	310		
19	26	310		
20				
21				
22	30	800		
23	65T			
24				
25				

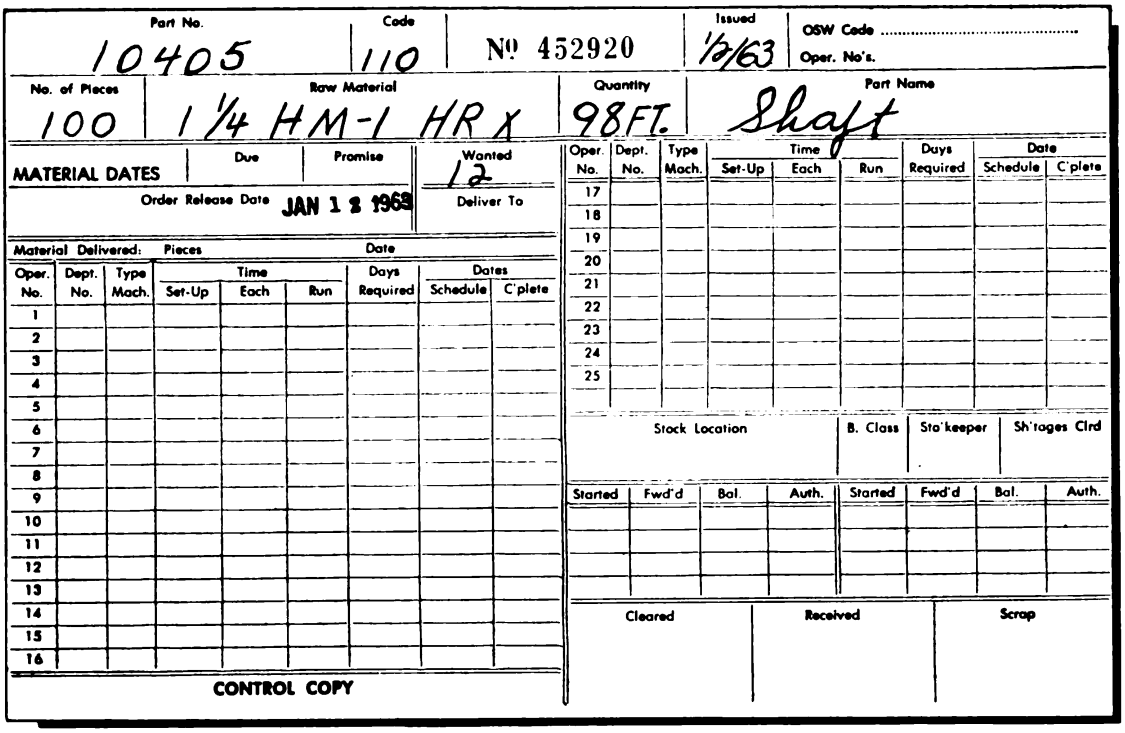
Oper No.	Dept. No.	Description of Operation	Tools and Instructions	Minutes Each
1	14	#7A Universal Bar Machine Runout, turn 1.124" diameter to 1.150"-.005", turn .749" diameter to .768"-.005", face shoulder and neck, face and chamfer, center and cut off 10-27/32" long.	Note: Scale by for start of next pc. Gage 10257-8 Gage 10405-8	
2		Face, chamfer and center head end.		
2.5	17	Straighten.		
6	26	Cylindrical Grinder Green grind 1.124" diameter to 1.140"-.001".		
7	24	Plain Mill Straddle mill .875" dimension and burr.	Hold on Vee block against stop. Gage 10405-2	
9		Mill .375" slot and burr.	Vise jaws 10405-4-1, 10405-4-2 Gage 10153-5	
10	22	Table Drill Spot 5/8" hole. Drill and ream and burr .250" hole.	Drill Jig 10405-1 Drill Jig 10405-3 Gage 10405-9	
13	17	Heat Treat.		
15	30	Hardness Test.		

continued

Changes	Op	By	Date	Op	By	Date	Op	By	Date

— Jones & Lamson Machine Company

Fig. 70. Routing sheet.



Part No. 10405 | Code 110 | No 452920 | Issued 1/2/63 | OSW Code ..... Oper. No's. .....

No. of Pieces 100 | Raw Material 1 1/4 HM-1 HR x | Quantity 98FT. | Part Name Shaft

MATERIAL DATES | Due | Promise | Wanted 12 | Deliver To

Order Release Date JAN 1 8 1963

Material Delivered: Pieces Date

Oper. No.	Dept. No.	Type Mach.	Time Set-Up	Time Each	Time Run	Days Required	Dates Schedule	Dates C'plete
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								

CONTROL COPY

Oper. No.	Dept. No.	Type Mach.	Time Set-Up	Time Each	Time Run	Days Required	Date Schedule	Date C'plete
17								
18								
19								
20								
21								
22								
23								
24								
25								

Stock Location | B. Class | Sto'keeper | Sh'tages Clrd

Started	Fwd'd	Bal.	Auth.	Started	Fwd'd	Bal.	Auth.

Cleared | Received | Scrap

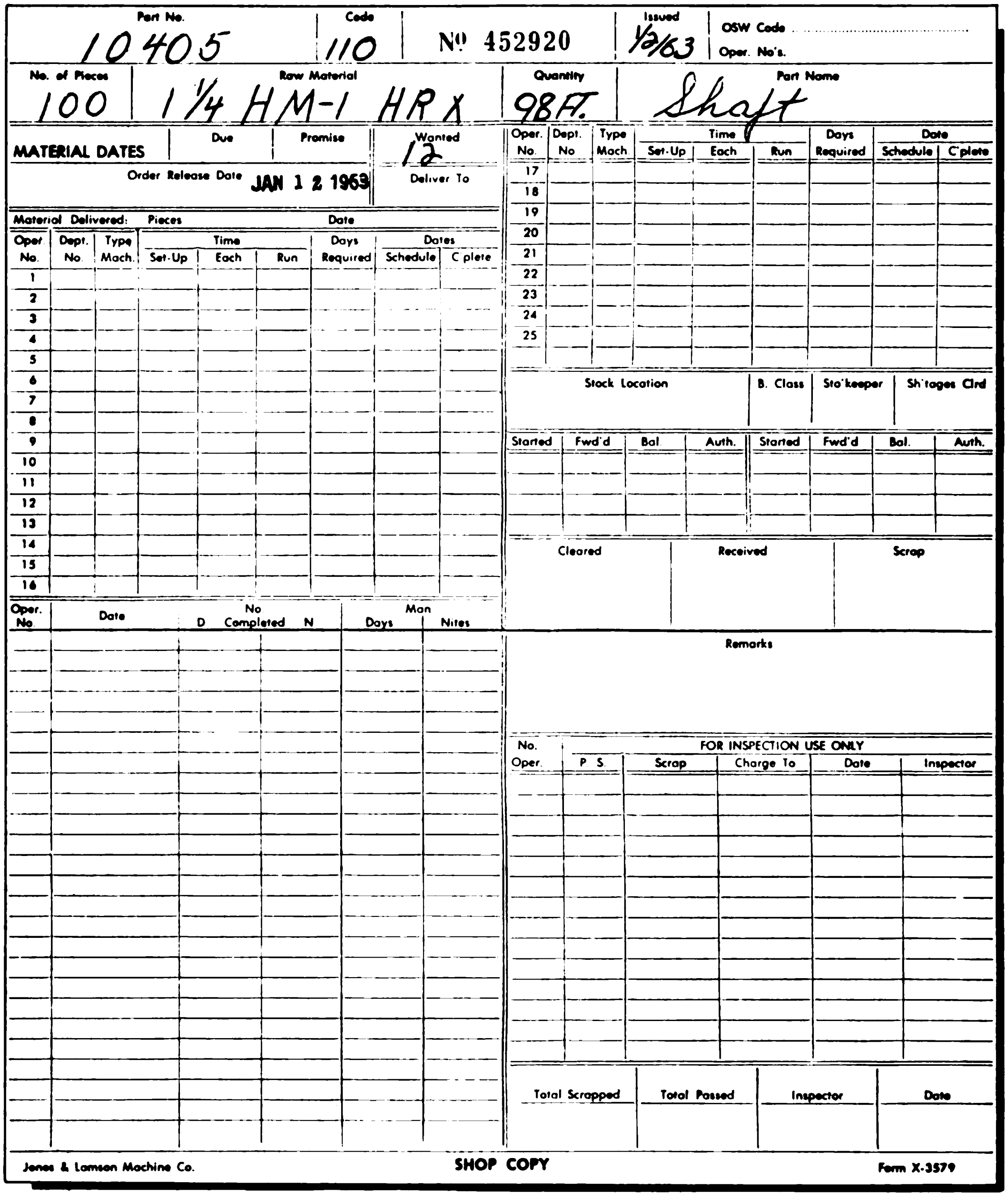
— Jones & Lamson Machine Company

Fig. 71. Control copy of a production order.

the component parts and processes have been scheduled, a master schedule is prepared showing the time required for the entire order and how the various portions of it are to be scheduled.

Schedules are prepared a considerable time in advance of production. The required number of working days is first calculated without reference to the calendar dates which will be involved when the operations are actually undertaken. The actual calendar dates can be supplied when the operations are begun and the current machine loads and shop schedule are known.

If schedules are to be of the greatest use, the various time elements must be carefully determined. Even before other considerations, the time must be provided to do the required planning and control work. The time required to procure materials and have them available is a factor of varying importance. Tooling may have to be planned a relatively long time in advance of production especially if the necessary tools are not on hand or if they are not in proper condition. The time necessary for factory processing becomes complicated in its details for various reasons. A number of parts will be in process at the same time, while some component parts will be made ahead of others and will be in stores before subassembly or assembly is possible. Schedules or charts must be prepared so as to indicate what is to be expected in connection


Part No. 10405 | Code 110 | Nº 452920 | Issued 1/2/63 | OSW Code | Oper. No's.

No. of Pieces 100 | Raw Material 1 1/4 HM-1 HRX | Quantity 98 FT. | Part Name Shaft

MATERIAL DATES | Due | Promise | Wanted 12

Order Release Date JAN 12 1963 | Deliver To

Material Delivered: Pieces | Date

Oper No.	Dept. No.	Type Mach.	Time Set-Up	Time Each	Time Run	Days Required	Dates Schedule	Dates C'plete
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								

Oper. No.	Dept. No	Type Mach	Time Set-Up	Time Each	Time Run	Days Required	Date Schedule	Date C'plete
17								
18								
19								
20								
21								
22								
23								
24								
25								

Stock Location	B. Class	Sto'keeper	Sh'tages Clrd

Started	Fwd'd	Bal	Auth.	Started	Fwd'd	Bal.	Auth.

Cleared	Received	Scrap

Oper. No.	Date	No Completed D	No Completed N	Man Days	Man Nites

Remarks

FOR INSPECTION USE ONLY

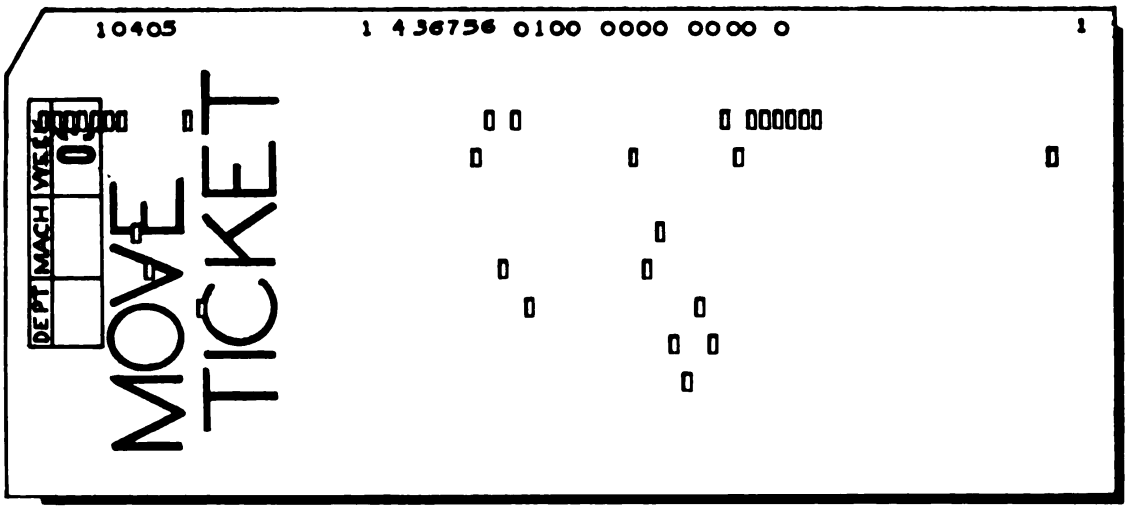
No. Oper.	P S	Scrap	Charge To	Date	Inspector

Total Scrapped	Total Passed	Inspector	Date

Jones & Lamson Machine Co. SHOP COPY Form X-3579

— Jones & Lamson Machine Company

Fig. 72. Shop copy of a production order. Note the place for inspection.



— Jones & Lamson Machine Company

Fig. 73. A move ticket.

with these matters. The time which will be necessary for moving materials from stores, from one station to another, and between departments also has to be accounted for in the schedule. Inspection time must also be provided. Finally, subassembly, final assembly, testing, and shipping times must be added if deliveries are to be made on schedule.

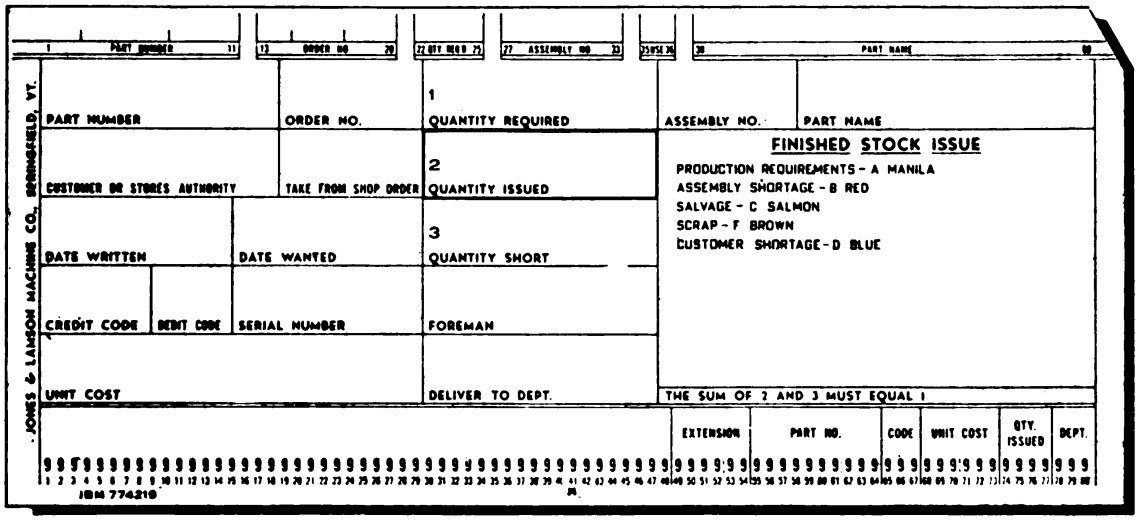
The route sheets for the different parts and assemblies to be made under the production order, together with the necessary job, material, tool, inspection, and move orders, are filed in a route file. When the schedule has been prepared and the actual times have been set for the various operations, the order tickets are filled out and sent to the dispatcher who issues them shortly before the work is to begin.

Figures 71 to 74 illustrate the control copy of a production order, the shop copy, a move ticket, and a material and cost order.

Dispatching. Dispatching is the setting in motion of production activities by releasing the orders which were prepared in advance of

Fig. 74. Material and cost order.

— Jones & Lamson Machine Company



production in accordance with the sequences and times worked out in routing and scheduling. The dispatcher releases work to the shop, directs its movements, and makes reports on its status. He is responsible for keeping the workers and the machines busy within the limits of the work released to the shop. He not only sends out the various orders but also posts to the dispatch board. He works with and is on a par with the foremen. He reports to the chief dispatcher, who reports to the production control manager.

The job order authorizes the worker to undertake the operation it covers. Job orders are filed according to machine class and in the order of dates the jobs are due on the machines. When a job is due the job order is taken from the files and sent to the first machine which becomes idle. All the details but the names and numbers of the workers and the particular machines to be used are included on these orders. The order number, the quantity to produce, and the next operation to which the work is to go are indicated. When instruction cards are issued to the workers, however, the job orders need not contain detailed instructions.

Job orders are stamped by the dispatcher with the time of starting and finishing the job. When the job is finished, the number of pieces and whether or not the lot has been completed are noted on the job order. The times stamped on it and the number of pieces are used for cost-accounting purposes and in calculating the worker's earnings. Finished jobs are checked off on the route sheet by the dispatcher. When a job is finished the next job order is issued to the worker.

The stores requisition is sent by the dispatcher to the stores department. Identification tags, which are attached to the requisition when it is sent to stores, are attached to the different materials issued and they accompany the material through the production process. The necessary move tickets are also sent by the dispatcher to the material handling or movemen. These tickets advise the men who move the material of the location of the material which is to be moved and where it is to be taken.

If inspection is not carried on continuously, inspection orders must be issued. Inspection and move tickets are frequently combined, and sometimes even the job order is combined with the inspection ticket. Other convenient combinations may also be used.

Tool orders are forwarded to the tool crib as authorization for the issue of tools. In instances where workers get the tools with the job order as their authorization, they usually also return the tools themselves. In other instances, however, tools are delivered by the plant transportation system, by truckers or messengers attached to the tool crib, or by similar workers in the using department.

Since the failure of machines or tools, or the lack of materials or men, will seriously interfere with production, notice of any such development

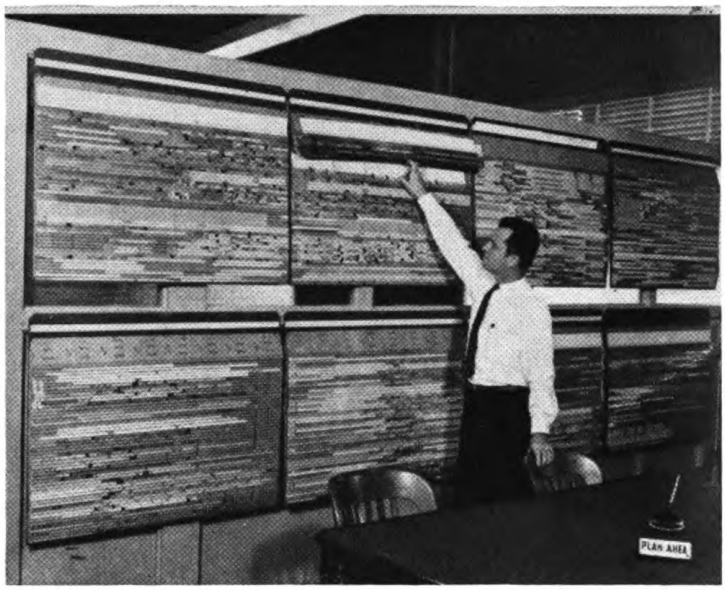


Fig. 75. Control boards in the production control department of a large manufacturing concern.

— Acme Visible Records, Inc.

must be promptly forwarded to those responsible for correcting them. A form is sent to the dispatcher, who in turn sends a copy to the proper place. The maintenance department is advised of machines which have to be repaired. The materials-control department is notified if materials are lacking.

Dispatch stations, which may be located in each department or located one for about every 50 to 100 men, may thus cover the activity under one foreman or several. A dispatch station is a small enclosed office containing a dispatch board or boards, a desk, a time recorder, a telephone, prints, and files. Dispatching boards are used to post job orders and indicate the work in process at the machines and workplaces. They also show the jobs ahead of each machine and workplace. The dispatching board shows all places where work can be performed, the job in process, work at each machine ready to be started, at least one job ahead definitely assigned to each machine, and jobs ahead tentatively assigned. The dispatching board detects shortages of work for machines, whether machines are actually engaged, whether there is a next job for every machine, and whether there is a reserve supply of work. Any lack of work is reported to the production-control department.

The progress and status of the work of all departments are recorded on the production-control department's control boards (Fig. 75). The necessary information is conveyed to it from the central dispatching office or departmental dispatching offices by plant messengers, a pneumatic-tube system, or some other method.

Conclusion. Production planning and control systems vary in detail from one company to another. They are developed to meet particular needs and hence there is a wide variation in the different practices. The discussion in this chapter has been in general terms with little reference

to alternative possibilities. The reason for this is that the different possibilities add complexities which make the explanation difficult to understand. The reader is then often confused when these factors are introduced into a discussion of the subject.

QUESTIONS

1. In general, what does the production-control department do?
2. What is the relationship between production planning and production analysis?
3. What advantages can be derived from the use of electronic data-processing equipment?
4. Briefly describe the elements of production control.
5. Describe what you would consider the economics of data-processing machines.
6. What are the determining factors in routing?
7. Compare and contrast scheduling and dispatching.
8. Describe the important features of dispatching.
9. How would you expect production control to differ in steel production and airlines?
10. Analyze one of the college's competitive team sports to determine whether the elements of production control may be discerned.

CASE: Rafferty Mill

Fred Rafferty, who began to produce men's argyle socks in his garage in a New England village, was sufficiently successful in finding markets that he decided the time had come to expand. He rented a floor over a large garage on the state highway, but with the widening of the highway the garage was to be torn down. Since another suitable location was not available, Rafferty approached a local banker to see whether a loan for constructing a one-story building could be arranged. The financing did not seem feasible for one bank. However, another commercial bank and a savings bank were in the general vicinity and the general sentiment persisted that industry could flourish in the area. The banks therefore agreed to a loan supported by the government's Small Business Administration.

The new cinder-block building which was constructed just off the highway and visible from it was a considerable improvement over the old quarters.

Rafferty had a contract with distributors to supply retail outlets in several California localities. Some of his products were sold in New York markets. He added different lines of socks to his production.

When he was located over the garage, he had already been prepared to sell to the general public in the village, and he now expected to be in a better position to attract customers from among local residents and motorists passing by. When he was located over the garage and filling station, possible customers learned about his interest in direct selling only by word of mouth and customers sometimes walked in and wandered among the machines only to find that no one was there prepared to service them. In the new

building he set off a room with counters and fixtures to the front and had a telephone operator and receptionist who had various miscellaneous clerical duties and was prepared to sell. There was a storeroom for supplies and materials as well as for finished inventory. There was also extra space for possible expansion.

Since he was now employing 18 operators on two types of machines, Rafferty thought an improved production-control system might be desirable. The work was simple and flowed in line sequence. Under the present system he assigns the work to the operators and keeps a card indicating what he has assigned to each and when she has finished. Inspection is done by each operator who puts a small printed piece of paper on each batch that is acceptable.

1. What is the difficulty with the present system?

2. What kind of system do you think he should have?

3. Should some provision be included in the new system for possible future expansion?

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Chapter XI

Setting Job Standards

Job Standardization. In previous chapters the setting of standards for the product, the materials and parts, and the machinery, equipment, and layout were considered in connection with their contribution to the achievement of efficient standard output. The standardizing of labor operations, which has so far not been taken up, will be discussed in this chapter.

It should be noted at the outset that, since these standards are also linked in various ways with wages, our interest in standardizing labor operations goes beyond the necessity for doing so from the production point of view alone. Job standardization not only sets up standardized methods, but also makes it possible to set a fair task for the workers when they are properly taught how to perform the job within the time set. With standardized operations the rate of production and the quality of the output can be maintained. When job standards have been worked out they help to maintain satisfactory labor-management relations by providing a factual basis for settling any controversies which may arise regarding worker output.

Work simplification and methods improvement may be facilitated by the study of the successive operations followed in completing a job. Process charts, which are widely used for this purpose, frequently reveal the possibility of completing the operations on a job much more efficiently.

Need for Time and Motion Study. Before jobs can be standardized satisfactorily, they must be studied to discover the one best way of doing the work. When the best method has been decided on and adopted as the standard method, instruction cards may be prepared for the various jobs and workers can be instructed accordingly.

The two basic matters entering into job standardization are, first, the determination of the most satisfactory motions to be used in doing the job and, second, the determination of the best time for doing it. Since

the time spent on a job is in no small measure dependent on the motions, it is now understood that the best time and the best motions are closely related.

When Taylor first turned his attention to job study, he was interested in determining the standard time necessary for doing a job. Part of his reason for this was his realization that neither he nor anyone else in management actually knew how long jobs should take. Although this was in itself almost sufficient to explain why he did not think of motion study, a further reason why he did not do so was the assumption that, although the men might not try to do the jobs as fast as they could, they did know how to do the jobs with the best motions as a result of their training. It was generally thought that this assumption was especially justified in connection with the work of craftsmen who had served an apprenticeship.

However, that the assumption was unwarranted even with respect to craftsmen was demonstrated by Frank B. Gilbreth's discovery a little later of wasteful methods in bricklaying. Although Gilbreth is generally called the founder of motion study, both he and his wife devoted considerable attention to motion study.[1]

Motion Study. Motion study can become very difficult and complex. But its importance is apparent as soon as attention is called to its contribution to work simplification of jobs which have not been standardized. Once there is a consciousness of the importance of motion, unnecessary and inefficient motions can be readily detected with only a little effort.

The theory of motion study is that there is a limited number of fundamental human motions which must first be discovered and that after these basic motions have been discovered it is possible to determine which ones should be used to perform an operation best. Although the Gilbreths concluded that there are seventeen fundamental motions, other investigators have added several more. Gilbreth called these elementary motions "therbligs," which is Gilbreth spelled backwards, except for the *th* and the *s*, which appears in the plural. The word was coined by Gilbreth in order to have a short word "which will save the motions necessary to write such long descriptions as 'the seventeen categories into which the motion-study elementary subdivisions of a cycle of motions fall.'" Each therblig was given a symbol and color, either or both of which could be used in describing the motion elements of an operation.

The therbligs and their symbols are not always used in practice. They are, in fact, most frequently used in connection with a work-simplification training program, or in the course of a thoroughgoing work-simplification

[1] Frank B. and Lillian Gilbreth, *Motion Study* (New York: D. Van Nostrand Company, Inc., 1911); William R. Spriegel and Clark E. Meyers, eds., *The Writings of the Gilbreths* (Homewood, Ill.: Richard D. Irwin, 1953).

program which is not expected to be continuous. Although the objective is to determine the best ways of moving the parts of the body, these motions cannot be achieved unless the work area is adequate and the workplace is properly arranged. One of the important matters in the arrangements as well as in the study of motion is the question whether both hands must be used, or whether they should be if they are not being used. Motion study is not as widely used as time study, and in some kinds of heavy industry it is not considered particularly worthwhile.

Time Study. The total time of performing operations had been taken for a variety of purposes before Taylor introduced his methods. The distinctive feature of Taylor's contribution is that jobs were to be broken down into their elements, for each of which element a standard time is determined, the total standard time for the job being that obtained by adding the standard times for the elements (together with certain allowances which will be mentioned later). In making a time study, then, the job as a whole must first be accurately and carefully described, after which it must be broken up into its elements. The elements into which a job is separated depend to a considerable extent on the nature of the work. They should not be too short or too long, and they should constitute a distinct step in the operation.

The Stopwatch. Taylor used the stopwatch in making his time studies, and this method is still the most widely used in industry even though some highly developed mechanisms have become available. Several different kinds of stopwatches are available for making time studies, but the best known are the decimal-minute and the decimal-hour stopwatches. The most widely used stopwatch is the decimal-minute watch, from which the time is read in hundredths of a minute. The time read from the decimal-hour watch is in thousandths of an hour. Although the decimal-minute times taken from the decimal-minute watch are the most widely used, there are certain conflicting features in the two types of watches which should be mentioned. Although decimal-minute times are easier to understand and machine times are stated in rates per minute, the payroll and cost-accounting men would prefer decimal-hour times, since wage rates are paid on an hourly basis.

Other Time-Study Devices. In using the stopwatch the observer cannot keep his eyes fixed on the operator and tends to be somewhat diverted by the need for reading the watch and recording the observations. The Marstochron, which has two keys on it, one of which is pressed down to record the beginning of an operation and the other of which is pressed down to record the end of an operation, is a time-study machine which avoids these difficulties. When a key is pressed down a type bar is depressed and makes a mark on the moving tape, the speed of which may be 10 or 20 inches per minute depending on the motor drive used. When

the tape moves at the rate of 10 inches per minute 1 inch of the tape represents ⅒ of a minute and ⅒ of an inch represents .01 of a minute.

Professor Barnes developed a kymograph through which a rapidly moving motor-driven tape is run to measure time to ⅒₀₀₀ of a second. Continuous lines are drawn on the tape by pens which, when they are electrically actuated, move crosswise and make short joggy lines perpendicular to the continuous lines. The distances between the jogs represent times.

The wink counter, which was developed by David B. Porter to obtain greater accuracy than the stopwatch by recording shorter elements, has three revolving disks with numerals from which the time can be read to .005 minutes.

Micromotion Study. Where the elements are short and the motions almost too quick to be carefully observed with a view toward simplifying them, the motion-picture camera can be used. Gilbreth used the motion-picture camera to determine time values by placing a special clock or microchronometer in the field of vision and getting the therblig times from an analysis of the film. An electrically driven constant-speed camera is sometimes used for the purpose of determining the time and studying the motions. If the speed of such a camera is stepped up to 1000 frames per minute, each frame represents a thousandth of a minute. After the film has been exposed, it can be run off as many times as seems desirable in order to study the operations, some of which are so fast that they would not otherwise be noticed, and permit the detection of waste motions which it might be possible to correct. It is also possible that observation of the film may suggest that the equipment could be improved.

The study of the motions in an operation and the time necessary for each is called micromotion study. When it is considered desirable to record the therbligs for both hands and the time consumed on them a simultaneous time and motion chart, called a simo chart, is used. Although the simo chart may be used for training purposes, these charts as well as the devices discussed in the preceding section are not used very much in practice. Not only is the stopwatch most widely used, but it is sufficiently satisfactory for most purposes.

Reading the Time From the Stopwatch. There are two ways in which to take and record time by using the stopwatch. In the first, which is called "snap-back timing," the watch is read and the time is recorded at the end of each element, after which it is snapped back to get the time of the next element. Although some of the clerical computations required under the continuous method of timing are avoided by snap-back timing, readings may be less accurate because the watch has to be snapped back

at the same moment that time is being recorded, even though the work being timed continues in the meantime.

Under the continuous method the times of all elements are recorded in sequence without stopping the watch throughout the entire study. All elapsed time is accounted for either as the time necessary for the elements or for delays of one kind or another. The cumulative readings are recorded from the watch as the work proceeds and the time for each element is determined later by subtracting the previous reading from the present cumulative figure. When the continuous method is used the forms provide a line or column marked *R* in which the reading at each observation is entered and when the time for each element is calculated later it is entered in the line or column marked *T* for entering the time for each element.

Observation Sheet. In making a time study the times are recorded on an observation sheet attached to a board on which the stopwatch is also attached. This equipment plus the pencil is all that is necessary to make time studies. An observation sheet is prepared for repetitive operations, the cycle of each of which takes a relatively short time. Observation sheets are also prepared for nonrepetitive operations requiring a whole day or longer and which might be special orders not expected to be repeated for some time.

The accompanying illustration (Fig. 76) of a time-study sheet shows how the standard time for a repetitive job is arrived at. It will be noted that time-study sheets call for extensive information regarding the job, the operator, the time-study man, and often for a sketch of the operation.

The job timed on the illustration has 6 elements. The decimal-minute watch was run continuously through 10 operations, that is, while the job was performed 10 times. All times are hundredths of a minute. The total elapsed time at the completion of each element was entered on the lines marked *R*. When the observations were completed, the time-study man entered the times for each element on the lines marked *T*. The observed time for an element is determined by subtracting the total elapsed time at the end of the preceding element from the total at the end of the element for which the time is being recorded.

In the following paragraphs additional references will be made to the illustration, in order to show how the standard time was arrived at.

Getting the Average Time. The distinguishing characteristic of the repetitive time study is that the observations are taken for a number of complete cycles of the operation. In practice the number of cycles timed varies although a frequent rule is that at least ten should be taken as in the illustration. The objective should be to time a sufficient number of cycles to permit getting a figure representative on the average for any

File No. 3-S-3-8-1
Study # 47
Sheet 1 of 1
Equipment Singer 108 W,

TIME STUDY OBSERVATION SHEET

Dept. Assembly

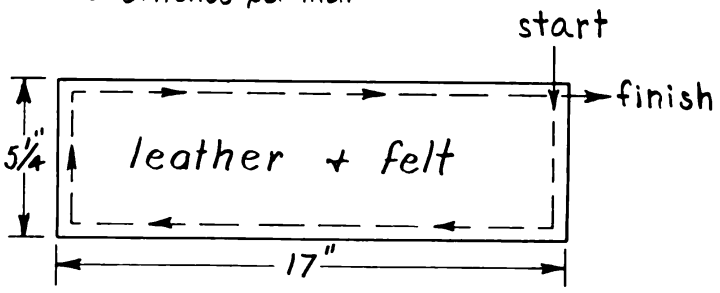
Operation	Part Name & No.
Assemble + Sew felt to Outside	2354 - Cover
Material Grade	**Dimensions**
Leather + Felt	$5\frac{1}{4}$" x 17"

Date	Observer	Time Start	Time Stop	Elapsed Time
9-28-62	S.M.C.	10.26 A.M.	10.285 A.M.	2.5 M.n.

Employee	Clock No.
P. Miller	159

Elem. No.	Element Description		Time Observations 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total T	No. Value Used	Average (Selec.) T	Level. Factor	Elem. Base Time
1	Pick up leather + felt +	T	5	3	3	3	3	3	4	3	3	3					.33	10	.033	100%	.033
	assemble + pos. under foot	R	5	30	56	79	104	133	159	186	206	225									
2	Sew 1" + break off	T	3	3	2	3	5	2	3	3	3	2					.24	9	.026	80%	.021
	preceding cover	R	8	33	58	82	109	135	162	189	207	227									
3	Sew 4¼"	T	2	2	2	2	2	3	3	3	2	8					.21	9	.023	90%	.021
		R	10	35	60	84	111	138	165	186	209	238									
4	90° turn + sew 17"	T	7	7	6	7	8	7	8	6	7	7					.62	9	.066	90%	.061
		R	17	42	66	91	119	145	168	192	216	245									
5	90° turn + sew 5¼"	T	3	4	3	3	3	3	3	3	3	3					.31	10	.031	90%	.028
		R	20	46	69	94	122	148	171	195	219	248									
6	90° turn + sew 17"	T	7	7	7	7	8	7	6	6	8	6					.61	9	.068	90%	.061
		R	27	53	76	101	130	155	177	201	227	256									
7		T																			
		R																			
8		T																			
		R																			
9		T																			
		R																			
10		T																			
		R																			

8 Stitches per inch



Total Base T.	.225
Allowance Factor 20%	.045
Standard Time	.270
Standard Units per Hr.	222.1
$ Hourly Base Rate	1.00
Straight Piece Rate ¢	.0045

Fig. 76. Time study of a sewing operation.

cycle. An average time must be found for each element. Before getting the average for an element any abnormal times which have been recorded for the element should be eliminated, although on short-cycle jobs the effect of doing so is insignificant to the resulting average, while, on the other hand, it is felt by some authorities that on longer jobs such times should be properly included because they reflect actual conditions likely to be encountered whenever the job is done. In the illustration abnormal times for elements 2, 3, 4, and 6 were eliminated.

The two commonly used averages are the arithmetic average and the mode. The arithmetic average, which is the one with which everyone is familiar, is arrived at by adding the observed times (remaining after any abnormal times are thrown out, if they are) and dividing the total by the number of observations. The mode, which is the most frequently found time, is not so widely used in time study as the arithmetic average.

In the illustration the average time is the arithmetic average. The average time for each element as shown in the third column from the right is arrived at as follows. The total time for each of the six elements was entered in the column entitled *Total T*. The items in that column were then divided by the number of values used, as shown in the next column. The average time thus calculated is shown in the next column.

Leveling Factor. In the course of making a time study the time-study man observes the worker's speed, effort, and consistency of movements and on the basis of his judgment he rates the worker as a percentage of average. This percentage, which is called the leveling or rating factor, is applied to the time recorded in order to level the time to average. If an operator is rated 80 per cent efficient and the time study reveals his time for a job to be 3 minutes then the average time for doing the job should be 2.4 minutes ($3 \times .80 = 2.4$). If the operator is rated 120 per cent efficient, the average time should be 3.6 minutes (3×1.20).

The leveling factor would have to be applied regardless of the kind of worker timed, unless he were entirely average and representative of the group in all ways. Although time-study men would for various reasons prefer to time first-class operators since their speed is steady, their motions are consistent, and they use the best methods, the time of such workers would be too low for the average workers to whom the standards are to be applied.

In the illustration, a leveling factor as shown in the next to the last column was applied to each element. The application of these leveling factors to the average times gives the element base times shown in the last column. These element base times are added to get the total base time of .225 minutes as shown below.

Allowances. Several allowances must be provided for in order to get the standard time. In some jobs the setting up of the machine must be

allowed for unless it is considered a separate operation. If the operator is idle when the machine is being prepared, however, he should be given the allowance since the idle time is chargeable to other causes. There may also be other machine delays of various sorts which should be allowed as being no fault of the operator. Material handling and supervision time may have to be taken into consideration; and an allowance must also be provided for personal needs, rest periods, and fatigue. These allowances may be stated as percentages of the base time. The total percentage is applied to the base time to get the allowance time, which is then added to the base time in order to get the standard time.

In the illustration the allowance factor is 20 per cent. That percentage of the total base time of .225 minutes gives .045 minutes, which is added to the base time to get the standard time, or .270 minutes.

Instruction Card. When a job has been standardized, it may be described on an instruction card, which also carries an explanation of the methods and procedures to be used in doing the work and shows the time for the various elements as well as the total time. An instruction card not only helps the worker to make the standard, but it also helps supervisors to check up on the work. When the standard rate of pay is entered on the instruction card, it is stated as a guarantee that the rate will not be changed unless there is a major change in the equipment and operations, in which event the standard instructions would be changed anyway.

Fatigue. Although reference has already been made to allowances for fatigue and rest periods, a few words of explanation are desirable. Although the role of fatigue was not recognized under earlier conditions, when it was common to try to keep men as busy as possible all through the day, fatigue has for some years now been recognized as a phenomenon for investigation and study in relationship to production. Fatigue results from a variety of factors, including the nature of the job, heavy work which cannot be done constantly throughout the day, and repetitive monotonous work. Work requiring little physical effort but a good deal of mental concentration and effort causes fatigue. The conditions of work, including hot stuffy conditions, poor lighting, and other poor working conditions, cause fatigue. The nervous demands of the job arising from the attitude of foremen, inferior quality of materials, poorly functioning machines, and noise contribute to fatigue. Although considerable improvement has been made with respect to the conditions of work, improvements are sometimes difficult to make since certain kinds of work cannot be changed materially. Nevertheless, since it is now understood that periodic rest periods overcome fatigue and as a result actually contribute to an increase in the output, such rest periods are widely provided.

Use of Rating Table for Leveling. Since a good deal of qualitative

judgment is obviously required of the time-study men in rating the worker, it is thought by some authorities that there would be less room for the time-study man to exercise his imagination if he were required to determine the leveling factor by reference to a table and thus achieve greater objectivity.

The following performance rating table makes the leveling factor depend on skill, effort, working conditions, and the consistency with which the operator works.[2]

Performance Rating Table

Skill			Effort		
+0.15	A 1	Superskill	+0.13	A 1	Killing
+0.13	A 2		+0.12	A 2	
+0.11	B 1	Excellent	+0.10	B 1	Excellent
+0.08	B 2		+0.08	B 2	
+0.06	C 1	Good	+0.05	C 1	Good
+0.03	C 2		+0.02	C 2	
0.00	D	Average	0.00	D	Average
—0.05	E 1	Fair	—0.04	E 1	Fair
—0.10	E 2		—0.08	E 2	
—0.16	F 1	Poor	—0.12	F 1	Poor
—0.22	F 2		—0.17	F 2	

Conditions			Consistency		
+0.06	A	Ideal	+0.04	A	Perfect
+0.04	B	Excellent	+0.03	B	Excellent
+0.02	C	Good	+0.01	C	Good
0.00	D	Average	0.00	D	Average
—0.03	E	Fair	—0.02	E	Fair
—0.07	F	Poor	—0.04	F	Poor

A table such as this may be printed on the lower right-hand corner of the observation sheet, with the decimal equivalents omitted. While the observer is making the time recordings he checks his estimate of the four factors on the table. If he checks skill as B 2, effort as C 2, conditions C, and consistency as E, the leveling factor is the sum of the decimal values for these letters plus unity or $+.08 +.02 +.02 -.02 +1 = 1.10$ or 110 per cent of average. Although the worker is in this particular case above average, he would be average or 100 per cent if the sum of these values were 1, and he would be below average if it were less than 1, or less than 100 per cent. The observed time is multiplied by the leveling

[2] Stewart M. Lowry, Harold B. Maynard, G. J. Stegemerten, *Time and Motion Study* (New York: McGraw-Hill Book Company, Inc., 1940), p. 233.

factor. To this there must also be added the time for various allowances as already indicated.

Continuing Observations. The time-study departments of companies in many types of industries are for several reasons steadily occupied with new and additional studies. Changes in procedures are made from time to time, new workers may be more or less productive than previous ones, delays and stoppages of various sorts have different effects, and the operations are necessarily changed from time to time. Changes in the combination of specifications for jobs on turret lathes, for example, will result in significant differences in the time required. Especially when important changes are being made, frequent time studies are necessary to reveal any possible increases in output which might be achieved but for which one or more workers might not be striving. Conversely, under an incentive wage system workers themselves frequently request that a job be timed when they believe the task time is too high.

Under certain circumstances, it is necessary to time several workers. When a new style is being introduced at the beginning of a production season, as in the garment industry, for example, it is essential to determine the standard time in relation to the wage rate to be set under the wage-incentive system. Although a particular worker being timed may purposely take too long for one or more of the elements, it is unlikely that several workers will do so for the same elements. If several workers are timed, a comparative study can be made of the average times for the elements, and analysis and investigation will reveal any unnecessary deviations and make it possible to determine the proper time.

Synthetic Time Studies. In synthetic time studies, which were implicit in some of Taylor's objectives, the idea is that by keeping comprehensive files of time-study data, it may be possible to arrive at element times which can be used in estimating the time which would be required to perform any new jobs when their elements have been determined but before actually undertaking the jobs. This procedure, which is called the standard data method or the making of synthetic times studies, requires that a comprehensive list of well-defined elements be first worked out and that the standard time be determined for each. The best way to get this is to take the average of each element as it was determined in a considerable number of past time studies. The importance of basing standard element data on a great many past observations cannot be overemphasized. Careful study of these observations is essential before deciding on the standard element times.

When standard element times have been determined they can be combined in any way necessary for a new job. When the data are adequate to justify making synthetic time studies, the time and therefore the cost of a new job can be accurately estimated in advance.

Predetermined Times. In recent years several systems of predetermined times have become available to industry. Of these, Methods-Time Measurement, which is usually referred to as MTM, is the most publicized, best known, and probably most widely used.[3] The application of this method requires considerable shop experience and special training with it. The following comments are therefore meant primarily as an introductory description. Predetermined motion times have been carefully worked out for ten basic motions, each of which is broken down according to the type of work on which it is employed. These motion times are stated in what are called Time Measurement Units, or TMU's. One TMU equals .00001 hour, or .0006 minute, or .036 second.

The origin of the TMU is as follows. The original research was done

[3] Harold B. Maynard, G. J. Stegemerten, and John L. Schwab, *Methods-Time Measurement* (New York: McGraw-Hill Book Company, Inc., 1948).

Fig. 77. Methods-Time measurement.

— Maynard Research Council

TABLE I—REACH—R

Distance Moved Inches	Time TMU A	B	C or D	E	Hand In Motion A	B
¾ or less	2.0	2.0	2.0	2.0	1.6	1.6
1	2.5	2.5	3.6	2.4	2.3	2.3
2	4.0	4.0	5.9	3.8	3.5	2.7
3	5.3	5.3	7.3	5.3	4.5	3.6
4	6.1	6.4	8.4	6.8	4.9	4.3
5	6.5	7.8	9.4	7.4	5.3	5.0
6	7.0	8.6	10.1	8.0	5.7	5.7
7	7.4	9.3	10.8	8.7	6.1	6.5
8	7.9	10.1	11.5	9.3	6.5	7.2
9	8.3	10.8	12.2	9.9	6.9	7.9
10	8.7	11.5	12.9	10.5	7.3	8.6
12	9.6	12.9	14.2	11.8	8.1	10.1
14	10.5	14.4	15.6	13.0	8.9	11.5
16	11.4	15.8	17.0	14.2	9.7	12.9
18	12.3	17.2	18.4	15.5	10.5	14.4
20	13.1	18.6	19.8	16.7	11.3	15.8
22	14.0	20.1	21.2	18.0	12.1	17.3
24	14.9	21.5	22.5	19.2	12.9	18.8
26	15.8	22.9	23.9	20.4	13.7	20.2
28	16.7	24.4	25.3	21.7	14.5	21.7
30	17.5	25.8	26.7	22.9	15.3	23.2

CASE AND DESCRIPTION

A Reach to object in fixed location, or to object in other hand or on which other hand rests.

B Reach to single object in location which may vary slightly from cycle to cycle.

C Reach to object jumbled with other objects in a group so that search and select occur.

D Reach to a very small object or where accurate grasp is required.

E Reach to indefinite location to get hand in position for body balance or next motion or out of way.

TABLE II—MOVE—M

Distance Moved Inches	Time TMU A	B	C	Hand In Motion B	Wt. Allowance Wt. (lb.) Up to	Factor	Constant TMU
¾ or less	2.0	2.0	2.0	1.7	2.5	1.00	0
1	2.5	2.9	3.4	2.3			
2	3.6	4.6	5.2	2.9	7.5	1.06	2.2
3	4.9	5.7	6.7	3.6			
4	6.1	6.9	8.0	4.3	12.5	1.11	3.9
5	7.3	8.0	9.2	5.0			
6	8.1	8.9	10.3	5.7	17.5	1.17	5.6
7	8.9	9.7	11.1	6.5			
8	9.7	10.6	11.8	7.2	22.5	1.22	7.4
9	10.5	11.5	12.7	7.9			
10	11.3	12.2	13.5	8.6	27.5	1.28	9.1
12	12.9	13.4	15.2	10.0			
14	14.4	14.6	16.9	11.4	32.5	1.33	10.8
16	16.0	15.8	18.7	12.8			
18	17.6	17.0	20.4	14.2	37.5	1.39	12.5
20	19.2	18.2	22.1	15.6			
22	20.8	19.4	23.8	17.0	42.5	1.44	14.3
24	22.4	20.6	25.5	18.4			
26	24.0	21.8	27.3	19.8	47.5	1.50	16.0
28	25.5	23.1	29.0	21.2			
30	27.1	24.3	30.7	22.7			

CASE AND DESCRIPTION

A Move object to other hand or against stop.

B Move object to approximate or indefinite location.

C Move object to exact location.

TABLE III—TURN AND APPLY PRESSURE—T AND AP

Weight	Time TMU for Degrees Turned 30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
Small— 0 to 2 Pounds	2.8	3.5	4.1	4.8	5.4	6.1	6.8	7.4	8.1	8.7	9.4
Medium—2.1 to 10 Pounds	4.4	5.5	6.5	7.5	8.5	9.6	10.6	11.6	12.7	13.7	14.8
Large— 10.1 to 35 Pounds	8.4	10.5	12.3	14.4	16.2	18.3	20.4	22.2	24.3	26.1	28.2

APPLY PRESSURE CASE 1—16.2 TMU. APPLY PRESSURE CASE 2—10.6 TMU

TABLE IV—GRASP—G

Case	Time TMU	DESCRIPTION
1A	2.0	Pick Up Grasp—Small, medium or large object by itself, easily grasped.
1B	3.5	Very small object or object lying close against a flat surface.
1C1	7.3	Interference with grasp on bottom and one side of nearly cylindrical object. Diameter larger than ½".
1C2	8.7	Interference with grasp on bottom and one side of nearly cylindrical object. Diameter ¼" to ½".
1C3	10.8	Interference with grasp on bottom and one side of nearly cylindrical object. Diameter less than ¼".
2	5.6	Regrasp.
3	5.6	Transfer Grasp.
4A	7.3	Object jumbled with other objects so search and select occur. Larger than 1" x 1" x 1".
4B	9.1	Object jumbled with other objects so search and select occur. ¼" x ¼" x ⅛" to 1" x 1" x 1".
4C	12.9	Object jumbled with other objects so search and select occur. Smaller than ¼" x ¼" x ⅛".
5	0	Contact, sliding or hook grasp.

TABLE V—POSITION*—P

CLASS OF FIT		Symmetry	Easy To Handle	Difficult To Handle
1—Loose	No pressure required	S	5.6	11.2
		SS	9.1	14.7
		NS	10.4	16.0
2—Close	Light pressure required	S	16.2	21.8
		SS	19.7	25.3
		NS	21.0	26.6
3—Exact	Heavy pressure required.	S	43.0	48.6
		SS	46.5	52.1
		NS	47.8	53.4

*Distance moved to engage—1" or less.

TABLE VI—RELEASE—RL

Case	Time TMU	DESCRIPTION
1	2.0	Normal release performed by opening fingers as independent motion.
2	0	Contact Release.

TABLE VII—DISENGAGE—D

CLASS OF FIT	Easy to Handle	Difficult to Handle
1—Loose—Very slight effort, blends with subsequent move.	4.0	5.7
2—Close — Normal effort, slight recoil.	7.5	11.8
3—Tight — Considerable effort, hand recoils markedly.	22.9	34.7

TABLE VIII—EYE TRAVEL TIME AND EYE FOCUS—ET AND EF

Eye Travel Time = $15.2 \times \frac{T}{D}$ TMU, with a maximum value of 20 TMU.

where T = the distance between points from and to which the eye travels.
D = the perpendicular distance from the eye to the line of travel T.

Eye Focus Time = 7.3 TMU.

by film and in units of time which were called frames. A frame was 1/16 of a second since it was the time that elapsed between one frame and the next frame with the camera running at 16 frames a second. This was a convenient unit used during the original research but when it came to describing the procedure more formally it was recognized that a "frame" was a picture in a motion-picture film and not a unit of time. Since it was awkward to try to express 1/16 second in decimals, it was decided to go to 1/100,000 of an hour as the time unit and to call it a TMU. It was then a simple matter to convert all time values expressed in frames into TMU's and, once this was done, TMU's were used thereafter as a convenient unit of time. Although the research began with film analysis, the TMU was later determined by an electronic device which performs time measurements more accurately. MTM eliminates the personal judgment involved in leveling or rating since the time value for any motion is always assigned by reference to the predetermined motion times printed on two sides of a card entitled "Methods-Time Measurement Application Data in TMU." The following statement appears on the face of this card: "Do not attempt to use this chart or apply Methods-Time Measurement in any way unless you understand the proper application of the data. This statement is included as a word of caution to prevent difficulties resulting from misapplication of the data." Figure 77 is a reproduction of part of the card showing the standard data for eight of the motions.

Attitude of Workers to Time Studies. Many workers were for a long time generally opposed to time studies. They feared that a time study was the forerunner of the speedup and that management wanted to set standard time only to drive them harder. Unions were especially opposed to time and motion studies. As a matter of fact, such opposition was not wholly unjustified since secrecy regarding time studies was the rule in the past and the idea of leveling time and of adding allowances was not prevalent. Moreover, many managers and methods men had no intelligent understanding of human relations. Sometimes young and inexperienced college graduates making time studies had, or appeared to the workers to have had, a superior attitude toward the workers, who became resentful as a result, especially if they were older and skilled or had considerable experience.

At the present time, however, there is widespread agreement on the need for time and motion studies. The first recognition of the value of time studies on the part of a union was the acceptance of them several decades ago by the International Ladies' Garment Workers Union. In more recent years other unions have agreed to the principle, and a number of unions have time-study men of their own to participate in time studies by checking them. Since the standards are now publicized, they are

known not only by the management but also by the workers as well as the union.

Training Program. When time and motion studies are first being introduced, it is necessary to stimulate an interest in them on the part of foremen and workers. Since foremen are likely to feel that present methods are perfectly satisfactory, and do not desire too much disturbance of established routines, they have sometimes been more hostile to methods analysis and time study than the workers. In such cases the effect of their attitude on the workers themselves is damaging to morale since workers themselves are already likely to be suspicious that layoffs will follow. For these reasons it is desirable to institute a training program in which the workers may or may not be included. The training program may be more or less formal or somewhat informal by means of conferences. Although such programs may consist of something like ten to fifteen two-hour sessions held possibly a week apart, the meetings are sometimes held consecutively. In the course of such a training program, the object of the work-simplification plan, the methods to be followed, and the advantages are explained. Although enlightened management would admit that some workers will be laid off unless the volume of sales increases, this is obviously an awkward matter which may often be avoided.

The Time-Study Man. The time and motion man should have a sufficient general knowledge of the work to be able to analyze it adequately and to proceed intelligently in his observations. For some time studies, men from outside the organization are considered unsatisfactory because they do not know enough about the work. In such cases, men who have done the work being timed are advanced from within the organization to time-study jobs. Figure 78 shows a multiple stopwatch holder board and a time-study trainer.

In addition to his technical knowledge, the time-study man must have some capacity for satisfactory human relations in order to get the coopera-

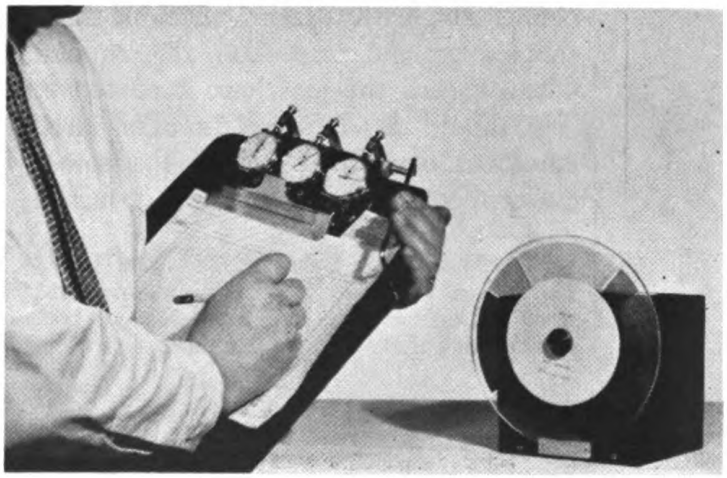


Fig. 78. Multiple holder board (left) and Time-Study Trainer (right).

— Meylan Stopwatch Corporation

tion of the workers and the foreman. This is particularly necessary when time studies are being made for the first time, since the time-study man needs cooperation in order to be able to learn some of the pertinent factors about the shop which he might otherwise not notice. Moreover, if he does not have the confidence of the worker, the worker will not perform his job in the customary manner, not necessarily intentionally, but possibly simply because he is ill at ease. The attitude of superiority sometimes witnessed in the past is now generally recognized as being fatal to success.

It may be worth adding that, since the proper attitude and procedures are still not entirely universal, it is not desirable to put implicit faith in methods men without careful inquiry into their background and experience. Foremen and workers resent intrusions by individuals in whom they do not have confidence; and it is such factors as immaturity, inexperience, and a certain lack of common sense which lead to a lack of confidence and an unwillingness to cooperate.

Job Enlargement. Job enlargement, which is opposed to job specialization, consists of encouraging the worker to add skills and responsibilities to minimum skills by absorbing other specialized tasks, such as cutting his own tools and inspection, which are performed by others. Such expansion of job content increases the worker's freedom of pace, his responsibility for checking quality, and his discretion in the methods he uses. The introduction of interest, variety, and responsibility not hitherto present may enrich jobs from the workers' point of view. Where it is feasible, job enlargement is therefore likely to improve morale by developing a pride in craftsmanship and an acceptance of training and placement by the foremen and workers. By planning responsibility for quality with the workers, better quality may result, together with a reduction in losses from rejects and scrap. If the workers can set up and check the machines themselves instead of having to call in setup men, there may be less idle time for both machines and operators.[4]

Job enlargement is not feasible in assembly-line operations, where a moving conveyer arbitrarily limits the work. It is, however, possible in connection with various machine-shop operations where setups, tool sharpening, and inspection are required. It may also be applicable in office work if the jobs have been too finely specialized.

It should also be kept in mind that the ability of some individuals employed on certain tasks is inadequate for the encouragement of job enlargement. The problem may in fact be somewhat similar to that some-

[4] Cf. Maurice D. Kilbridge, "Reduced Costs Through Job Enlargement: A Case," *The Journal of Business*, Vol. 33 (October, 1960), pp. 357–361. This case, which is based on cost savings only, suggests that job enlargement can be more efficient than job specialization if the latter is carried too far.

times encountered in connection with a promotion from within policy. Those employed in the first instance for some types of menial work may not have the capacity for growth and promotion. The basic problem is that, if they did, they might not have accepted their jobs in the first place.

Conclusion. Simplification and standardization of jobs have long been an established aspect of methods work. Although methods improvement is still regarded as an integral part of industrial management, increasing emphasis has been placed on the possibilities of job enlargement. The emphasis on human relations and the improved educational level of workers have both contributed to this tendency toward a change.

QUESTIONS

1. What is the relationship between motion and time study?
2. What is the theory of motion study?
3. Define (a) therblig, (b) micromotion study, (c) wink counter.
4. What is the value of an instruction card?
5. How is a rating table useful in time study?
6. What kind of training program should be considered before undertaking a program of setting job standards? Should the workers be included or should they be given a separate and different program?
7. How might synthetic times be derived?
8. What possible advantages can be achieved through predetermined time studies?
9. What qualifications should the time-study man have?
10. Observe the motions involved in the work in a restaurant, cafeteria, home, or other establishment to determine whether you could suggest any improvements.

CASE: Milling Machine

The following are six continuous readings in hundredths of minutes for a milling machine operation:

Pick up piece, place in fixture, and tighten.	4	47	92	34	80	25
Table in, throw feed lever.	15	59	302	46	93	37
Mill bottom.	130	276	418	563	711	854
Release feed, table out.	36	84	25	71	17	62
Loosen and remove piece.	40	87	30	75	21	67

The operator is 110 per cent of average.

The allowances are 15 per cent fatigue, 10 per cent personal, and 10 per cent miscellaneous.

Calculate the standard time.

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Chapter XII

Inspecting the Product

Evolution of Inspection as an Independent Function. Inspection of various sorts was formerly part of the regular work of foremen and workers. Although they still do a certain amount of inspection, inspection has come to be recognized as an independent function. The idea of a separation of this function arose with Taylor's functional foremen, one of whom was made responsible at the shop level for inspection. This was the beginning of the modern inspection department. With the passage of time and the increasing size and complexity of plants and production processes, inspection came to be recognized as consisting of more than checking on the parts and the products made to see that they conform to the standards since it is also essential to inspect incoming materials as well as the machines, the tools, and the equipment.

Because of the variety of the different types of inspection, the subject might be dealt with in various places. On the other hand, there is also a tendency for inspection to be considered under the general heading of quality control, and therefore to be closely associated with production control. The subject is dealt with in this book after production control, however, because one ordinarily thinks first of production and then of inspection.

Inspection Standards. Manufacturing standards which appear in written specifications, instructions on design drawings, or in models of the product are set up when the standard design of the product is decided on. The specifications represent the quality requirements of the product as an accepted policy of the firm and it is on the basis of these standards that inspection standards are worked out. The standards indicate the quality requirements which must be met by incoming materials, work in process, and finished products. Although inspection for quality, which involves such features as physical and chemical properties, shape, size, strength, and color, is a form of control, the inspection of machines,

equipment, and tools is also essential to maintain quality and must be provided for.

It is essential to establish the inspection standards with a certain amount of permissible flexibility. Since the highest precision is not only unnecessary but also frequently impossible to achieve, tolerances are specified. A tolerance is the total of the allowable amounts plus and minus the specified quality standard. It is the range between the upper and lower acceptable limits. Although exact precision is not necessary and tolerances are permitted, it is always necessary to see to it that the tolerances do not become the standard.

Inspection Reports. Although inspection by itself exercises a form of control, the extent and usefulness of this control is increased by the practice of preparing inspection reports. Such reports on incoming materials serve as a check on vendors, while those made out in the course of the production process make it possible to locate sources of trouble and to remove them. By showing the number of rejections and the number of satisfactorily made parts, these reports make it possible to determine the causes of difficulty and the reasons for them.

Inspection Department. Authority and responsibility for all inspection is placed in the inspection department, a functional staff department properly located under the superintendent or the works manager and at least coequal with production foremen. Although it may be regarded as a staff department, the inspection department is itself organized on a line basis. The chief inspector, who is responsible for organizing the department, must have fairly wide experience. An assistant chief inspector may assist him in his general duties and also have charge of some of the routines involving the most careful inspection. For tool inspection and certain other specialized inspection, experts may be necessary. A supervisor of inspection gauges buys, designs, and may build them, and he also teaches men how to use them. The foremen inspectors, each of whom is in charge of inspection of a particular kind, may be under a general foreman inspector. The inspectors themselves may be directly under the foremen inspectors or under assistant foremen.

The number and ability of inspectors depend on the nature of the work. In assembly-line work of some kinds, one or more inspectors may be stationed at the end of the line. When several inspectors are so placed, each has a special inspection task. Some assembly work requires, however, that inspectors be placed at various points along the line. Since the actual location of some aspects of inspection may vary somewhat depending on such factors as the nature of the production process, the product, and the amount and type of inspection which is necessary, it may be distributed over more than one department.

Although rejected lots and defective work can occasionally be re-

worked, sometimes they must be sold as seconds or disposed of as scrap. The inspection department may be given the task of handling scrap disposal on the theory that such an arrangement will prevent defective work from being put back into production even though it is undesirable to do so. The purchasing department may, however, be responsible for scrap disposal.

Materials Inspection. Incoming raw materials may be checked as to quality in a number of ways. Although laboratory tests of physical and chemical properties may be made by the buyer, commercial inspection services are available to do the work at the vendor's plant for a nominal charge. Sometimes work in process is inspected at the vendor's plant, although some vendors sell materials on a quality guaranteed basis.

There is no complete agreement as to who should be responsible for the inspection of incoming materials. It is believed by some authorities that the purchasing department should be responsible, but against this view others maintain that the purchasing department should have nothing to do with such matters because it placed the order and should be subject to some check through inspection of the materials. Others believe that the stores department should be responsible for this task, but the feasibility of such an arrangement might depend in particular instances on the type of workers in that department as compared with the requirements of competent inspectors. The same considerations apply in even larger measure to the receiving department, which is suggested by some as the place where inspection of incoming materials should take place.

The cost of rejected materials is allocated in various ways between the buyer and seller. The particular arrangements depend on the kind of material, trade customs, the buyer's cost-accounting methods, and an analysis of the essential elements of a given situation.

Inspection of the Quality of Output. In a production process in which the emphasis is on quantity, some provision must be made to see to it that the quantity of output continues to meet the standards of quality determined upon. In the process of production the quality does not maintain itself, partly because of the stress on quantity, partly because raw materials may be affected by the weather, and partly because the machines may not continue to maintain standards. It is, of course, particularly necessary that the interchangeable parts conform to standards so that any one of the pieces can be used in the assembly, which would be impossible unless the various parts were made to fit.

From what has already been said about the interest of the manufacturing department in quantity in contrast with that of the inspection department in quality, it is clear that this is the reason why the inspection department should not be under the jurisdiction of line executives interested mainly in quantity production. In instances where quality is

Fig. 81. Testing the chemical purity of raw materials used in making adhesives.

— Johnson & Johnson

of secondary importance it may be decided to locate inspection directly under production foremen or the superintendent. In process industries, inspection is often necessarily a laboratory problem, and therefore not so closely related to shop matters.

Place of Inspection. Inspection of work in process may be done at the place of production or at an inspection center. In some instances there may be little choice. The inspection of large pieces of equipment, for example, must obviously be done at the place of production. Inspection at the place of production saves both time and transportation. If the volume of output justifies it, inspectors may be placed at fixed locations but sometimes they cover a wider area.

In cases where laboratory tests must be made, inspection must be done at an inspection center (Fig. 81). Centralized inspection may, however, also be decided upon as desirable in other instances, such as when specialized equipment is necessary for the purpose, or when the quality is sufficiently demanding. Although centralized inspection has the advantage of not interfering with production and may be organized more easily, it is generally somewhat costly. Although it is possible to provide one inspection center, it is also possible to have a main center together with other centers located at strategic points.

Inspection in an automobile plant starts when the parts and materials arrive at the receiving docks. Samples of a shipment go to plant laboratories for chemical and physical tests, as well as for other necessary inspection to determine whether the item meets the specifications. Inspection also takes place at the various steps in processing the materials in the plant. Although some inspection is made by employees working on the parts, regular inspectors are located at different selected points.

Each part is inspected at the end for size, strength, appearance, or performance, depending on its nature. Completed engines get a test run, moving parts are tested for proper fit and for quietness of operation, and the completed car is given a check of performance and appearance.

Machine and Tool Inspection. Although machines are usually inspected at the time they are acquired, they should be inspected at regular intervals. A tool-inspection system should also be set up to provide frequent and regular checks of the tool crib, the condition of the tools, the adequacy of their supply, and the efficiency of the system of issuing them.

Amount of Inspection. In some productive processes each piece is inspected. This is particularly necessary when an expensive part requires further work, which would be wasted if the part is not inspected and found satisfactory before going to that next step. A somewhat similar occasion for 100 per cent inspection arises when defective parts would make proper assembly impossible. When products like large machines, motors, generators, and turbines are made, each one much be tested for accuracy. This is called engineering inspection.

Under some circumstances the machine to be used in production is set up and a trial piece is run through, to determine whether it is set up correctly and makes the piece to specifications. If it does, the machine can be turned over to the operator and further inspection is not necessary for the lot. Under other circumstances, it may be necessary to check pieces from time to time in order to determine whether they are still being turned out to specification. Although the decision on when to do this is usually based on past experience, it is often possible to work out the intervals more accurately.

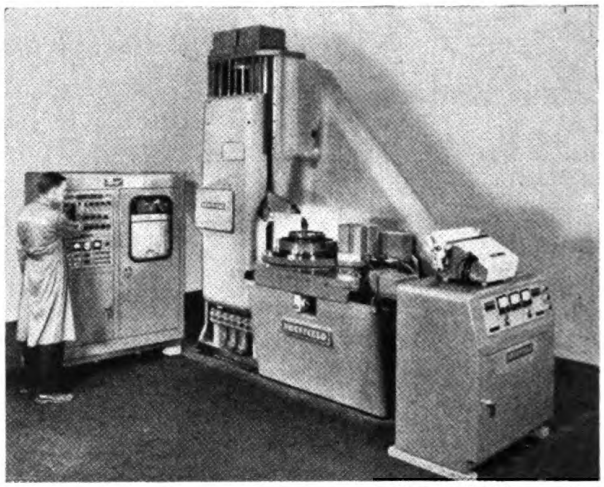
The inspection of work paid for on a straight piece basis is especially important because the workers are striving for quantity. Incentive arrangements in the form of quality bonuses for foremen and workers are sometimes worked out to stimulate quality production.

The sampling method of inspection involves the inspection of less than 100 per cent of the items, the theory of samples being that a certain percentage of all the items in the universe of the data will be, when taken at random, representative of all the items. Although the required percentage is generally not worked out very accurately, the result is sufficiently satisfactory for most purposes. The size of the sample must be fairly large unless there is a high degree of control over production as in Figure 82.

Inspection Equipment. Many different devices are used in inspection. Gauges of various sorts are used in the metal trades. Precision measurement, which is measurement to an accuracy of not less than one thousandth of an inch of the exact dimension, is possible with precision

— E. I. du Pont de Nemours & Company

Fig. 82. An experienced technician tests dye samples to see if they match customer needs.



— The Sheffield Corporation

Fig. 83. A tape controlled measuring machine.

measuring instruments. These measure to .001 inch or a greater degree of precision. Automatic testing equipment based on the photoelectric cell is widely used in some types of production. Laboratory equipment of a highly developed sort is necessary for chemical and physical analyses. With the further development of mechanical methods of inspection and automation, inspection is being transferred from men to machines in somewhat the same way that production skill in general has been transferred to the machine (Fig. 83).

In automotive companies magnetic equipment is used to detect hidden flaws in steel forgings; profilometers are used to determine surface smoothness to one millionth of an inch; special equipment measures the sound made by a car-door slam and the running of axle gears. Chemical content, hardness, and other qualities of different metals must be tested. The making of a typical car involves over 12,000 applications of precision gauges. One firm reported that each car called for 700 measurements within one 1000th of an inch of accuracy. Over 200 measurements must be within one 2000th of an inch of accuracy, 14 within one 10,000th of an inch, and in some moving parts accuracy must be within one 50,000th of an inch. A wide variety of electronic and air gauges are used, many of them built into the machinery so that the machine will stop automatically when parts are finished to the proper dimension. Other instruments are read by employees. The working gauges are periodically tested for accuracy by the use of master gauges made of special steel and kept accurate within two millionths of an inch at a temperature of 68 degrees in controlled-temperature vaults.

Statistical Quality Control

Much of the inspection we have considered may be called acceptance inspection. Since it has as its object the determination of acceptable materials, parts, and so forth, it exerts a form of control only indirectly. In contrast, control inspection has as its object the control of quality in advance. Quality control involves the observation, analysis, interpretation, and correction of the production processes before poor quality output is made.

Statistical quality-control methods had been known for some time, but their use received an additional impetus in attempts to reduce costs by wider application following World War II. Although a detailed consideration of statistical quality control would take us too far afield, it is appropriate to indicate briefly what is involved. In the first place, as has been pointed out, the pieces in the output do not conform exactly to the standard. As a matter of fact, a frequency distribution of the observations will show that most of them are somewhere in the middle, that is, clustered about the standard, while some of the items will deviate to one side and some to the other side. When plotted, a frequency distribution forms a bell-shaped curve which is called the normal curve of error if it is entirely symmetrical. In connection with production data this means that most of the items turned out are located near the standard, but that some lying to the more extreme left and right deviate considerably from the standard. The tolerances set the limits to acceptable specifications. If the limits of the specifications are marked off on the OX axis, these points will be the allowable tolerances $+$ and $-$ the standard (Fig. 84). Most of the items will fall within these limits and will be satisfactory, but those outside the limits are not. Analysis of the items lying beyond the limits of tolerance might reveal that some of the causes of defects can be recognized and therefore removed. Those

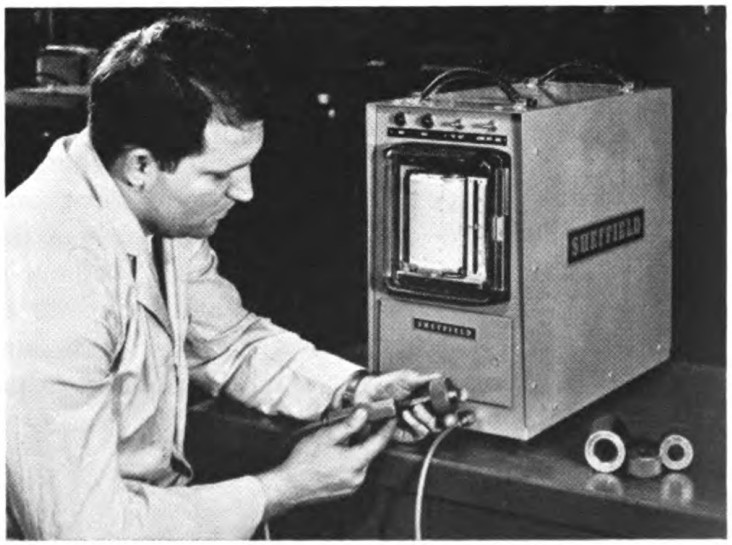


Fig. 84. Checking the sizes of parts with an Air Gauge Recorder.

— The Sheffield Corporation

for which no cause can be assigned are called chance variations. If most of the plotted items do not fall within the limits of tolerance or if the distribution is quite skewed, that is, if it departs considerably from the normal bell-shaped curve, the cause of the difficulty must be sought out, and will no doubt be found to lie in an improperly adjusted machine.

Study of past performance and what can be expected of a machine makes possible the determination of statistical standards. As has already been mentioned, most of the parts turned out will be within the limits of tolerance, a small percentage being larger than average and a small percentage smaller than average. A few parts may be above or below the limits of tolerance. The average amounts to be expected for each of the different groups can be predetermined on the basis of past experience and what can be expected from the machine. These amounts constitute standards against which future output can be checked. By making periodic, say hourly, checks of a sample of the machine's output, it is possible to determine whether the machine is still turning out the parts in accordance with the standard. If it is not and the parts are becoming larger or smaller, then conditions have changed and the machine must be adjusted.

In setting up the organization for statistical quality control it must be kept in mind that the work is of a more professional type than that in many aspects of inspection. The department which is set up is given the authority and responsibility for establishing the control system for statistical research, and also for seeing to it that the methods and records of the customary inspection work are adequate. The last requirement is especially necessary if such inspection records are used to some extent for statistical quality-control purposes, as they sometimes are. The quality-control men should be independent of inspection, manufacturing, and sales.

The objection that the cost of statistical quality control is unwarranted is usually met by pointing out that it lowers costs by reducing the amount of scrap, as well as the amount of spoiled material which cannot be reworked. It may also reduce the cost of inspection. It is even possible that the knowledge derived from such studies will assist in product development and design. It is also claimed that employees become more interested in quality output and take pride in their records.

Conclusion. Inspection is of considerable importance for various reasons. A good system will prevent excessive costs arising from too many parts or finished products which must be discarded because they do not meet the specifications. Without a good inspection system customer goodwill would soon deteriorate. Inspection is of course of the utmost importance in such fields as aircraft and missile production. Although it is also very often quite expensive as organized in companies

producing under government contracts, such costs are passed on and are not absorbed by the company.

QUESTIONS

1. What determines the standards for inspection?
2. How is the inspection department organized?
3. Who should be responsible for inspecting incoming materials?
4. What should be considered in inspecting output?
5. Where should inspection be done?
6. How much inspection is desirable? How does the kind of production affect this?
7. How is inspection being transferred from men to machines?
8. What is involved in statistical quality control?
9. In what types of production would you expect statistical quality control to be most useful?
10. How should acceptance and control inspection be distinguished? Is automatic-machine inspection acceptance or control inspection?

CASE: Terminal Appliance

The Terminal Appliance Corporation has been receiving complaints from dealers and customers about defects in its products. The complaints are in sufficient volume to alert the management to investigate operations. The workers are generally apathetic to quality. Although the management was alerted to the problem by outside complaints, rejects within the plant were found to be considerable. Since parts from vendors are often not up to standard, apparently their quality control is also not satisfactory. Some of the management men believe the annual model is a contributing cause of the difficulty, since the yearly changeover requires a break-in period to train employees in new methods. Several say that the changes are themselves a system which provides steady product improvement and increased consumer demand. Some say the models in the product line should be decreased in number. However, the immediate problem seemed to be to discover how to secure more effective control and how to stimulate interest in quality. The company has a quality-control system but the personnel in this area have no authority over production.

1. **Is Terminal's quality-control system adequate? Why not?**
2. **What recommendations should be made to improve quality control?**
3. **Should annual changes be eliminated and the product line reduced?**

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UNIT 6

PROVIDING AND CONTROLLING MATERIALS

Chapter XIII

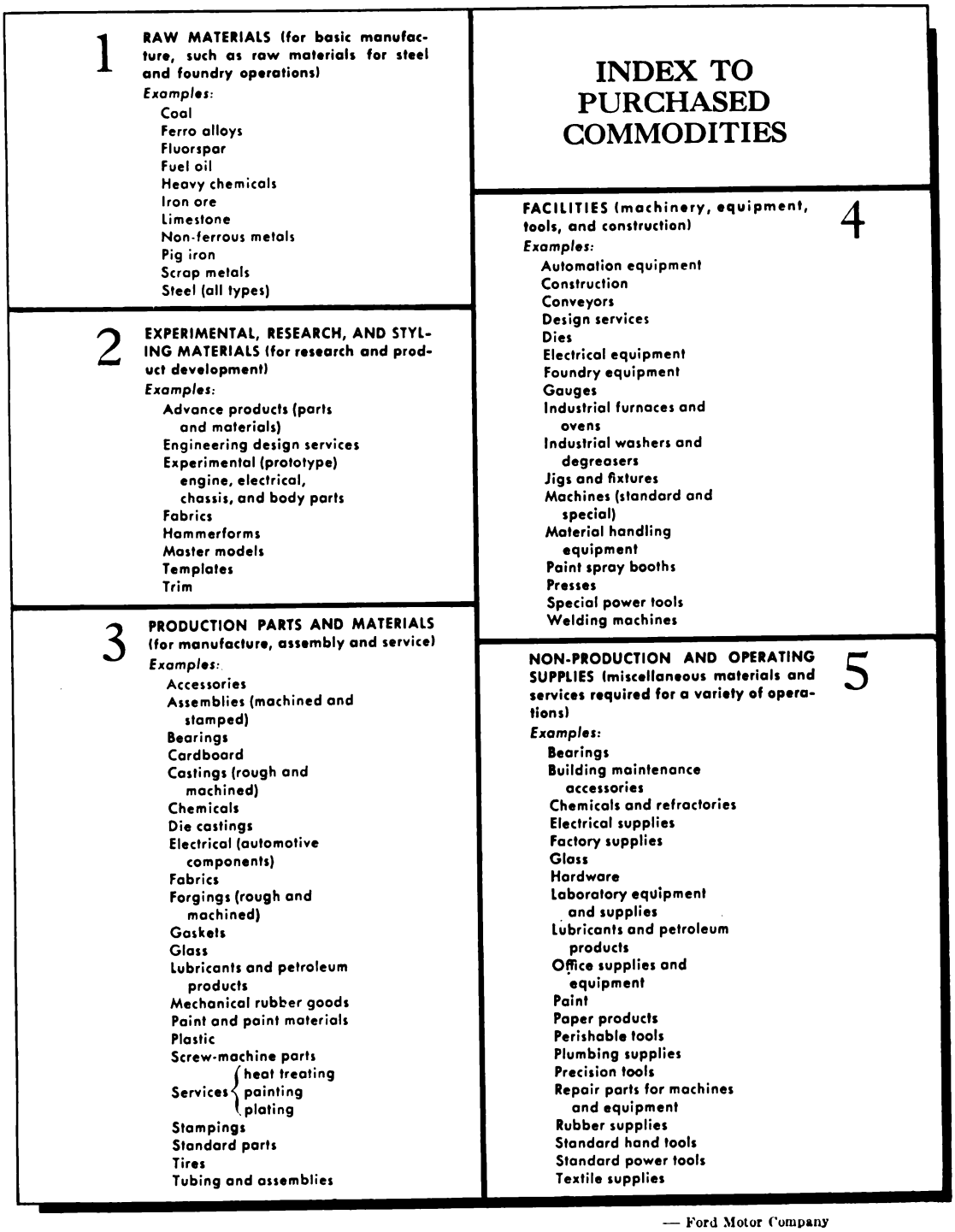
Purchasing

The Purchasing Function. At one time each of the various departments and shops in a business bought its own materials and supplies. But with the passage of time purchasing came to be recognized as a specialized and often independent major function. The purchasing department procures materials, parts, supplies, machinery, tools, and the services needed for the equipping, maintaining, and operating of the plant. By centralizing this function the various departments are relieved of the responsibility for doing their own buying, and the department heads and foremen are free to devote the time they would otherwise spend in procurement to the actual operation of their departments. Specialization on the part of the purchasing department makes it possible to buy more efficiently and to combine orders for the purpose of securing quantity discounts.

Classification of Purchases. Some idea of the variety of decisions which must be made in purchasing is suggested by the different classes of things purchased (Fig. 85). There are four broad classes: materials, supplies, parts, and equipment of various kinds. Basic raw materials include pig iron, copper, lead, and similar materials to be used in fabricating the product as well as coal, coke, and fuel oil used for power and similar purposes. Materials are bought in carload lots for use over a considerable period of time ahead at prices based on quotations from the commodity markets and on specifications by chemical analysis or physical characteristics. Transportation charges constitute a large part of the cost of raw materials, and storage is an important problem.

Supplies, which consist of a wide variety of small items, are items which do not enter directly into the product. They are necessary for maintenance, record-keeping, and office purposes and are bought according to published list prices subject to possible discounts.

Parts include items which are to become part of the product which the company manufactures, items which are to be sold with the product



1 RAW MATERIALS (for basic manufacture, such as raw materials for steel and foundry operations)

Examples:

- Coal
- Ferro alloys
- Fluorspar
- Fuel oil
- Heavy chemicals
- Iron ore
- Limestone
- Non-ferrous metals
- Pig iron
- Scrap metals
- Steel (all types)

2 EXPERIMENTAL, RESEARCH, AND STYLING MATERIALS (for research and product development)

Examples:

- Advance products (parts and materials)
- Engineering design services
- Experimental (prototype) engine, electrical, chassis, and body parts
- Fabrics
- Hammerforms
- Master models
- Templates
- Trim

3 PRODUCTION PARTS AND MATERIALS (for manufacture, assembly and service)

Examples:

- Accessories
- Assemblies (machined and stamped)
- Bearings
- Cardboard
- Castings (rough and machined)
- Chemicals
- Die castings
- Electrical (automotive components)
- Fabrics
- Forgings (rough and machined)
- Gaskets
- Glass
- Lubricants and petroleum products
- Mechanical rubber goods
- Paint and paint materials
- Plastic
- Screw-machine parts
- Services { heat treating, painting, plating }
- Stampings
- Standard parts
- Tires
- Tubing and assemblies

INDEX TO PURCHASED COMMODITIES

4 FACILITIES (machinery, equipment, tools, and construction)

Examples:

- Automation equipment
- Construction
- Conveyors
- Design services
- Dies
- Electrical equipment
- Foundry equipment
- Gauges
- Industrial furnaces and ovens
- Industrial washers and degreasers
- Jigs and fixtures
- Machines (standard and special)
- Material handling equipment
- Paint spray booths
- Presses
- Special power tools
- Welding machines

5 NON-PRODUCTION AND OPERATING SUPPLIES (miscellaneous materials and services required for a variety of operations)

Examples:

- Bearings
- Building maintenance accessories
- Chemicals and refractories
- Electrical supplies
- Factory supplies
- Glass
- Hardware
- Laboratory equipment and supplies
- Lubricants and petroleum products
- Office supplies and equipment
- Paint
- Paper products
- Perishable tools
- Plumbing supplies
- Precision tools
- Repair parts for machines and equipment
- Rubber supplies
- Standard hand tools
- Standard power tools
- Textile supplies

— Ford Motor Company

Fig. 85. Purchases of Ford Motor Company.

although they are not part of it, and also small tools. Although the prices of some parts may be the subject of negotiation, on standard catalogue items the purchasing department gets jobbers' prices.

Large items of equipment such as machinery, boilers, furnaces, and trucks are bought after special consideration and approval by management. A good deal of equipment is bought according to careful specification, although some equipment such as trucks is not.

There are occasions when the buyer purchases the materials which a vendor company uses in producing the articles ordered by the purchasing company.

Organization of the Department. The purchasing department is headed by the company's purchasing agent, who is in some companies a vice-president. There may be an assistant purchasing agent and one or more buyers who specialize in related groups of materials, although in some instances the organization of the department provides for divisional buyers who buy for particular divisions of the company. A clerical force is essential to record purchase orders, invoices, and receipts, and to keep other records.

Where the function is of considerable importance the purchasing agent may be responsible to the president, whereas in other instances where it is of less importance he may report to the official in charge of production.

Advantages of Centralized Purchasing. There are several advantages of centralized buying in addition to those already mentioned. Bills can be paid more promptly, so as to take advantage of cash discounts; inventories can be controlled more satisfactorily, thereby reducing storage and interest costs; and the more accurate purchasing of the necessary goods which is also possible makes for a better product and lower costs. Centralized purchasing not only fixes responsibility, promotes uniform policies, and facilitates the setting up of adequate procedures, routines, and records, but it also contributes toward more satisfactory inspection. The specialized knowledge accumulated by the purchasing department frequently is helpful to others in the company. The decentralized purchasing of the past, which was uncoordinated and haphazard, frequently resulted in working at cross purposes.

Under a good system of centralized purchasing all salesmen are first interviewed by the purchasing agent before they call on the heads of using departments. In this way the purchasing department becomes familiar with new products and materials which may be recommended for use in the future as occasion warrants. Although salesmen may try to bypass the purchasing department, when they do so they probably place themselves at a disadvantage because the purchasing department often exerts considerable influence.

FORD MOTOR COMPANY

PURCHASING ORGANIZATION

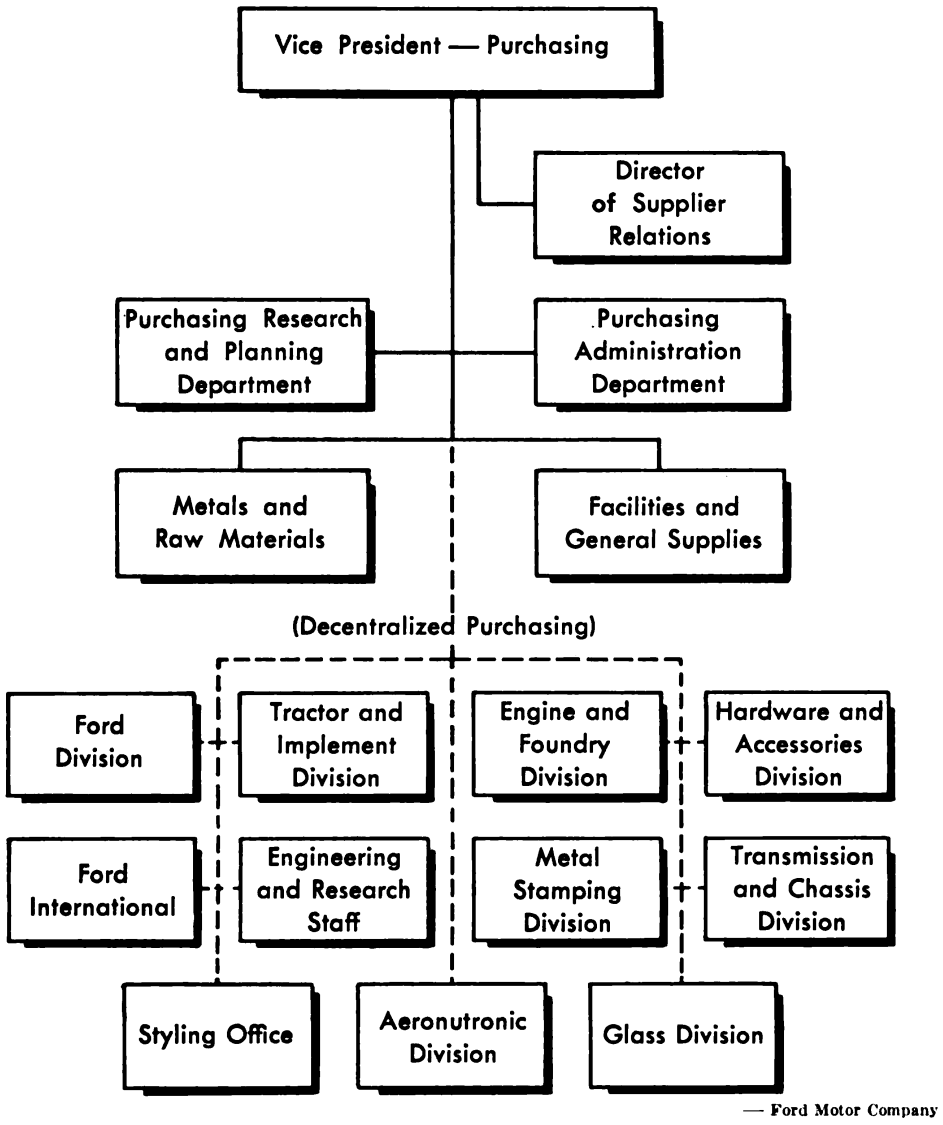


Fig. 86. Organization chart of purchasing.

Extent of Decentralization in Large Companies. In large organizations with widely scattered plants, the problem of the extent to which centralization is desirable takes on additional aspects. The control of inventories from a central source at some distance from the plant may be too inflexible and costly, warehouse facilities may have to be larger

than desirable, emergency requirements calling for the revision or canceling of orders as well as the need for servicing and repairing machines require quick action, and there may be specialized local suppliers from whom purchases can be made satisfactorily.

For reasons such as these, decisions must often be made as to the degree of decentralization which may be desirable. Under some arrangements the general purchasing officer, who is at the main office, formulates the basic policies and sets up the organization and procedures, while local purchasing officers at the plants are responsible for knowing the specialized requirements of their plants, and must comply with the broader purchasing policies laid down by the general purchasing agent. It is essential to define the authority and responsibility of local officers as carefully as possible in order to avoid any overlapping of activities.

In meat-packing plants, tobacco companies, and textile mills, responsibility for the purchase of raw materials is frequently delegated to a responsible official other than the purchasing agent. In companies with many branches the practices vary. One large meat-packing company which maintains centralized control of purchasing has divided the country into zones, with purchasing in the different zones centralized at points where purchasing departments are maintained. In another industry, one large company has carried decentralization further since each plant has a purchasing agent responsible to the plant superintendent, although the central purchasing department of the company establishes master contracts for commodities bought in large quantities and the local purchasing agent draws on these contracts. In one oil company, purchasing is controlled from the central purchasing office in New York. In a textile company, purchasing is controlled from the central purchasing office in Boston. Figure 86 is the Ford Motor Company's organization for purchasing.

Scope of Purchasing. Purchasing involves defining the specifications of the things to be purchased, determining the quantity to be purchased, deciding on the price to be paid, and selecting the source from which the article is to be purchased. Although specifications are ordinarily written by the engineering and operating departments, sometimes the writing of specifications for at least some items is the responsibility of the purchasing agent. In the Aluminum Company of America the director of purchases is also the chief engineer and he is responsible for purchase specifications.

The purchasing agent usually does not determine the quantity to be purchased, but again there are exceptions. In some companies there are inventory committees for this purpose, whereas in others the storeskeeper, the production department, or the purchasing department determines the quantity to be bought, at least for some items. The pur-

chasing agent sometimes has authority to cut down or add to the quantity to be ordered.

Although the purchasing agent generally decides on the price to be paid, in some instances several officials decide on price. The policy of some companies requires the payment of prevailing market prices or the using of competitive bids for specified items.

Since the purchasing officer selects the vendor, the department must be familiar with sources of supply.

The actual scope of a purchasing department's activities depends to a considerable extent on the type of goods required and the size and strength of the company, although the ability and aggressiveness of the department's personnel is frequently a factor of importance. Among the duties sometimes found being performed by a purchasing department are inspection of incoming materials, storeskeeping, inventory control, receiving, traffic, research, engineering, waste disposal, and salvage. Of these possible duties, probably most are performed by the purchasing department only in small companies.

Information on Sources of Supply. Knowledge of sources of supply is secured in a number of ways. Although one way is obviously dependence on memory, this is just as obviously inadequate. Catalogues of all kinds, sizes, and shapes are available. Jobbers' catalogues provide information on a variety of manufacturing sources, while equipment and machinery catalogues provide information on the specifications and prices of parts and new equipment. Catalogues not only provide information on prices, but they are also important as reference sources for department heads and engineers. Because of their great variety and the lack of a standard size, they raise a special problem of indexing and filing.

Trade journals are an important source of information, and the better ones are read with considerable care not only by purchasing men but also by other production officials. Both the articles and the advertisements are informative and helpful in keeping up to date. The advertising in these journals is not based on emotional appeal but strives to be informative because it is understood that otherwise industrial advertising will not be successful. Many purchasing agents say that a good deal of direct-mail advertising represents a waste of money because it is not sufficiently informative.

Trade registers or directories, which provide classified lists of manufacturers, their addresses, the products made, and trade names, are another source of information.

Salesmen's interviews as a source of information have already been mentioned. The purchasing agent makes an effort to see as many as he can and he makes notes on the interviews.

Although the purchasing department's files include all of the pre-

ceding types of material including an index of catalogues, it is also essential to develop files by vendors and commodities.

Selecting Suppliers. In selecting suppliers the purchasing department must make its decisions on the basis of such factors as financial soundness, dependability for quality and quantity, whether the prices are reasonable, general reputation for honesty and fairness with customers, and whether the management is progressive. There is frequently a question of whether to depend on one supplier or to have more than one source. This question is of course automatically answered when a supplier is the only source because of exclusive ownership of patents or processes. When the quality of a particular supplier's output is superior to that of any of the other suppliers in the field, it is clearly desirable to select him as the source. When orders are for small amounts, there is little point in raising any question regarding the possibility of using more than one source. At the other extreme, however, is the possibility of savings in the form of quantity discounts and lower freight rates when one supplier is used. Another advantage is that a single supplier, aware that he is the sole source, is likely to take a greater interest in the buyer's needs and to be more cooperative in arranging for such things as a better delivery schedule.

On the other hand, it is a common practice of large companies to cultivate more than one source of supply, especially for important items. There are certain possible advantages in doing so. For one thing, a continued supply is more definitely assured when more than one supplier is used. Labor difficulties at one supplier's plant, transportation tie-ups, or floods will not necessarily prevent delivery of all orders, and, with at least some quantity at hand, interruptions to production may be avoided. Another factor is that the use of competing suppliers may tend to stimulate a more alert attitude on their part. When only one supplier is used as the source of a fairly large volume of supply, there is some danger that the buying company may become the supplier's sole support, which is a possibility fraught with considerable risk.

The question sometimes arises whether and to what extent local sources of supply should be cultivated; there may be certain advantages in this, some of which are not always measurable in dollars and cents. Although freight savings are clearly measurable in money, the advantages of prompt deliveries are not. A local supplier may also develop a closer knowledge of the buyer's requirements and acquire some flexibility in his ability to meet them. It has sometimes even been suggested that as a long-run proposition it may pay to build up a local supplier, who can at first meet only a part of the buyer's requirements, to the point where he can meet all or most of them. In the shorter period, the advantages from deliveries of rush orders may even offset a slightly higher price.

Automotive firms often help vendors get established by giving them engineering advice and advance purchase orders. The building of a number of new assembly plants since the end of the war in regions where automotive plants did not exist before intensified the effort to find new suppliers in local areas.

When purchases can be made either from the manufacturer or from distributors, a certain amount of judgment must be exercised in determining from which of the two sources to buy. General sentiment seems to favor using the middle men on the theory that they carry a variety of goods and their stock may be larger than a single manufacturer could carry. The wholesaler and jobber can also fill emergency orders. In spite of the use of distributors, however, doubt has sometimes been expressed as to the efficiency with which they perform their work.

The purchasing department strives to develop goodwill with the company's suppliers, in order to encourage assurance of supply if for no other reason; emergency needs may arise, and orders must sometimes be modified downward or even canceled. If the purchasing agent has a good knowledge of his suppliers, develops the confidence of suppliers in him, and makes sure they get to know his requirements, a cooperative attitude on the part of both comes about. Sometimes in the course of visiting the plants of new or old suppliers the purchasing agent learns a good deal about their methods and problems. Although a purchasing agent who has done his job well is in a favored position with suppliers in such periods of short supply as during war or preparation for war, there are other reasons for developing goodwill with suppliers. The reputation of the company is in some degree made known to other companies by the attitudes and reputation of the purchasing department, and, after all, the company doing the buying also has goods to sell.

Reciprocity. Reciprocity is the practice of giving preference in buying to those vendors who are customers of the buying company as opposed to vendors who do not buy from the company.[1] However, the practice is not necessarily limited to two-way relationships, and three-or-more-way arrangements are possible. Reciprocity can arise for various reasons. In its simplest form it may arise because of the desire to favor one or more customers with orders. It is also used to solicit and sometimes to demand orders. In general, various interests within the company, including perhaps especially the sales department and board members, bring pressure to bear for reciprocity.

Reciprocity has been a controversial practice and its existence has often been publicly denied because of its monopolistic implications. Although smaller companies claim it is forced on them by larger com-

[1] Cf. George W. Stocking and Willard F. Mueller, "Business Reciprocity and the Size of Firms," *The Journal of Business*, Vol. 30 (April, 1957), pp. 73–95.

panies who use it as a way of getting business, some larger companies maintain they have to use it for one unclear reason or another.

Although a decision to engage in reciprocity is made by the general management and not the purchasing department, it is the job of the purchasing department to carry out such a policy if it is adopted.

Most Economical Purchase Quantity. Various efforts have been made to develop a formula for determining the most economical quantity to purchase at any one time. Although not a few formulas have been developed for particular needs, none is universally applicable. All of the formulas take into account the cost of ordering, interest charges on capital tied up, storage charges, and the consumption for a specified period of time. Some of them take quantity discounts into account, although some do not. Even if a purchasing department succeeds in working out a formula for its purposes, it is always necessary to exercise judgment.

Factors in Quantities Ordered. Although maximum and minimum inventory points are established for some items, there is some scope for varying the quantities ordered even within these limits. Under the policy of purchasing only to meet requirements as they arise, an order is placed when there is need for an item but nothing in excess of the existing need is bought. Some items, especially those used regularly but not in large quantities such as supplies, are bought for a specified period. In the purchase of some items such as coal, coke, pig iron, and other raw materials, which may be made according to the market, large savings may be possible if advantage is taken of fluctuations in the prices of such materials. If the price of the finished product does not fluctuate with the price of the component raw materials, savings made by buying raw materials according to the market will result in a greater margin of profit. Hence it may sometimes pay to consolidate purchases for this purpose, in which case savings in purchasing expenses may also be possible. There are, however, possible disadvantages in buying according to market. Thus, an error in judgment regarding the market might result in tieing up large amounts of money while the price falls still further; in such a case the buying of normal quantities would have clearly been more advantageous. Also, buying according to market may result in larger inventories with greater storage and carrying charges. In some instances there is the possibility of obsolescence.

Forward and Speculative Buying. In forward buying, which may be necessary to insure an available supply of seasonally available goods, the amount bought is increased or decreased with expectations of probable needs as well as price trends. In speculative buying, in which the amounts bought are varied on the basis of expectations regarding prices, most of the stress is on prospective prices. Speculative buying is risky

and, if it is to be permitted at all, requires the imposition of controls if the company wishes to avoid commitments to the point where financial difficulties might be encountered. Since speculation of this sort is not an industrial company's field of specialization, it may be said that a company practicing it is very likely engaging in activity for which it is not especially fitted.

Hand-to-Mouth Buying. Hand-to-mouth buying, which means buying only those quantities which will be needed within a fairly short time, is a policy that grew out of the inventory losses sustained as a result of the price collapse in the depression of 1920–1921. Although hand-to-mouth buying is ordinarily and in general a very cautious policy, it in effect becomes speculation if it is carried to the extreme of buying less than minimum needs in order to derive a profit from an expected further decline in prices.

Contract and Scheduled Purchasing. In contract purchasing, where the object is to enter into a contract covering future needs at a time when prices are low, delivery is deferred and spread over the schedule of future requirements. In addition to the possible advantage in price, the future supply is assured to the extent of the commitment.

In what is called scheduled purchasing, suppliers are given an estimate of future requirements for a period of time without entering into a specific contract. This is done where there is the possibility of later changes in specifications or quantities needed and it is desirable to restrict purchasing to definitely known requirements. If scheduled purchasing can be arranged for, it has the advantages of reducing the investment in inventory and of assuring the supply.

Blanket orders calling for large quantities provide that the orders be delivered as specified. Long-term contracts may be made with suppliers to the effect that orders will be placed with them as long as quality, services, and reasonable prices are maintained.

Prices. The prices to be paid for materials, supplies, and parts are naturally a fundamental consideration. Where the price is not made in highly organized open markets, the purchasing department must in effect decide whether the quotation represents a fair competitive price after taking into account all surrounding factors. In this connection, experience, common sense, and an understanding of business economics are important qualifications required of purchasing men. Although price is fundamental, it is always essential to keep in mind that the requirements and specifications are final determinants. When a price is rejected as too high, what is meant is that it is not a fair competitive price for the quality required.

Since data on prices must be kept on file for reference, various records are necessary. A purchase record file of past transactions and a quotation

record of all bids received must be kept. Although records of open-market prices will be kept, it is necessary in referring to the published quotations to keep in mind the fact that the prices at which many transactions are actually made may frequently be different. The prices of standard production items available from a number of suppliers can be found in files, catalogues, and supplementary sheets. Salesmen are sometimes a good source of current prices, and small and scattered items can often be bought without knowing exactly what the current price is. The space for the price on the purchase order is either left blank or the last known price is entered with the understanding that it is subject to any change made.

For specially made items the bids requested from acceptable suppliers are compared in selecting the successful bidder. Although the lowest bid is usually accepted, the purchasing department makes its own estimate of reasonable costs in order to judge a fair price. If this is to be done, an understanding of the cost of producing the goods on which bids have been requested is essential. There are certain possible circumstances under which purchasing agents do not feel obliged to accept the lowest bid, as for example when a slightly higher price may be accepted of a supplier because of past reliability, or when there appears to be unfair price cutting which it is expected might lead to potential future price increases. The idea is that price cutting could not be depended upon in the future and might only have the effect of driving others out of business after which the price cutter would raise prices unduly. It is a general principle that the price quoted by the successful bidder should not be revealed. A good purchasing agent tries to establish a reputation for requiring firm bidding, which means requesting bids to be final so that no changes can be made unless there were errors in calculating the bids. As a matter of practice, frequent revisions are often made. In times of falling prices guarantees against price declines may be demanded by buyers, whereas in times of rising prices escalator clauses calling for higher prices in the event of cost rises may be demanded by sellers.

Commodity Exchanges. In a later chapter we shall consider commodity exchanges and hedging. At this point it should be mentioned that there are certain limitations on the usefulness of commodity exchanges which should be kept in mind. For instance, the accurate grading of some commodities is difficult and in some instances grades are not sufficiently narrow to meet industrial specifications. On some exchanges where there is no spot or cash market, all trading is in futures. This means that contracts are made for the purchase or sale of stipulated amounts of specified grades of the particular commodity at a fixed

price at a future date. The contracts are settled in money based on money differences between the original contract price and the current price at the time of settlement, rather than by actual delivery of the goods. On those markets which are dominated by a few large buyers and others by a few large sellers, the prices are of doubtful validity. The same is true where the actual number of transactions on the market itself is limited with many, if not most, of the transactions taking place off the exchange, so that a relatively large purchase or sale on the exchange would in such instances unduly raise or depress the price. Producers of some raw materials, such as metals, may not use the exchange because of a desire to control the prices. Despite these limitations, however, prices on the commodity markets do furnish a clue to current market prices, and in some instances the prices of finished products are to a large extent dependent mainly on the market prices of one or several raw materials.

Hedging, which is made possible by future trading, involves the coincident purchase and sale in two markets expected to behave in such a way that any loss realized in one will be offset by an equivalent gain in the other. Thus, the same amount of the same commodity may be purchased and sold in the spot and future market. However, hedging does not provide absolute protection against price changes and the maximum possible protection can only be approximated by extremely skilled and experienced traders. It is widely believed that, except in the highly developed wheat and cotton markets, there is little value in hedging for manufacturers as against merchants. Considerable doubt has been raised as to its usefulness in cotton.

Discounts. While price concessions of one kind or another may be made on some occasions, little can be said about them beyond the general statement that they reflect economic pressures of some sort and are not recognized either as regular reductions or as resulting in the establishment of a new regular price. Regular reductions or discounts take the form of cash, trade, and quantity discounts.

Cash discounts are offered to encourage prompt payment. Since the seller expects most of the buyers to take them, it may be assumed that the price after the discount is the seller's price. Practices with respect to cash discounts, and in fact the very use of cash discounts, are matters of trade custom.

Trade discounts are given to distributors by manufacturers in order to protect the selected channels of distribution. In theory the trade discount should amount to the average cost to distributors of doing business. Trade discounts do not affect the price of goods bought by the purchasing department. The fact that requirements are available through

distributors, however, makes for a more convenient source of supply.

Quantity discounts are customarily given because the seller's marketing and production costs are lower for quantity production.

Cumulative discounts are not based on the size of one order but are given for quantities purchased over a period of time.

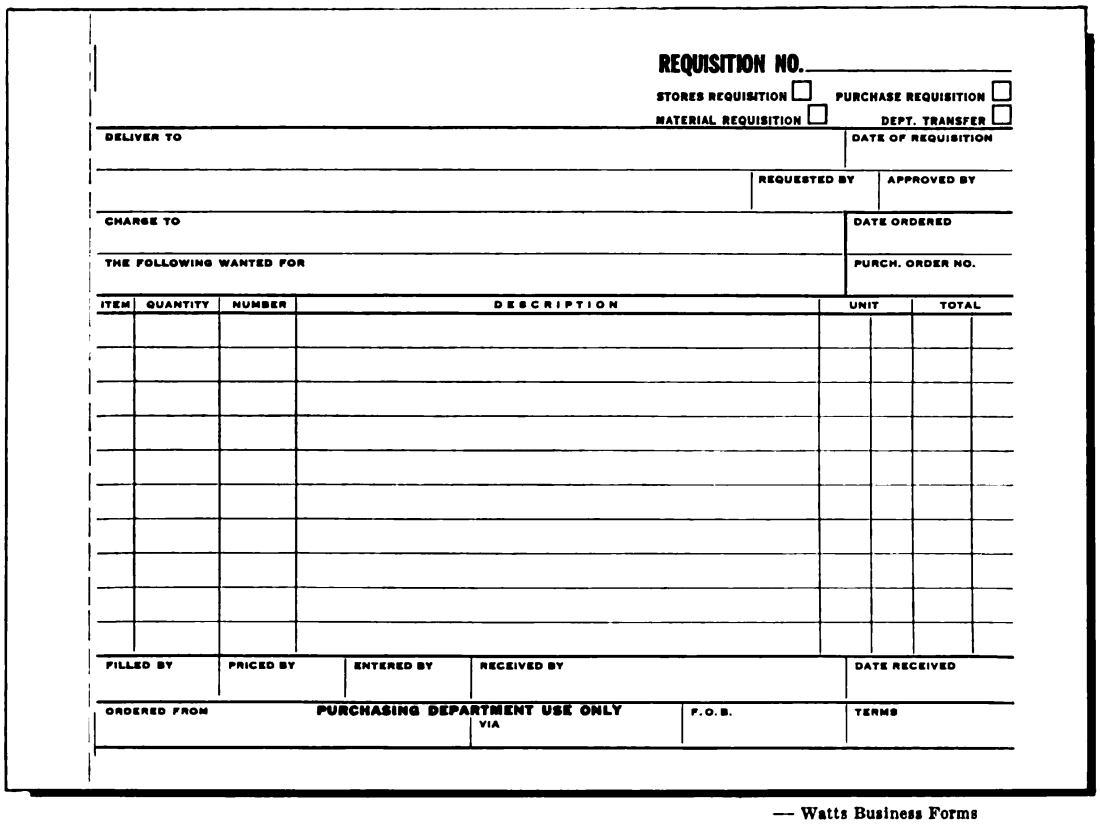
Disposition of Excess Purchases. Materials are sometimes bought in excess of immediate requirements, either because of errors in placing orders or because production requirements have changed. Excess purchases may be stored until needed if it is thought they will be used within a reasonable period of time and if storage costs are not too high. On the other hand, it may be better to dispose of such excesses, especially if there is a possibility of a change in style or design or if the material is perishable or if it will be needed only at a much later date at which time the necessary amount can be ordered.

Scrap. The responsibility for disposing of scrap is sometimes placed with the purchasing department, since the accumulated information which the department has includes sources of information regarding possible users and enables it to make good decisions regarding scrap disposal. The system which is worked out should provide against losses through poor methods, actions of employees, and irregular practices.

For some purposes scrap, waste, and spoilage should be carefully distinguished. Scrap is considered to include material and equipment which, although no longer useful in the company's production process, have a sale value. Scrap material in this sense is material which is an unavoidable remainder of the production process. Waste has been differentiated from scrap by the fact that it has no value. Spoilage has been defined as material processed up to a point at which it is found to be undesirable to process any further. Although these distinctions might be valid for some purposes, the terms "scrap" and "waste" are often used interchangeably, in which case spoiled material is also included in the meaning. The distinctions are also not particularly important from the point of view of disposing of scrap.

Some scrap materials might be reclaimed and perhaps used in other departments. When it cannot be salvaged for such use, it may be sold to scrap dealers, large consumers, or original suppliers. Although some companies do not provide adequately and efficiently for the disposition of scrap, its importance is definitely recognized in some industries such as metals, where its disposition is systematically provided for. In disposing of old equipment it may be possible to trade it in or it might be necessary to sell it to the highest bidder. Specialized equipment may have to be destroyed, however, in order to prevent its falling into the hands of competitors.

Purchase Record System. The purchasing department keeps systema-



REQUISITION NO.

STORES REQUISITION ☐ PURCHASE REQUISITION ☐
MATERIAL REQUISITION ☐ DEPT. TRANSFER ☐

DELIVER TO | DATE OF REQUISITION

REQUESTED BY | APPROVED BY

CHARGE TO | DATE ORDERED

THE FOLLOWING WANTED FOR | PURCH. ORDER NO.

ITEM	QUANTITY	NUMBER	DESCRIPTION	UNIT	TOTAL

FILLED BY | PRICED BY | ENTERED BY | RECEIVED BY | DATE RECEIVED

ORDERED FROM | PURCHASING DEPARTMENT USE ONLY VIA | F.O.B. | TERMS

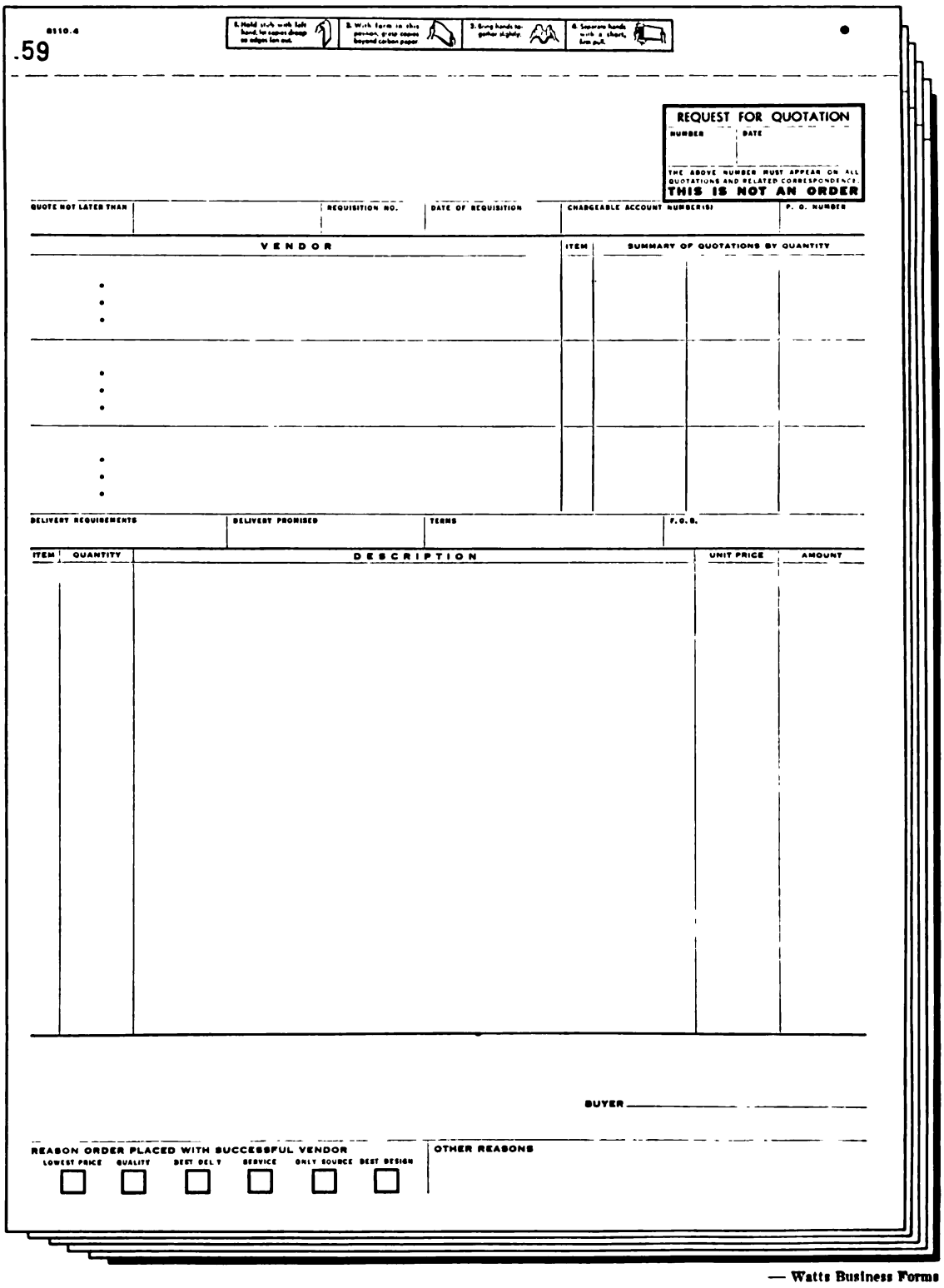
— Watts Business Forms

Fig. 87. A purchase requisition.

tic records of specifications, contracts, vendors, and prices and quotations. The purchase record of each commodity by size and variety is posted from the purchase orders. The entries include the order numbers, the description and specifications, the list of vendors who submitted quotations, the price, the f.o.b. point, the freight terms, the quantity, and the vendors with whom orders were actually placed. The contract, vendor, and purchase record may be combined in different ways.

Purchasing Procedures. In developing the system of procedures for the purchasing department the essential steps in the purchasing cycle must be provided for. The materials, supplies, and parts required must be made known by the preparation of the purchase requisition, which is forwarded to the purchasing department. The department determines possible sources of supply and, on receiving proposals, selects a vendor and places the purchase order. A follow-up may be essential. The invoice must be checked when it is received. The receiving and inspection of the goods must be provided for. Finally, the purchasing department's records must be completed. A few comments on the steps in the cycle will indicate in a general way what must be provided for in the system.

Although the determination of quality and other specifications is not the responsibility of the purchasing department, the department has a continuing interest in the requirements of the various departments and



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REQUEST FOR QUOTATION
NUMBER | DATE
THE ABOVE NUMBER MUST APPEAR ON ALL QUOTATIONS AND RELATED CORRESPONDENCE.
THIS IS NOT AN ORDER

QUOTE NOT LATER THAN | REQUISITION NO. | DATE OF REQUISITION | CHARGEABLE ACCOUNT NUMBER(S) | P. O. NUMBER

VENDOR | ITEM | SUMMARY OF QUOTATIONS BY QUANTITY

DELIVERY REQUIREMENTS | DELIVERY PROMISED | TERMS | F. O. B.

ITEM | QUANTITY | DESCRIPTION | UNIT PRICE | AMOUNT

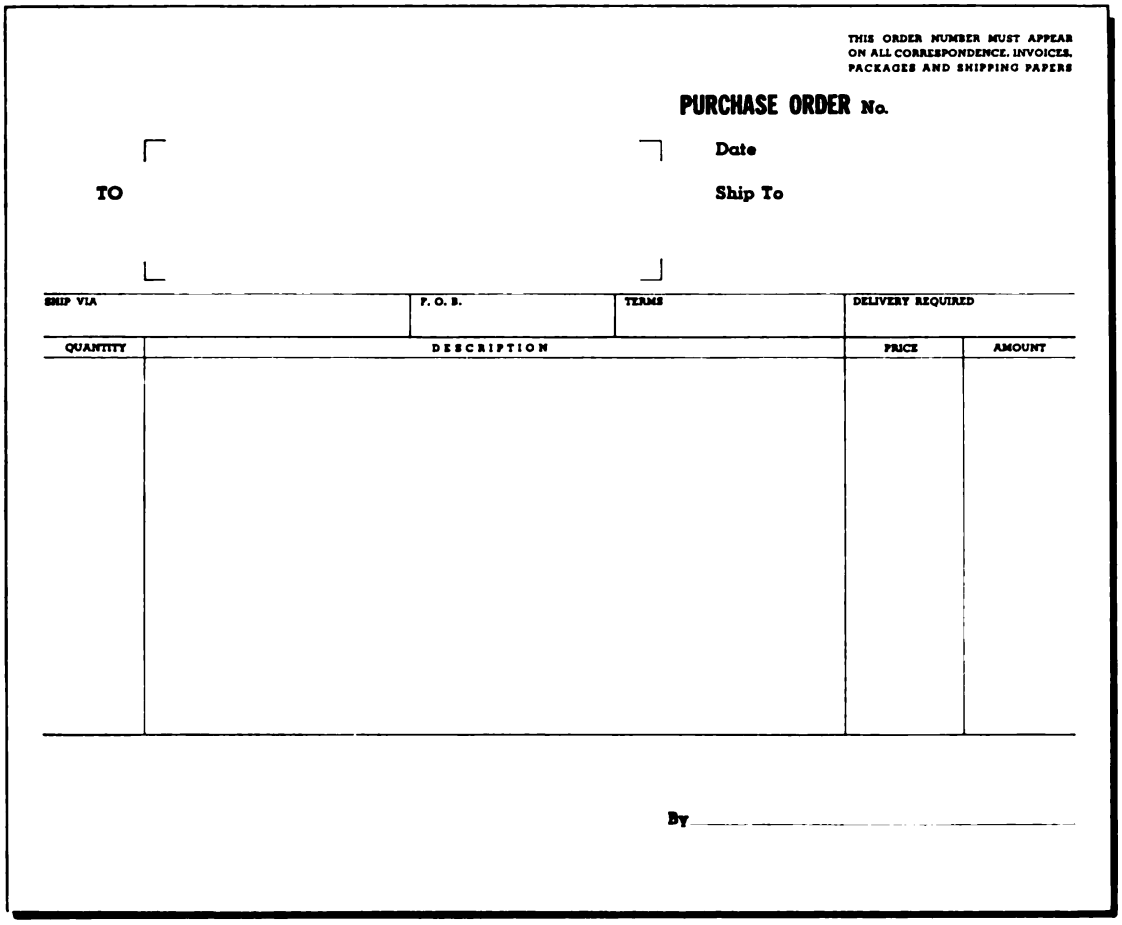
BUYER

REASON ORDER PLACED WITH SUCCESSFUL VENDOR
LOWEST PRICE ☐ QUALITY ☐ BEST DELY ☐ SERVICE ☐ ONLY SOURCE ☐ BEST DESIGN ☐

OTHER REASONS

— Watts Business Forms

Fig. 88. Request for quotation.



THIS ORDER NUMBER MUST APPEAR ON ALL CORRESPONDENCE, INVOICES, PACKAGES AND SHIPPING PAPERS

PURCHASE ORDER No.

Date

TO

Ship To

SHIP VIA	F. O. B.	TERMS	DELIVERY REQUIRED

QUANTITY	DESCRIPTION	PRICE	AMOUNT

By _____

— Watts Business Forms

Fig. 89. A purchase order.

especially in their possible future requirements. It is also frequently in a position to make suggested changes on the basis of information coming to its attention.

Requisitions (Fig. 87) are originated in the using department, the stores department, or the production-control department. The authorization to issue requisitions must be specifically assigned to various individuals whose authority to requisition is then definitely known to the purchasing department. At least two copies of requisitions are prepared, one of which is retained by the originating department and the other of which is forwarded to the purchasing department. Although small and rush orders are sometimes necessary in emergencies, the general rule should be to avoid them. Frequent orders of this sort reflect the likelihood of faulty inventory control or poor production planning.

Although the description of what is needed is written on the requisition, the purchasing department must have accurate descriptions in its files. Although the department should not have to assume responsibility for interpreting inadequate descriptions, it must have the descriptions in order to be able to check the requisitions.

The purchasing department keeps two files of sources of supply, one classified by commodities and the other by vendors. Files of catalogues are used not only in order to determine possible sources of supply, but also for such purposes as checking specifications. They also indicate prices, although sometimes the prices are not entirely current and inquiries may be necessary before placing an order. For many requirements, inquiries in the form of bids or requests for quotations (Fig. 88) are made. Since a request for a quotation may be mistaken for an order, words to the effect that "this is not an order" are usually printed conspicuously on the form.

After the vendor has been selected, the order form is filled out. A purchase order (Fig. 89) is made out for each purchase even though a special sales agreement may have been made. Purchase order forms differ somewhat. Attempts to draw up standard forms to cover all purposes and satisfy all companies have not been successful largely because the purchase order is a legal document on some features of which there are differences of opinion. There are, however, certain features common to all purchase order forms. They all contain the serial number, the date of issue, the name and address of the company placing the order, the name and address of the vendor, the quantity and description of the items being ordered, the date of required delivery, shipping instructions, the terms of payment, and any conditions governing the order. The number of copies which are made varies to as many as perhaps eleven. The original is sent to the vendor (sometimes with a duplicate for acknowledgment), another copy is sent to whichever department originated the requisition, a copy is retained by the purchasing department for its files, another is sent to the receiving department, and another to the accounting department.

Some method must be devised to follow up orders (Fig. 90). Although follow-up is not always necessary and sometimes is done informally by telephone, a more formal arrangement calls for the use of a special form. Sometimes a follow-up man must be sent out.

Although the receiving department may check the quantity of incoming goods by direct comparison with the purchase order, the system of internal control is more complete if the receiving department is required to make up a statement of the goods received (Fig. 91), after which a comparison with the purchase order can be made. After inspection for quality the goods are sent to stores. When the goods have finally gone to stores and the bills have been checked all the documents and papers pertaining to an order are filed.

The question of who should check the prices and terms on the bills has given rise to some difference of opinion. Although some authorities

PURCHASE ORDER FOLLOW-UP
PLEASE RUSH REPLY
USE THIS FORM . . . SAVE YOUR TIME AND OURS

DATE _____

THIS IS OUR REQUEST
PLEASE ANSWER IMMEDIATELY

REPLY TO ITEMS CHECKED BELOW BY ☐ THIS FORM ☐ WIRE ☐ PHONE

PURCHASE ORDER NO.	REQUEST FOR QUOTATION NO.	INVOICE NO.	DATE	AMOUNT

☐ 1 RUSH SHIPMENT. ADVISE EARLIEST DATE.
☐ 2 WHEN WILL SHIPMENT BE MADE? IF SHIPPED, ADVISE METHOD.
☐ 3 PLEASE TRACE SHIPMENT.
☐ 4 IF SHIPMENT HAS BEEN MADE, MAIL INVOICE, TODAY.
☐ 5 PLEASE MAIL RECEIPTED FREIGHT BILL.
☐ 6 PLEASE SEND CERTIFIED WEIGHT SLIP.
☐ 7 WHY DID YOU NOT SHIP AS PROMISED? ADVISE WHEN YOU WILL SHIP?
☐ 8 WILL YOU SHIP ON DATE SHOWN ON PURCHASE ORDER?
☐ 9 RELEASE SHIPMENTS AS SHOWN UNDER REMARKS.
☐ 10 PLEASE MAIL US ACCEPTANCE COPY OF OUR PURCHASE ORDER.
☐ 11 PLEASE ACKNOWLEDGE OUR ORDER.
☐ 12 PLEASE MAKE YOUR SHIPPING DATE MORE SPECIFIC.
☐ 13 WHEN WILL BALANCE OF ORDER BE SHIPPED?
☐ 14 WHEN WILL PRICES BE SUBMITTED? PLEASE RUSH.
☐ 15 PLEASE MAIL SHIPPING NOTICE.
☐ 16 PLEASE INDICATE OUR PURCHASE ORDER NUMBER ON PAPERS REFERRED TO, OR ATTACHED.
☐ 17 WE HAVE NO RECORD OF TRANSACTION COVERED BY YOUR INVOICE. ADVISE DATE OF SHIPMENT, NAME OF PERSON PLACING ORDER AND FURNISH SIGNED DELIVERY RECEIPT COPY.
☐ 18 INVOICE RETURNED HEREWITH.
☐ 19 INVOICE IS REQUIRED IN _____ COPIES.
☐ 20 PRICE OR DISCOUNT IS NOT IN ACCORDANCE WITH QUOTATION.
☐ 21 TERMS ON INVOICE ARE NOT IN ACCORDANCE WITH THE PURCHASE ORDER.
☐ 22 ENCLOSED INVOICE SENT TO US IN ERROR.
☐ 23 DIFFERENCE IN QUANTITY.
☐ 24 UNIT PRICE INCORRECT.
☐ 25 EXTENSION INCORRECT.
☐ 26 PURCHASE ORDER NO. LACKING OR INCORRECT.
☐ 27 SALES TAX DOES NOT APPLY.
☐ 28 SHOULD BE BILLED F. O. B. DESTINATION.
☐ 29 PLEASE MAKE SURE SHIPMENT IS MADE VIA:

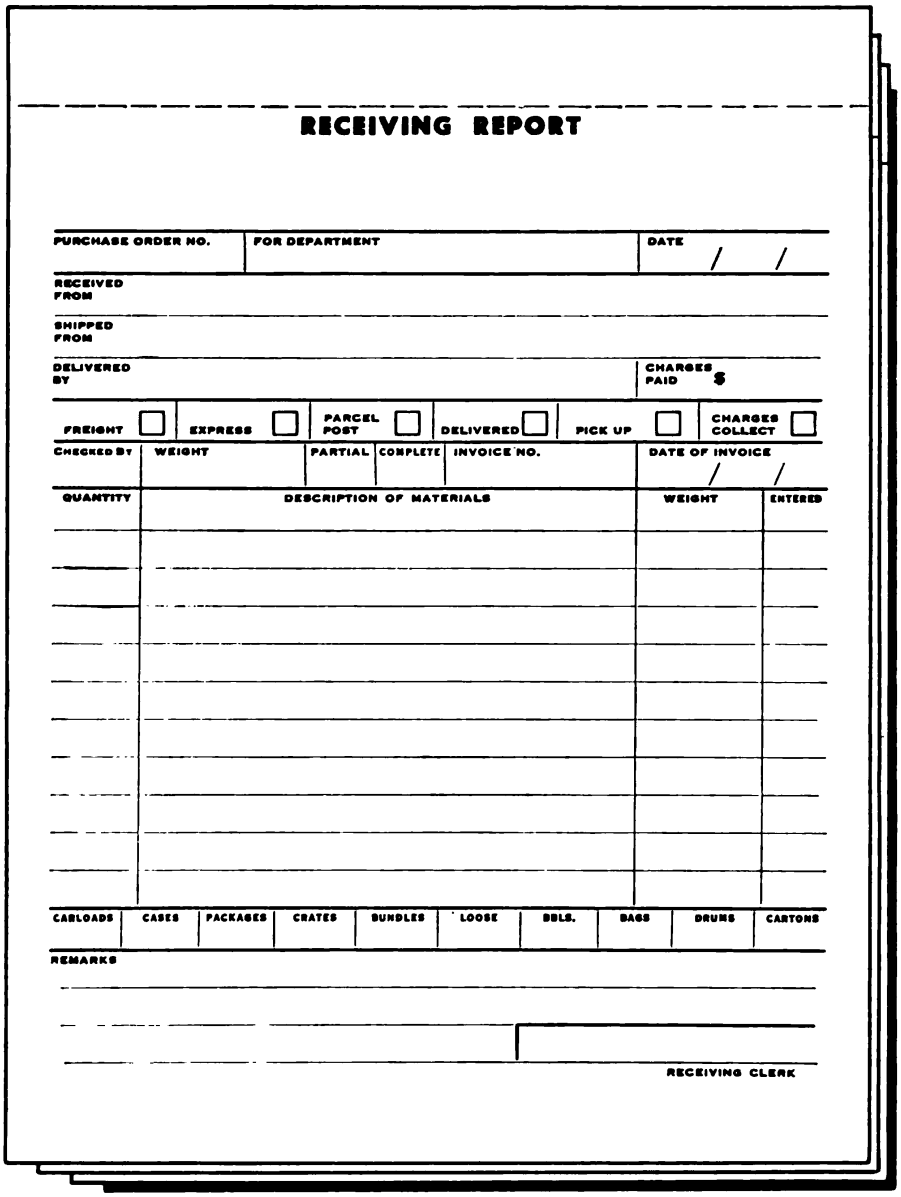
REPLY OR REMARKS DATE _____

VENDOR

BY _____ BY _____

— Watts Business Forms

Fig. 90. A purchase order follow-up.



RECEIVING REPORT

PURCHASE ORDER NO. | FOR DEPARTMENT | DATE / /

RECEIVED FROM

SHIPPED FROM

DELIVERED BY | CHARGES PAID $

FREIGHT ☐ | EXPRESS ☐ | PARCEL POST ☐ | DELIVERED ☐ | PICK UP ☐ | CHARGES COLLECT ☐

CHECKED BY | WEIGHT | PARTIAL | COMPLETE | INVOICE NO. | DATE OF INVOICE / /

QUANTITY	DESCRIPTION OF MATERIALS	WEIGHT	ENTERED

CARLOADS	CASES	PACKAGES	CRATES	BUNDLES	LOOSE	BBLS.	BAGS	DRUMS	CARTONS

REMARKS

RECEIVING CLERK

— Watts Business Forms

Fig. 91. Receiving report.

on purchasing think it is perfectly satisfactory for the purchasing department to check prices, accountants maintain that the system of internal control is incomplete unless the accounting department checks prices.

Transportation rates are checked and approved by the traffic department.

Purchasing-Department Reports. Various reports are prepared by the purchasing department for management purposes. Among the reports prepared are analyses of the expenses of operating the department, statements of costs resulting from losses and errors, including those arising from failure to have material on hand when necessary for production, and, finally, reports on proved savings made by the department.

Conclusion. Purchasing, which during and since World War II has frequently been referred to as "procurement" because of the use of that term by the military, has become recognized as a major function. This is partly because of the fact that many of the men attracted to this work have been capable and energetic in pursuing their work. At the same time, it must be recognized that some men in other departments have been known to object to the status which the purchasing department has often achieved.

QUESTIONS

1. What are the advantages of centralized purchasing?
2. What factors suggest decentralization in purchasing? How is decentralized purchasing best organized?
3. What is the scope of the purchasing function?
4. How are decisions made in selecting suppliers?
5. Why does reciprocity suggest possible monopolistic practices?
6. What factors must be taken into account when making decisions on quantities ordered?
7. How are decisions on prices arrived at?
8. What forms do discounts take? How should decisions be made on which of these to secure?
9. How should decisions be made to dispose of scrap?
10. What qualifications do you think purchasing men should have?

CASE: Fairview Corporation

The Fairview Corporation is a multiplant company with plants scattered throughout the United States. When Charles Simpson came into the corporation as vice-president of purchasing he found buying authority diffused throughout the company. At first he made a brief but unsuccessful effort to centralize purchasing, but then went into the direction of decentralization. However, he soon decided that faulty communications, unstandardized procedures, and generally disjointed operations had serious disadvantages. He therefore once again seriously turned to centralization, this time determined it had to work. He felt that it was not necessary to control in detail the activities of the purchasing agents but that some ground rules were necessary. He planned to set up five divisional sections each with a purchasing agent as department head. The purchasing agents at the plants were to buy local supplies. The divisional purchasing agents were to negotiate for raw materials and major contracts for their groups. These divisional purchasing agents were to be members of management committees in their divisions. The top purchasing agent would be on the top corporation management committee. All of the divisional heads were to be at the home office. The various men would have titles of "purchasing agent" so that vendors would recognize their authority.

The corporation uses about 5000 different types of containers and many varieties of labels. The packaging engineering and control department is under the control of purchasing and headed by a purchasing agent assisted by engineers.

1. **What should be done to effect such a reorganization?**
2. **What advantages would the system have?**
3. **Should the purchasing agents have any control over inventories?**

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Chapter XIV

Controlling Materials

Materials Control

Development of Materials Control. The control of inventories, or materials control, first began to attract attention when shortages threatened during World War I. It was not until the heavy inventory losses sustained in the depression of 1920–1921, however, that continuing careful attention was given to the need for better decision-making with regard to inventory control policies. The desirability of keeping minimum inventories consistent with requirements and the availability of materials, parts, and supplies was widely and continually discussed until the question became recognized as one requiring consideration and decision by every company. The possibility of limiting inventory accumulation was meanwhile enhanced by improvements in transportation and communication. At the same time, it became clear that inventories which are either too large or too small result in higher costs than necessary. The emphasis on style changes, together with successive improvements in products and manufacturing processes, also required the limitation of inventories since changing requirements in the form of different or substitute materials would otherwise result in losses. With the recent development of electronic data-processing machines, inventory decision-making has progressed tremendously. The data accumulated in the machine permit it to indicate at once when the predetermined reorder points have been reached.

Content of Inventories. In general, inventories consist of raw materials, goods in process, and finished goods. The amounts on hand must be sufficient to meet requirements of production and sales. The necessary raw material inventory depends upon the coordination of purchasing with production. Economic purchase quantities, storage costs, handling charges, and transportation charges are attendant factors. The amount of goods in process or worked materials is determined in large

measure by the length of the production period, but production must be undertaken in sufficiently large quantities to insure economic output. Finished or partly finished parts which enter into the final product are included in goods in process if they are received and stored in advance of their final assembly or processing. The requisite amount of finished goods or stock depends on coordination between production and sales.

In addition to the foregoing categories of inventory, supplies of different kinds are kept in varying quantities. Such supplies are items for the office, construction, service, and maintenance departments which do not enter directly into the production process.

Advantages of Materials Control. In addition to the general problem of excessive inventories, inadequate accounting and excessive storage and handling costs are generally prevalent when inventory controls are not properly established. Orderly procedures not only help to reduce inventories, but they also promote more satisfactory purchasing. The accumulation of inventories to provide the necessary materials on hand to permit orderly production can be more readily coordinated with various possible buying advantages arising from quantity discounts, prices, and similar features.[1]

Materials Control and Production Control. Materials control involves the advance planning of material needs with the objective of supplying the necessary materials to keep the production lines running. The required quantity of materials of the prescribed quality should be provided at the required time and place with a minimum of investment. Although the ideal would be to have most materials in the process of production, this is obviously not always feasible. Some companies which consider virtually all materials as goods in process on receipt have practically no raw material inventories, since material is scheduled for processing within a few hours of receipt. A disadvantage of this procedure is that difficulties in suppliers' plants or transportation tie-ups may slow down or stop the whole production process within a very short time.

Under a materials control system the operating departments are not responsible for the kinds and quantities of the production materials and parts which are regularly stored. The purchase requisition is originated in the stores record section of the production planning and control department. Those authorized to issue purchase requisitions as needs arise are definitely designated. In addition to materials and parts bought from outside, some worked materials and finished goods made on the basis of production orders are also kept in stores.

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[1] Cf. National Industrial Conference Board, Inc., New York, *Inventory Management in Industry*, Studies in Business Policy No. 88, 1958. Billy E. Goetz, "An Introduction to Inventory Management," *Advanced Management*, Vol. 25 (July, 1960), pp. 20–28, presents a technical discussion of the subject.

Materials control is closely related to all other phases of production planning and control. Of course, the importance of materials varies in different industries. Although the necessary control becomes more detailed and difficult in complicated manufacturing processes, the more complex the process the more important materials control becomes. Materials must be available at the scheduled times. The fact that the purchasing, receiving, stores, and shipping departments generally have some degree of more or less independent relationship to materials means that a single materials director is not always feasible. However, in some companies a senior executive exercises continuing responsibility over inventories while in others materials committees are established.

As materials control becomes more integrated with production planning and control, storeskeeping tends to be absorbed in the production process. Although these tendencies are implicit in the development of materials-control systems, they have not always been fully worked out.

Materials and Stores. Receiving and inspection includes unloading and unpacking materials, checking them against the purchase orders and invoices, inspection, and delivery to the storeroom. In a sense this work is a first step in the control of materials entering the plant. As the materials are delivered to the storeroom for storage, they are identified according to the stores classification, which provides a name and symbol for each class of items. On the separate bin tag provided for each item and hung on a hook at the bin or shelf where the item is stored, receipts are posted from the purchase-order copies or the receiving slips on the receipt of the goods in the storeroom, while the amounts issued are entered from the stores requisitions or shop orders on the issue of goods from stores. Bin tags show the receipts, issues, and the balance on hand for each item. Any returns or replacements are also appropriately noted on the bin tags. The balances on the bin tags should check with those on the balance of stores records, which is kept by the stores-records section of the production-control department.

Stores-Records Section of Production Control. Although the storeroom is in or close to the shop, the stores-records section is located somewhat near the production-control department of which it is a part. The stores-records section not only keeps the balance of stores records, but it may also keep records of finished products especially when the production volume is closely related to the sales program and therefore to the demands for the production output.

A systematic way of providing for a continuing check of the balances on the bin tags against the balances on the balance of stores sheets is to have the storeskeeper enter his balance on the receiving slips and stores requisitions every time he enters an item on the bin tag. When these forms are routed to the stores-records clerk, the balance of stores noted

by the storeskeeper can be checked by the stores-records clerk to determine whether his balance is the same as that on the bin tag.

Balance of Stores Sheet. The balance of stores sheet has four columns to show amounts ordered, balance on hand, amounts apportioned to production orders but not yet withdrawn from stock and issued, and amounts available for new production orders. Although the order of the columns varies somewhat in different companies, these columns, to-

Fig. 92. Stock card record.

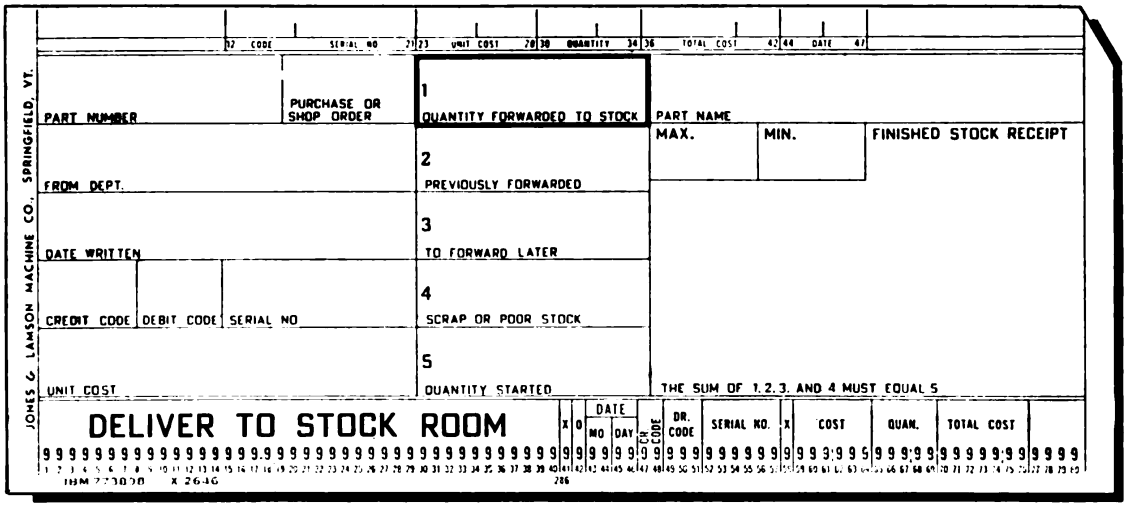
— Jones & Lamson Machine Company

PART NO. NAME ORDER SYMBOL

ORDER POINT | STD. ORDER | M | STD. COST
SHORTAGE POINT | DATE | USAGE | NO. OPER.
| | V | SET-UP/RUN

DATE	ORDER NO.	AMOUNTS				BALANCES				WTD. DATE
		ORD'D	ASSIGN'D	REC'D	ISSUED	ON ORDER	ASSIGN'D	AVAIL-ABLE	ON HAND	

FORM X-3503



— Jones & Lamson Machine Company

Fig. 93. Finished stock receipt card.

gether with the maximum and minimum amounts which have been set for the different items, control the inventories. When an amount goes to the reorder point a purchase requisition is prepared to cover replenishment of the inventory. The quantity to be ordered is based on prior agreement arrived at by various interested departments, including especially the purchasing, stores, production-control, and manufacturing departments.

In highly developed systems of materials control, the balance of stores sheet is kept by the stores-records clerk of the production planning and control department. However, there are still many instances where they are kept in the storeroom, or even by the general accounting department.

Figure 92 shows a stock-card record. This card provides for all the information previously mentioned and is a balance of stores card used by a machine-tool manufacturer. The finished-stock receipt card (Fig. 93) is an order to "deliver to stockroom" materials or parts purchased or parts made in the shop. The finished-stock issue card (Fig. 94) covers the issue of stores either on customer order or for a job in the shop.

Ordering Points. In deciding on the proper amount of inventories the maximum and minimum method is fundamental. The maximum

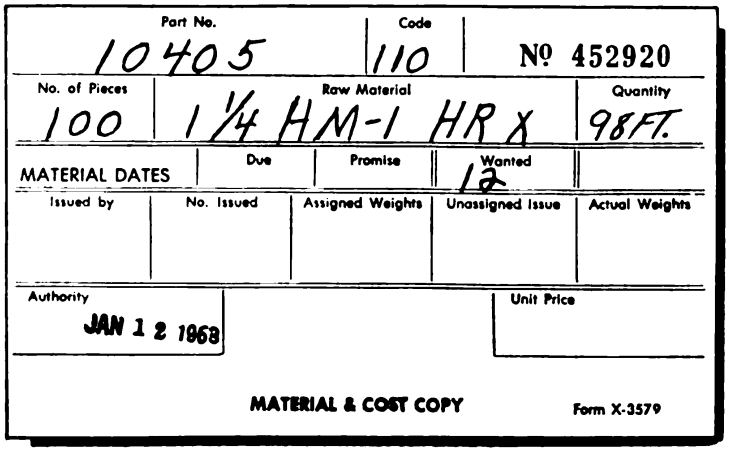


Fig. 94. Finished stock issue card.

— Jones & Lamson Machine Company

amount is the upper limit of the inventory, whereas the minimum amount is the lower limit of the inventory. The reordering point is the sum of the minimum, or cushion, plus the quantity required in production during the interval between the placing of an order and its delivery. When the available balance falls to this point a new order is placed. If the quantity on hand goes below the minimum safe limit, the danger point has been reached and emergency action is necessary.

The minimum quantity can be roughly estimated on the basis of production requirements. The maximum amount is arrived at by adding the standard ordering quantity to the minimum. The standard-order quantity is the most economical amount to purchase. The most economical order is that which can be secured at the least overall unit cost. Although there are economies in large orders, excessive amounts of capital are tied up when orders are too large. In addition to this cost influence, there are also other factors influencing the cost of materials inventories. Among these are physical deterioration, obsolescence, fluctuations in price, the availability of the materials and storage facilities, the cost of purchasing, and lower prices for large quantities.

Materials Records in Companies Without a Materials-Control System. In companies which do not have a highly developed system of materials control somewhat divergent practices are found. Stores record cards, one for each item, may be kept in the storeroom to show receipts, issues, and balances on hand. When additional information covering purchase orders, balances still to come, job numbers, prices, and total costs is provided for, the card begins to approach a balance of stores form. The stores record cards which are sometimes kept in addition to or instead of bin tags may constitute the whole of the stores-record system. However, a card system together with bin tags may not be necessary when the balance of stores records are kept by a stores-records section under the production planning and control department.

Issue of Materials. Materials should be issued only on the basis of properly made out requisitions signed by authorized individuals. When there is no production-control department, stores are issued only on material requisitions signed by foremen. When there is a production planning and control department, stores are issued on requisitions prepared by that department. The requisitions are made out on the basis of the requirements of the bill of materials, which is a master sheet showing all the materials required for a production order. Sometimes a bill of materials may serve directly as the requisition for the different materials required, especially when the manufacturing order is to meet a special order, but in other cases separate requisitions are issued for the different items. The requisitions are forwarded to stores by the dispatcher, or sometimes by the foreman.

In continuous production, such as in chemical, cement, and similar industries, materials are forwarded for daily needs in accordance with the production schedule. The materials may be stored in the production areas and placed under the control of the manufacturing departments.

In the production of repetitive lots, materials sufficient for each day's output may be sent in under planned control from the parts plants and outside vendors. In such instances they are delivered to the sub-assembly or main assembly line as required.

Special and irregularly used materials are ordered by foremen, department heads, or other executives. Supplies for purposes other than direct production are issued on special materials requisitions. Some supplies such as those used by the maintenance department and the office may be stored in separate storerooms.

Requisitions and bills of materials forms must provide for a variety of information, including the name and symbol of the item covered, the quantity, the place to which delivery is to be made, the date needed, the charge or order number, the signature of the person making out the form, the date, the initials of the person receiving the materials, and the initial of the storeskeeper. Since more than one type of material may be requisitioned at one time, space is often provided for listing several items.

Taking Inventories. The recording of receipts and issues of materials, as well as balances on hand as they take place, is known as a perpetual inventory system. Although the various stores records provide information regarding the physical and money quantities of inventories, an actual physical count is nevertheless necessary from time to time since errors somehow creep into the paper records. When a physical inventory is taken, the whole count of all the items in the inventory is made within a short time. Sometimes the plant is shut down for this purpose at a convenient time during the year. A period of normally slow production is generally selected as the time within which the inventory count is to be made. During such a period the plant is cleaned up and maintenance work may also be done.

In taking a physical inventory, tag sheets are prepared and placed on the different materials, parts, and supplies counted. The count and the name of the person doing the counting is noted on the tag sheet which is placed on the various batches of items counted. When the count has been entirely completed, the tags are taken off and the data are listed and priced on inventory sheets.

Large companies provide for taking inventory on a continuing basis throughout the year. The different items in stores are regularly checked in accordance with a schedule developed for that purpose. Adjustments of discrepancies between the physical count and the stores records can

be made as they are discovered. In addition to this advantage in adjusting the records more quickly, the count is also likely to be more accurate than that of an annual physical inventory because it is not made under pressure. Another advantage is that the plant does not have to be shut down. However, a disadvantage lies in the fact that since the plant is not shut down the work in process cannot be easily checked.

Storeskeeping

Materials, parts, and supplies must be stored in a convenient location within the plant or, in the case of some types of bulky items, adjacent to the plant. While the details involved in setting up and operating a storeroom differ somewhat, there are nevertheless certain general features common to all storeskeeping. The stores department receives materials and supplies and stores them for safekeeping and protection. When necessary, provision must be made for storing partially worked materials and raw materials to be stored for aging or seasoning. The stores department also issues materials and supplies to the manufacturing and using departments as they are requisitioned.

Setting up a Stores Department. In setting up a satisfactory stores system certain fundamental information must be kept in mind. Obviously various features of the items to be stored are basic to the space required, the method of issue, and transportation in the plant. Although the items should be considered by size and weight, it must be remembered in this connection that the size and weight of the units in which they will be handled are more important than the size and weight of single items. The quantity usually ordered and the maximum and minimum number to be stored should also be considered. The location of the receiving and using departments is important. The space needed in handling and transporting materials as well as any special care which may be necessary for some of them must be taken into account. Any special lighting, heating, humidifying, and ventilating requirements which may be necessary will also have an important bearing.

Unless the plant is to be built around the layout, the adequacy of alternative available areas must be compared. In addition to the dimensions of different areas, the shape of some of them may make for more ready adaptability. The location of stores in relation to the manufacturing departments and elevators is important. Floor loads, ceiling heights, and building and fire laws are other factors in selecting a satisfactory location for stores. Closely related to general space requirements is the space needed for handling materials within the storeroom. To a considerable extent handling requirements depend on the type of materials, but where there is some choice in the particular type of material-handling equip-

ment to be used the equipment selected will make more or less demands on space.

In addition to determining space requirements and deciding on material-handling equipment, the most suitable storeroom equipment must also be selected. Finally, a system of procedures must be developed.

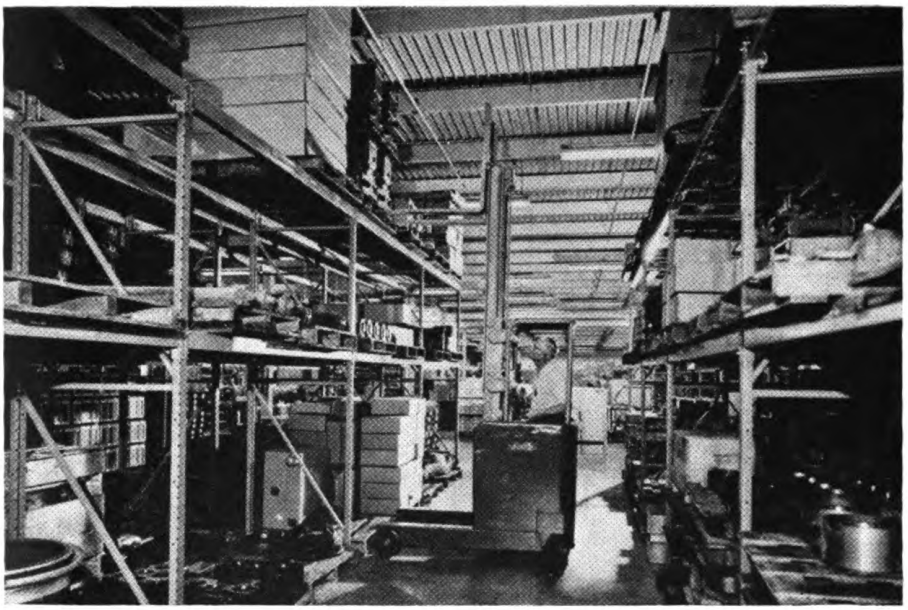
Organization of Stores. The precise arrangements in the organization of the stores department depend on such factors as the general organization of the company, the degree of centralization or decentralization, whether there are any branch storerooms or temporary storerooms, and the relationship of stores to production planning, purchasing, manufacturing, and accounting. In general, a chief storeskeeper may have an assistant storeskeeper and the department will have one or more stores clerks, the exact number depending on the nature and volume of stores. Although a transportation crew may be under the jurisdiction of stores, sometimes it is under a separate materials-handling manager and in some companies the individual departments provide for their own transportation of materials.

Although the chief storeskeeper may report to the production planning and control superintendent, sometimes storeroom operations are under the direct jurisdiction of the manufacturing superintendent, the purchasing department, or even the comptroller. Although various claims are made for locating stores under the control of different major functions, most manufacturing companies locate stores under production control.

When there is little materials control and production planning, the stores department is rather closely related to the purchasing department. The stores department sends requisitions to the purchasing department and advises the purchasing department on the rate of use of different materials, to permit more efficient buying. It may also advise the purchasing department of future needs if they are known and the purchasing department in turn may inform stores of economic purchase quantities as well as market trends.

Location of Stores Department. Although the term "storeroom" is used to describe the place where materials are stored, a separate building may be used for the purpose in some instances while in other cases more than one storeroom will be desirable. Since the location depends on individual plant needs it naturally varies somewhat. Although the general objective is to provide the greatest amount of storeskeeping service at the least cost, in seeking to achieve this objective some consideration should be given to providing a certain amount of flexibility necessary to meet possible future changes.

A single centralized storeroom has certain advantages. Supervision is easier, fewer employees are necessary, less space is needed, the layout can be better, it is easier to take inventory, and in some instances better



— Clark Equipment Co.

Fig. 95. Handling material in an automotive parts warehouse.

service might be possible. In larger plants a single central storeroom may have serious disadvantages, however, since it will be too far away from some departments, a greater amount of trucking will be necessary, and any rush needs will take longer to fill. Since as a general principle materials should be kept as close to the machines as possible, the storerooms should be as close to the production centers as possible.

The availability and cost of efficient material-handling equipment is a factor in deciding on the location of stores. Sometimes gravity can be satisfactorily used. Heavy materials are stored on the ground floor. Some items not subject to rapid deterioration from the elements are stored outside. Some items are stored in special warehouses. Inflammable materials must be separately stored.

Storeroom Layout. In working out storeroom layout, sufficient area must be provided for all equipment and for each of the items to be stored. In addition, space must be provided not only for the receipt and sometimes the inspection of incoming materials but also for their withdrawal and issue. Platforms and other facilities of different kinds must be provided for loading and unloading. Adequate aisles are necessary for efficient movement, and careful attention needs to be given to their width.

Storeroom Equipment. Storeroom equipment includes wood or steel shelving and bins, weighing scales, movable ladders, and material-handling equipment (Fig. 95). Wood shelving and bins are still relatively cheap and may be quickly installed. Although wood provides better protection for some items than does steel, steel shelving and bins are being increasingly used. Standard units which are available at relatively low prices may be bought knocked down and easily assembled.

Since the units are interchangeable, the rows of standard steel shelving can be expanded. The standardized sections are so drilled that smaller compartments can be made by inserting dividers, and considerable rearrangement is also possible. Steel units are strong and durable, they have a fairly high salvage value, they provide maximum storage capacity, they reduce fire hazards, and they promote safety and cleanliness.

Closed shelving is necessary for some purposes. Stacking boxes may be used for some items and racks are necessary for lumber, bars, and pipe. Weighing scales are used for materials issued by weights. Movable ladders are required to reach items stored higher up.

Various special arrangements are essential for the protection of stores. Protection against fire makes it necessary to provide fire-fighting apparatus including water lines, hose lines, a sprinkler system, and chemical extinguishers. Machine castings, forgings, and other items must be protected against rust and corrosion. Some items must be protected against deterioration or evaporation. Textiles and stationery must be protected against dust. Items stored outside are often protected by a covering of some sort. Protection against theft is essential for all the items in stores.

Location and Classification of Items in Stores. Since there are ordinarily so many different items in stores, it is necessary to develop a standard system of classification so that the items can be readily found as needed. The classification and symbols should not only be simple, brief, definite, clear, and foolproof, but they should also be suitable for the engineering, manufacturing, and cost-accounting departments. In working out the system attention has to be given to the fact that symbols are given not only to the raw materials, parts, supplies, and work in process which are stored, but also to tools, manufactured parts, and finished products. It is essential to avoid duplication and to work out the classification of stores as part of the whole system of classification.

A simple system is to arrange the items in groups convenient for storage and issue. The items may be numbered in consecutive order with the next number being used for each item coming up for classification and new items being added having the next number assigned. When there are so many items that the numbers will run too high, letter prefixes may be used up to a certain number after which the next letter is used. One difficulty with this system of arbitrarily assigning the next number to an item is that a separate index has to be kept. When an item is wanted the index must be consulted in order to learn where it is located in the storeroom. Another difficulty is that in the effort to arrange the items conveniently for storage and issue, spaces have to be provided near different types of items to permit the addition of new items at convenient places.

Another method is to divide the items into major classifications, pos-

sibly by functions or possibly by departments where used. Each group or classification is then broken down further into subgroups. Each major classification is assigned a number or letter as a prefix to the next number or letter assigned to the subgroup. In this method there is the inconvenience of rearranging the articles when new ones are added.

Moving Items From Stores. Arrangements for delivery of materials from stores vary, partly by choice and partly by physical necessity. As has already been pointed out, materials should be issued only on the basis of properly made out requisitions signed by authorized individuals. Although some materials may be delivered from the storeroom by workers from the production departments who go to the storeroom to get needed items, movemen from the departments may be sent to stores by the dispatcher or the foremen. Under some arrangements the movemen are employees of the stores department. It is also possible to have a separate plant transportation department. Some items may be moved from the storeroom by conveyors, and trucks of various sorts may be needed to move other items.

Since material-handling equipment of some types is costly, it should be given careful consideration before it is bought. It is desirable to consult engineers specializing in such work, especially when the equipment represents a considerable outlay. Manufacturers of conveyers, industrial trucks, and other material-handling equipment make useful information available.

Conclusion. Materials control has been receiving increasing attention. With the use of electronic data-processing machines, inventories can be controlled more satisfactorily than before. It will be of interest to note as time passes whether such control will minimize the influence of the rate of inventory accumulation on business fluctuations.

QUESTIONS

1. What does one find among the inventories of a company?
2. Why is it desirable to control inventories?
3. How is materials control related to production control?
4. How is the stores-records section related to production control?
5. What does the balance of stores sheet show and why is it important?
6. How are the ordering points determined?
7. If there is no materials-control system, what materials records are necessary?
8. What principles should be followed in issuing materials?
9. How are inventories taken?
10. In what significant ways would you say inventory control in a college bookstore differs from that in an industrial plant?

CASE: Liberty Company

Tom Crawford, plant production manager of the Liberty Company, thought it would be a good idea for authorized employees needing replacement parts to go into the storeroom themselves since they might find items on the shelves better suited to their needs. This plan was adopted and the employees took their own requisitions to the check-out counter where the withdrawal information was recorded by hand. The new plan seemed to work out satisfactorily.

After several months another suggestion was made to issue charge-a-plates to authorized requisitioners and to have the items selected for withdrawal checked out at the check-out counter by stamping an item-withdrawal plan with the charge-a-plate, to eliminate most of the information which was formerly handwritten. Then an IBM typewriter-tape-punch machine fills in the item's identification number on the form. Simultaneously, it punches a continuous-tape record of the transaction. The authorized requisitioner takes the parts and returns to his workplace. The tape goes to the data-processing section where it is converted to punched cards and used to get up-to-date inventory figures.

1. How is time saved by this system?
2. How could this system be extended further?

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Chapter XV

Handling Traffic and Storage

TRAFFIC problems arise because of the necessity for selecting the most economical and efficient routes and methods of transporting materials, parts, and other goods bought, as well as for the products made and sold by the business. Furthermore, sometimes goods in transit have to be speeded up and sometimes their location has to be traced. Although the storage of goods in warehouses is related to traffic, decisions regarding warehousing are related also to production and marketing policies. Traffic and warehousing can therefore be considered from the point of view of either purchasing or marketing. Before turning to traffic management and warehousing, it is desirable to consider freight.

Freight. A common carrier is a transportation agency which holds itself out as being ready and willing to carry goods for anyone. In contrast, a private carrier operates under specific contracts only. Common or public carriers operate over definite routes, while the routes of private carriers depend upon the particular contracts made. Although common carriers must accept goods for transportation, they may limit them to specific kinds. They may also declare an embargo when circumstances are such that goods cannot be moved. Common carriers limit their liability to the agreed valuation of goods as indicated on the bill of lading.

The important means of transporting goods are railroads, trucks, pipelines, and water transportation. Although a good deal of freight is being moved by air (Fig. 96), air transportation is not yet a serious competitor in most fields. To a considerable extent the rates and practices of railroads influence those of other transportation agencies. Before turning to railroads, however, a few remarks about pipelines, domestic water transportation, and trucks are in order. Pipelines are used to carry crude petroleum products, and there are also natural-gas pipelines. Water transportation is used on the coasts, rivers, canals, and the Great Lakes. A

— Pan American World Airways

Fig. 96. Electronic equipment being loaded for air freight shipment to South America.

— The Pennsylvania Railroad

Fig. 97. "Piggy back" hauling has been found to be an economical means of transporting goods.

good many of the ships are owned by the companies which own the goods being transported. Common carrier trucks, which make regular trips between customary terminals, hold themselves out to serve all comers; contract truckers carry goods on a job or haul basis by individual agreement with the shipper; and private truck carriers carry goods for their owners according to their own convenience. Most commercial trucking is done by common carriers and not by contract trucks, although in the period after World War II a great deal of freight was lost by the railroads to contract trucks. Freight is charged on the truckload (TL) or less-than-truckload (LTL) basis. The railroads own some trucks to speed up less-than-carload freight and to provide pickup and delivery service in competition with commercial trucks.

In piggyback service, the shipper loads his freight on highway trailers, which are rolled on to flat cars; the railroad then carries the trailers to their destination (Fig. 97). Under one plan, the shipper provides the trailer, while the railroad supplies the flatcar and the locomotive. The railroad charges 50 cents per mile for each flatcar. Under another plan, the shipper furnishes the trailer and the flatcar, while the railroad provides the locomotive; the charge here is 40 cents per mile. The shipper rents the trailers and flatcars.

Piggybacking has various advantages for shippers. The long-haul ton mile costs about one half that of motor carriers, the time needed to go across the country is substantially less, the trailer avoids the high terminal costs in transferring a load of that size, and door-to-door delivery is possible without breaking bulk between carriers. Some railroad men

foresee the end of the boxcar as the predominant vehicle in railroad freight transportation.

The development of piggybacking dealt a blow to contract truckers, which do not provide common carrier service and do not operate with published tariffs under the Interstate Commerce Commission's jurisdiction, as do the railroads and the common carrier trucks.

Tariffs. Charges made for freight carried by common carriers are published in compilations called tariffs (Figs. 98 and 99). On the railroads rates for carload (CL) shipments are lower than those for less than carload (LCL) shipments. There are three types of carload traffic rates: class rates, exceptions to the class rates, and commodity rates. Class rates are rates charged on articles within certain classes or groups. The rates apply between any origin and destination of the goods. There are three major territory classifications: the Official (in general, the northeastern part of the country), the Western, and the Southern. Within each classification territory there are various subdivisions called "rate territories." The descriptions of all the articles in a classification are uniform in the three classification territories, but there are some differences in classification ratings. The first-class rate is the basis of the rate system, succeeding classes being a percentage of this rate. The second type of CL rate consists of exceptions to the class rate. These rates are published when an article is being transported in greater quantities than in the past and it is desired to encourage its movement. Commodity rates which are the third type of CL rate are for commodities moving in substantial volume between fairly well-defined areas of origin and destination. The rates are on named commodities between named origins and destinations. They are made to fit the needs of the traffic more than is possible under the first two ratings. Most railway traffic moves under commodity rates with only about 5 per cent being moved on class rates.

Every commodity has a specified minimum carload rate. Shipments weighing less than the minimum are charged the LCL rate. Carload freight is loaded by the shipper and unloaded by the consignee, whereas less-than-carload freight is loaded and unloaded by the railroads. Pickup and delivery service is generally available for LCL freight. On some commodities there are "any-quantity rates" which apply to shipments regardless of weights. Rates are expressed in cents per 100 pounds or per 2000-pound ton, or in cents per gross ton of 2240 pounds.

In some instances certain rates on a commodity between key points of large movement are regarded as standard or base rates, with rates for movements to or from other points being related to the base rates. In other instances rates between the same origin and destination vary according to the route designated. The lower rates are called differential rates.

SUPPLEMENT 55 TO TARIFF 11-O

SECTION 1

ITEM	COMMODITIES, CARLOADS, EXCEPT AS OTHERWISE INDICATED	FROM STATIONS	TO STATIONS	DELIVERING LINE	RATES IN CENTS COLUMN 1	RATES IN CENTS COLUMN 2	PER In Pounds except as noted	CARLOAD MINIMUM WEIGHT IN POUNDS	ROUTE See Section 5
▲ 21160B (M. 6472)	Liquors, Alcoholic, in bond, in bulk in barrels.....	Terre Haute .....Ind	Peoria.....Ill	PRR.....	(37) c35 (B) 54	... (B) 43	100	.....	2 2
	(A) Minimum weight 30,000 pounds, except rate prefixed by "c" minimum weight is 75,000 pounds. (Not applicable on shipments provided for in (B)). Apply rates in Column 1. (B) On shipments weighing in excess of 30,000 pounds in the car not subject to Rule 24 of Official Classification. Apply rates in Column 2. On first 30,000 pounds, apply rates in Column 1. On weight in excess of 30,000 pounds, apply rates in Column 2.								
▲21315A	Machine Parts: Dish Washing Machine Cabinets	Louisville .....KY	Greenville.....Ohio	PRR.....	RATES IN CENTS (C)(34) 88		100	20,000R	2
21320	Expired with April 9, 1960, in tariff. (Machinery).								
33 21385	Machinery or Machinery Parts: Crusher, Breaker or Grinder Parts, Coal, Ore or Stone, noibn.	Latrobe....Pa	Chicago.....Ill	PRR.....	(C)(B) 94		100	50,000	2
▲21400B	Machinery, Electrical and Supplies, in mixed carloads (except as noted) as described in Item 490.....	East Pittsburgh.....Pa	Chicago.....Ill	PRR.....	(B)(L) 104		100	30,000	RG
		Sharon.....Pa			104				
		Trafford(See Note).....Pa			(B)(L) 104				
	(L) Also applies on shipments of Circuit Breakers or Parts thereof; Condensers or Capacitors or Parts thereof; Generators or Parts thereof; Fuses; Lightning Arrestors or Parts thereof; Motors, Electric or Parts thereof; Rectifiers, not including Glass Mercury Tubes, Regulators, Electric or Parts thereof; Rheostats or Resistors; Switches or Parts thereof; Switchboard or Parts thereof; Transformers or Parts thereof; when shipped in straight or mixed carloads. NOTE:—Rates do not apply when the weight of any article exceeds 40,000 pounds each or when, because of dimensions, regardless of weight requires movement in special type flat cars with mechanical designation (as listed in the Official Railway Equipment Register, I.C.C. R.E.R. 335, The Railway Equipment and Publication Company, Agent) "FD," "FG," "FW," "FM," or any other flat car having a capacity in excess of 250,000 pounds.								
47 21470	Machinery or Machines: Vacuum cleaners, noibn, with or without complement of attachments, weighing each less than 100 pounds, and floor polishing or scrubbing machines, electric, separate or combined.	Canton...Ohio	Buffalo.....NY	....	(B) 82		100	30,000	(35) RG
51 21478	(B) Machinery and Parts, Metal Rolling Mill.....	Chicago...Ill	Detroit.....Mich	.....	(C) (28) 75		100	30,000	RG
	(C)(H) Machinery, Metal Rolling Mill and Parts...	Pittsburgh.Pa	Alton.....Ill Federal.....Ill	....	145 119		100	30,000 50,000	RG
9 21485A	(C)(H) Housings, Rolling Mill.....	Pittsburgh.Pa	Alton.....Ill Federal.....Ill	....	145 112		100	30,000 50,000	RG
	Commodities in this item apply in straight or mixed carloads. Rates on commodities in this Item will not apply on shipments in heavy duty, depressed, "DF", well or special equipment of any kind.								

(C) Subject to expiration date in Item 362.
For explanation of other reference marks, see concluding pages of this supplement.

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— The Pennsylvania Railroad

Fig. 98. A railroad freight tariff.

A.T.B. No. 125 — C.A.B. No. 259

R. C. LOUNSBURY, AGENT

LOCAL AND JOINT AIR CARGO TARIFF NO. C-AP-9

5th Revised Page 18
Cancels 4th Revised Page 18

‡ATABLE VI - (Concluded)
TABLE OF TRANS-ATLANTIC GENERAL COMMODITY RATES FOR NEW YORK, N.Y.,U.S.A.
In Cents Per Kilogram - U.S. Currency
All Rates apply via Route No. 1.

Between NEW YORK, N.Y.,U.S.A. And (Except as Noted)		Per Kilogram 45 Kgs. and Over	Per Kilogram Under 45 Kgs.
JERUSALEM JORDAN	F	328	437
JERUSALEM JORDAN	T	307	409
JOHANNESBURG U OF SA	F	499	666
JOHANNESBURG U OF SA	T	376	502
JUBA SUDAN	F	419	559
JUBA SUDAN	T	341	455
KABUL AFGHANISTAN	F	421	561
KABUL AFGHANISTAN	T	367	489
KANDAHAR AFGHANISTAN	F	408	544
KANDAHAR AFGHANISTAN	T	367	489
KANO NIGERIA	F	393	523
KANO NIGERIA	T	316	421
KARACHI PAKISTAN	F	436	579
KARACHI PAKISTAN	T	367	489
KEFLAVIK ICELAND		164	218
KHARTOUM SUDAN	F	388	518
KHARTOUM SUDAN	T	321	428
KIEV U S S R		289	386
KRISTIANSAND NORWAY		240	319
KUWAIT KUWAIT	F	374	498
KUWAIT KUWAIT	T	341	455
LAGOS NIGERIA	F	410	547
LAGOS NIGERIA	T	332	443
LAS PALMAS CANARY IS		261	348
LENINGRAD U S S R		297	396
LEOPOLDVILLE B CGO	F	429	572
LEOPOLDVILLE B CGO	T	348	464
LINZ AUSTRIA		255	340
LISBON PORTUGAL		214	285
LIVERPOOL ENGLAND		203	271
LIVINGSTONE N RHOD	F	496	661
LIVINGSTONE N RHOD	T	372	496
LONDON ENGLAND		211	281
LOURENCO MARQUES MOZ	F	499	666
LOURENCO MARQUES MOZ	T	376	502
LUXEMBOURG LUX		230	306
MADRAS INDIA	F	476	635
MADRAS INDIA	T	383	511
MADRID SPAIN		236	314
MALMO SWEDEN		243	324
MALTA		270	359
MANCHESTER ENGLAND		203	271
MANILA P I	F	578	771
MANILA P I	T	458	611
MARSEILLES FRANCE		242	322
MAURITIUS ISLAND	F	591	789
MAURITIUS ISLAND	T	471	628
MEDAN INDONESIA	F	579	772
MEDAN INDONESIA	T	481	642
MILAN ITALY		247	329
MOGADISHU IT SOM	F	462	616
MOGADISHU IT SOM	T	355	474
MONROVIA LIBERIA	F	330	440
MONROVIA LIBERIA	T	333	444
MOSCOW U S S R		327	436
MUNICH GERMANY		249	332
NAGPUR INDIA	F	444	614
NAGPUR INDIA	T	377	503
NAIROBI KENYA	F	472	629
NAIROBI KENYA	T	350	470
NAPLES ITALY		269	361
NDOLA N RHOD	F	491	654
NDOLA N RHOD	T	358	477
NICE FRANCE		242	322
NICOSIA CYPRUS		306	408
NOUMEA N CAL	F	693	924
NOUMEA N CAL	T	528	703
NUREMBURG GERMANY		245	326
ODESSA U S S R		336	448
OSLO NORWAY		240	319
PALEMBANG INDONESIA	F	571	761
PALEMBANG INDONESIA	T	451	601
PALERMO ITALY		270	360
PARIS FRANCE		225	299
PERTH AUSTRALIA	F	699	852
PERTH AUSTRALIA	T	476	695
PORT SUDAN SUDAN	F	380	506
PORT SUDAN SUDAN	T	320	427
PRAGUE CZECH		256	342
RANGOON BURMA	F	523	697
RANGOON BURMA	T	403	537
REUNION ISLAND	F	579	772
REUNION ISLAND	T	461	615
RIGA U S S R		279	367
ROME ITALY		258	343
SAIGON VIET NAM	F	539	718
SAIGON VIET NAM	T	419	558
SALISBURY S RHOD	F	498	664
SALISBURY S RHOD	T	374	499
SALZBURG AUSTRIA		253	337
SANTA MARIA IS AZ		165	220
SHANNON APT IRELAND		192	255
SINGAPORE BR	F	548	730
SINGAPORE BR	T	428	570
SOFIA BULGARIA		301	401
STANLEYVILLE B CGO	F	429	572
STANLEYVILLE B CGO	T	353	471
STAVANGER NORWAY		240	319
STOCKHOLM SWEDEN		243	324
STUTTGART GERMANY		242	322
TANANARIVE MAD	F	543	724
TANANARIVE MAD	T	428	570
TANGIER MOROCCO		238	317
TEHERAN IRAN	F	388	517
TEHERAN IRAN	T	353	471
TEL AVIV YAFO ISRAEL	F	329	439
TEL AVIV YAFO ISRAEL	T	303	404
TENERIFE CANARY IS		274	365
TOKYO JAPAN	F	646	862
TOKYO JAPAN	T	526	702
TRIESTE ITALY		259	345
TRIPOLI LIBYA	F	275	366
TRIPOLI LIBYA	T	270	360
TUNIS TUNISIA		256	342
TURIN ITALY		247	329
USUMBURA B CGO	F	458	610
USUMBURA B CGO	T	365	486
VIENNA AUSTRIA		259	346
WARSAW POLAND		277	370
ZAGREB YUGOSLAVIA		272	362
ZURICH SWITZERLAND		259	318

For explanation of abbreviations, reference marks and symbols used but not explained hereon, see page 5

ISSUED:	Issued by R.C. LOUNSBURY, AGENT PAN AMERICAN WORLD AIRWAYS SYSTEM 28-19 Bridge Plaza North, Long Island City 1, N.Y.	EFFECTIVE:
April 30, 1959		May 30, 1959 (Except as Noted)

Printed in U.S.A. — CORRECTION NO. 278

Departure from the terms of Sections 221.52 and 221.58 of its Economic Regulations authorized by the Civil Aeronautics Board (1442).
‡Effective May 1, 1959. Issued on one (1) day's notice under Special Tariff Permission of the Civil Aeronautics Board C.A.B. No.12537 and Special Permission No.4069 of the Air Transport Board dated April 27, 1959.

— Pan American World Airways

Fig. 99. An air freight tariff.

(25M 8½x11) F. D. 2534

(Uniform Domestic Order Bill of Lading, adopted by Carriers in Official, Southern, Western and Illinois Classification territories, March 18, 1938, as amended August 1, 1939, June 18, 1941, September 21, 1942, January 6, 1943, and July 14, 1943.)

UNIFORM ORDER BILL OF LADING—ORIGINAL

RECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Bill of Lading, the property described below, in apparent good order, except as noted (contents and conditions of contents of packages unknown), marked consigned, and destined as indicated below, which said company (the word company being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its own road or its own water line, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed, as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the conditions not prohibited by law, whether printed or written, herein contained, including the conditions on back hereof, which are hereby agreed to by the shipper and accepted for himself and his assigns.

The surrender of this Original ORDER Bill of Lading properly indorsed shall be required before the delivery of the property. Inspection of property covered by this bill of lading will not be permitted unless provided by law or unless permission is indorsed on this original bill of lading or given in writing by the shipper.

THE PENNSYLVANIA RAILROAD COMPANY 1

STOP this car at | FOR | WEIGHT IN TONS: Gross / Tare / Net | LENGTH OF CAR: Ordered / Furnished | MARKED CAPACITY OF CAR: Ordered / Furnished | Stenciled Weight of Car

CAR INITIALS AND NUMBER | KIND* | SPOT(L.C.L.) | CL TRANSFERRED TO | FREIGHT BILL DATE | FREIGHT BILL No. | WAYBILL DATE | WAYBILL No.

ORIGIN ROAD CODE / No. AND INITIALS | AT No. ( ) B/A ( ) STATION STATE

FROM (SHIPPER)

BILL OF LADING DATE | BILL OF LADING No. | INVOICE No. | CUSTOMER'S No. | *KIND OF CAR: AR—AUTO RACK; AP—AUTO PARTS; B—BOX; CM—COV. HOPPER; C—GONDOLA; H—HOPPER; F—FLAT; R—REFGR; S—STOCK; T—TANK; V—BOX VENT

CONSIGNED TO

ORDER OF

DESTINATION | STATE OF | COUNTY OF

NOTIFY

AT | STATE OF | COUNTY OF

Route (For Shipper's Use Only) | DELIVERING CARRIER

Subject to Section 7 of Conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement: The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

Signature of Consignor

PICKUP SERVICE YES NO

NOTE—Where the rate is dependent upon value, shippers are required to state specifically in writing the agreed or declared value of the property. The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding

PER

DELIVERY SERVICE REQUESTED YES NO

* If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is "carrier's or shipper's weight."

Received $ ..... to apply in prepayment of the charges on the property described hereon:

Agent or Cashier:

Per ..... (The signature here acknowledges only the amount prepaid.)

Charges advanced: $

WEIGHED AT

GROSS

TARE

AL'NCE

NET

If Charges Are To Be Prepaid, Write or Stamp Here, "TO BE PREPAID"

SHIPPER'S SPECIAL INSTRUCTIONS

SHIPPER PER AGENT

PERMANENT POST OFFICE ADDRESS OF SHIPPER PER

No. PKGS.	DESCRIPTION OF ARTICLES, SPECIAL MARKS, AND EXCEPTIONS	*WEIGHT (Subject to Correction)	RATE	FREIGHT	ADVANCES	PREPAID

— The Pennsylvania Railroad

Fig. 100. A uniform order bill of lading.

When goods move over more than one line the rates are called joint rates.

Packing. The method of packing goods for shipment not only influences the amount of possible damage, but it also has a bearing on the transportation cost because it influences the classification for freight-rate purposes. The carriers have rules governing packing, and if they are not adhered to recovery for damages suffered in transit cannot be secured. Shipments may also be refused for various reasons having to do with packing. While economical packing methods should be developed, it should be remembered that poor packing is a frequent cause of loss in transit. The destination on the bill of lading (Fig. 100) and on the package must be the same or the cost of delay will have to be borne by the shipper. A uniform order bill of lading such as that shown in Figure 100 is consigned to the order of a named consignee and is negotiable because of the phrase "to order of." The person named may negotiate it by endorsement. Under the Uniform Bills of Lading Act bills of lading represent the property described in the document and negotiable bills were thus made possible. They can be used for loans since they may be negotiated by endorsement and delivery if made out to the order of the shipper. Figure 101 shows a non-negotiable air-cargo waybill.

Freight Charges. Many sales are made f.o.b. factory (or shipping point), which means that the seller bears the cost of putting the freight on the cars at the shipping point and that the buyer pays the freight charge. However, in order to meet competitive prices from plants located nearer to a buyer, a seller may absorb the freight charge by selling f.o.b. destination, which means free on board cars at destination. Although buyers would prefer to buy f.o.b. their own railroad siding because title would then rest with the vendor until that point, vendors naturally prefer the earliest possible transfer of title. Hence, they sometimes allow transportation charges, in which case the terms are f.o.b. the shipping point with freight allowed.

Special Charges. Special charges are made for accessorial services such as switching, refrigeration, weighing, and stoppage in transit for various reasons. If goods are not loaded on or unloaded from the railroad cars within a short time after arrival and the cars are available for the purpose, a demurrage charge is added to the freight cost.

Loading, Unloading, and Delivery. Merchandise traffic which is less than carload quantities, or less than truckload traffic in the case of trucks, is loaded, unloaded, and otherwise handled by the carrier. Large amounts of freight move this way. Railroads consolidate merchandise shipments according to destination as much as possible. A less-than-carload shipment may be picked up at the shipper's door by a truck at the railroad's expense. The truck may be operated by the railroad, by an affiliate, or by a

NOT NEGOTIABLE

PAN AMERICAN

WORLD AIRWAYS SYSTEM

CLIPPER CARGO — AIR WAYBILL

(AIR CONSIGNMENT NOTE)

AIR WAYBILL NUMBER

MEMBER OF INTERNATIONAL AIR TRANSPORT ASSOCIATION

ISSUED BY: PAN AMERICAN WORLD AIRWAYS, INC., NEW YORK, N. Y., U. S. A.

DEPARTURE (AIRPORT OF) | DESTINATION (AIRPORT OF)

CONSIGNED TO ____ Also Notify ____ (NAME) ____ (ADDRESS)

Street Address ____

City & State ____

MARKS AND NUMBERS	NO. OF PACKAGES AND METHOD OF PACKING	NATURE AND QUANTITY OF GOODS — COUNTRY OF ORIGIN (If Required)	DIMENSIONS OR VOLUME	GROSS WEIGHT LBS. / KILOS (Cross Out One)	SHIPPER'S DECLARED VALUE (Specify Currency) For Customs Only	For Carriage

INSURANCE: AMOUNT REQUESTED (Specify Currency) → ____ If the shipper has requested insurance as provided for at the left hereof, shipment is insured in the amount specified by the shipper (recovery being limited to actual loss) in accordance with Paragraph 6 on the reverse hereof. Insurance is payable to shipper unless another payee is designated in writing by the shipper.

SHIPPER'S INSTRUCTIONS IN CASE OF INABILITY TO DELIVER CONSIGNMENT AS CONSIGNED

☐ ABANDON; ☐ RETURN TO SHIPPER; ☐ DELIVER TO..........

DOCUMENTS TO ACCOMPANY AIR WAYBILL· ☐ COMMERCIAL INVOICE; ☐ CONSULAR INVOICE; ☐ CERTIFICATE OF ORIGIN; ☐ OTHER..........

METHOD OF ROUTING AND CHARGES Agreed stopping places are those places (other than the place of destination) shown under Routing and Weight or Volume Charges, and/or those places shown in carriers' timetables as scheduled stopping places for the route. SEE CONDITIONS ON REVERSE HEREOF.

Portions Surrounded by Bold Lines Reserved For The Carrier

AIR CARRIAGE	Chargeable Weight	RATE CLASSI-FICATION	PREPAID CASH / CREDIT (Cross out one)	Shipper Must Insert Item Number Chargeable to Self	CHARGEABLE TO CONSIGNEE: AMOUNTS IN CURRENCIES AS CHARGED	AMOUNTS IN CURRENCY AT DESTINATION
From ____		RATES				
Routing & Weight or Volume Charges						
1. To ____ Carrier ____ Via ____						
2. To ____ Carrier ____ Via ____						
3. To ____ Carrier ____ Via ____						
Value Charges						
4. To ____ Carrier ____						
5. To ____ Carrier ____						
6. Insurance Premium: ____						
7. Carrier's Cartage Charges on Departure ____						
Other Charges At Departure (Forwarding by Other Transportation Agencies, etc.)						
8a ____						
8b. ____						
8c. ____						
9. Transit Charges ____						
10. Carrier's Cartage Charges at Destination						
Other Charges At Destination (Reforwarding by Other Transportation Agencies, etc.)						
11a. ____						
11b. ____						
11c. ____						
12. Charges for Collection of C. O. D.						
13. SHIPPER'S C.O.D. (Amount in Words)		SUB-TOTAL →				
		AND C.O.D. IN FIGURES →				
APPARENT CONDITION OF THE GOODS AND OF PACKING	Total → (Specify Currency)					

The shipper certifies that the particulars on the face hereof are correct and agrees to the CONDITIONS ON THE REVERSE HEREOF.

NAME OF SHIPPER ____

ADDRESS ____

SIGNATURE OF SHIPPER ____

BY BROKER/AGENT ____

Executed on ____ (DATE) at ____ (PLACE) when above described goods were received for carriage SUBJECT TO THE CONDITIONS ON REVERSE HEREOF, the goods then being in apparent good order and condition except as noted hereon.

NAME AND ADDRESS OF FIRST CARRIER ____

SIGNATURE OF ISSUING CARRIER OR ITS AGENT ____

NAME & ADDRESS OF ISSUING CARRIER'S AGENT ____

PTD. IN U.S.A. GY. N.Y. 0855-5002M -1

12 Copies of this Air Waybill have been completed, of which Copies 1, 2 and 3 are originals and have same validity.

EXTRA COPY — FOR ____

— Pan American World Airways

Fig. 101. A nonnegotiable waybill.

local trucking company operating under contract with the railroad. However, the shipper may deliver the goods in his own vehicle and receive an allowance from the railroad in cases where the railroad normally arranges to pick up shipments. If the shipper has considerable volume, arrangements may be made for him to load the shipment into an empty freight car at his warehouse or plant. Such cars are called ferry or trap cars.

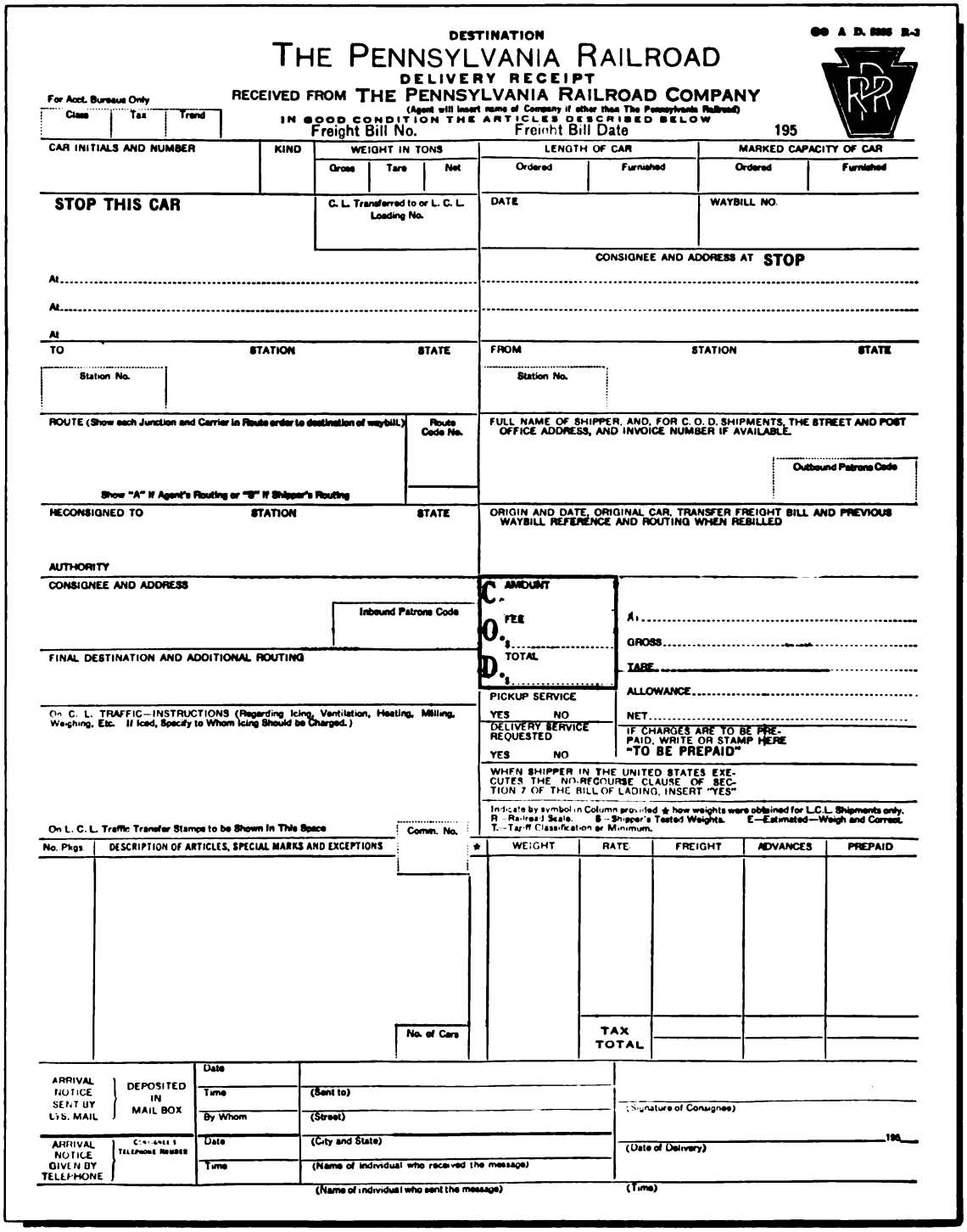
The delivery of merchandise shipments which have already been transported is the reverse of delivery to the railroad. The consignee may call for the goods and receive an allowance or the railroad will deliver them. A consignee with large shipments of merchandise traffic may have his inbound shipments switched to his plant in a ferry or trap car.

Freight Forwarders. Freight forwarders solicit and assemble many small merchandise shipments for consolidation into carloads or truckloads which can be shipped by them at carload or truckload rates. The forwarders receive the difference between the LCL and the CL rates. They either contract with highway common carriers or local cartage companies to perform pickup and delivery service or else they use their own equipment. Freight forwarders are now using piggyback services on a wide scale.

Traffic Management. In large companies the management of incoming and outgoing traffic is organized as a separate department, the head of which is the traffic manager. Traffic management is always necessary, even in smaller companies where it may be combined with the purchasing or sometimes even the credit department. The traffic department cooperates with the purchasing department in selecting advantageous shipping routes and concentration centers. It also cooperates with the marketing department in selecting routes, and it may be called upon for advice when market areas are being selected.

Traffic-Department Work. The traffic department collects rate information; audits freight bills (Fig. 102); prepares claims for losses, damages, and overcharges; selects carriers and routes; traces lost shipments; expedites urgently needed shipments; prepares shipping documents; and supervises transportation facilities. It also assists in consolidating freight into carload lots, in concentrating less-than-carload shipments at strategic rate points, and in selecting warehouse facilities. The department continually studies the classifications and rates on the materials bought as well as on the finished products. The rates of different carriers and alternative routes are assembled and tabulated for the purpose of making rate studies.

In traffic management, the terms "routing," "expediting," and "tracing" have specialized meanings. Routing means the instructions given to the original carrier as to the various carriers by whom shipments are to be carried beyond the territory of the original carrier. In deciding on routes the cost of transportation, necessary speed, facilities, and any special



DESTINATION

THE PENNSYLVANIA RAILROAD

DELIVERY RECEIPT

RECEIVED FROM THE PENNSYLVANIA RAILROAD COMPANY

(Agent will insert name of Company if other than The Pennsylvania Railroad)

IN GOOD CONDITION THE ARTICLES DESCRIBED BELOW

Freight Bill No. Freight Bill Date 195

For Acct. Bureaus Only: Class | Tax | Trend

CAR INITIALS AND NUMBER | KIND | WEIGHT IN TONS: Gross | Tare | Net | LENGTH OF CAR: Ordered | Furnished | MARKED CAPACITY OF CAR: Ordered | Furnished

STOP THIS CAR

C. L. Transferred to or L. C. L. Loading No. | DATE | WAYBILL NO.

CONSIGNEE AND ADDRESS AT STOP

At

At

At

TO STATION STATE | FROM STATION STATE

Station No. | Station No.

ROUTE (Show each Junction and Carrier in Route order to destination of waybill.) | Route Code No.

Show "A" if Agent's Routing or "S" if Shipper's Routing

FULL NAME OF SHIPPER, AND, FOR C. O. D. SHIPMENTS, THE STREET AND POST OFFICE ADDRESS, AND INVOICE NUMBER IF AVAILABLE.

Outbound Patrons Code

RECONSIGNED TO STATION STATE

ORIGIN AND DATE, ORIGINAL CAR, TRANSFER FREIGHT BILL AND PREVIOUS WAYBILL REFERENCE AND ROUTING WHEN REBILLED

AUTHORITY

CONSIGNEE AND ADDRESS

Inbound Patrons Code

C. AMOUNT
O. FEE
D. TOTAL

A.
GROSS
TARE
ALLOWANCE
NET

FINAL DESTINATION AND ADDITIONAL ROUTING

On C. L. TRAFFIC—INSTRUCTIONS (Regarding Icing, Ventilation, Heating, Milling, Weighing, Etc. If Iced, Specify to Whom Icing Should be Charged.)

PICKUP SERVICE YES NO

DELIVERY SERVICE REQUESTED YES NO

IF CHARGES ARE TO BE PREPAID, WRITE OR STAMP HERE "TO BE PREPAID"

WHEN SHIPPER IN THE UNITED STATES EXECUTES THE NO-RECOURSE CLAUSE OF SECTION 7 OF THE BILL OF LADING, INSERT "YES"

Indicate by symbol in Column provided ★ how weights were obtained for L.C.L. Shipments only. R—Railroad Scale. S—Shipper's Tested Weights. E—Estimated—Weigh and Correct. T.—Tariff Classification or Minimum.

On L. C. L. Traffic Transfer Stamps to be Shown in This Space | Comm. No.

No. Pkgs	DESCRIPTION OF ARTICLES, SPECIAL MARKS AND EXCEPTIONS	★	WEIGHT	RATE	FREIGHT	ADVANCES	PREPAID
	No. of Cars			TAX TOTAL			

ARRIVAL NOTICE SENT BY U.S. MAIL — DEPOSITED IN MAIL BOX

Date
Time
By Whom

(Sent to)
(Street)
(City and State)

ARRIVAL NOTICE GIVEN BY TELEPHONE — Consignee's Telephone Number

Date
Time

(Name of individual who received the message)

(Name of individual who sent the message)

(Signature of Consignee)

(Date of Delivery) 195

(Time)

— The Pennsylvania Railroad

Fig. 102. A railroad delivery receipt. The railroad freight bill and the arrival notice are similar to the delivery receipt except for notes at the bottom pertaining to demurrage charges, notice of loss or damage, and amount to be paid.

services needed must be considered. Expediting is the speeding up of goods or hurrying them to their destination. Special freight services may be used for this purpose. Tracing is determining the location of an overdue shipment. It may also be done to determine the exact time a shipment is in transit and in order to file claims.

The receiving of incoming goods is part of plant management, whether or not it is sufficiently important to be organized as a separate department. The movement of finished goods out of the plant begins in the shipping room (Fig. 103).

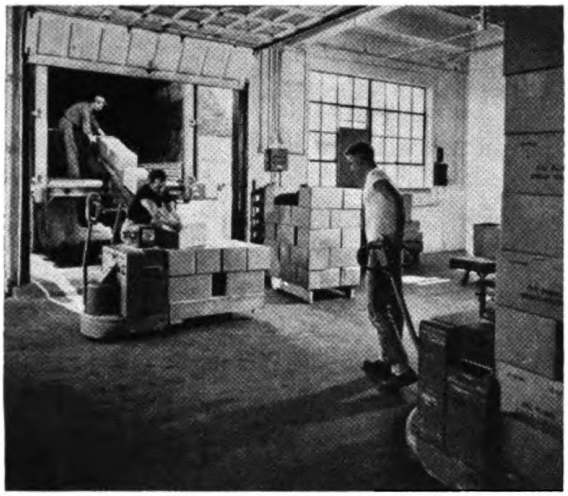
Warehousing. Warehousing is necessary for the storage of raw materials as well as finished goods. By buying in carload lots transportation charges are lower, but large quantities must be stored in warehouses. The manufacture and assembly of parts in economic lot quantities is also made possible when they can be put in storage. Furthermore, warehousing is very important in providing for storage of finished goods near marketing centers and consumers.

Private Warehouses. A private warehouse is one owned by the manufacturer. Private warehouses are used when special handling facilities are necessary, when there are many items sold by units or at least not in volume packages, and when complicated items requiring technical knowledge are being distributed from the warehouse. It is claimed by some that customers receive better attention from private warehouses than from public warehouses and that mistakes are less likely to be made. However, the investment required is fairly large.

Public Warehouses. Public-warehouse charges are generally less than the costs resulting from the acquisition and operation of private warehouses. The rent varies with the volume of business and sometimes with the amount of space used. Public warehouses are well constructed and conveniently located with respect to transportation. Warehouses in different centers can be used for storage near markets and to avoid risks to all the inventory from fire, floods, and storms.

The general merchandise warehouse, which is sometimes called a distribution warehouse, is used for storing finished goods which are not perishable. These warehouses in which goods are stored for short periods are used by manufacturers and distributors to store goods until they are required by retailers, distributors, or industrial buyers. These warehouses are often combined with cold storage and household-goods storage, especially in smaller communities. Cold-storage warehouses (Fig. 104) for storing perishables at or below 45 degrees Fahrenheit are used by producers, wholesalers, retailers, and consumers.

Customs-bonded warehouses developed because of the tariffs on imports. The goods must be taken off the ships at once and they are held at the bonded warehouse until the duty is paid or the goods are re-



— Clark Equipment Co.

Fig. 103. Loading a shipment on a truck.

— Clark Equipment Co.

Fig. 104. Moving produce into cold storage.

exported. They can be held at the warehouse for some time until the duty is paid. If the goods are reshipped without being changed or worked on, there is no duty. While the goods are in the warehouse they are under the custody of an agent of the United States Treasury. Internal-revenue-bonded warehouses, which are usually operated at the place of the manufacturer, are used for goods produced in the United States, mainly liquor and tobacco.

Since public warehouses base their charges on the number of units of goods handled, the costs are readily known. They may also act in a branch-office capacity, doing everything the manufacturer would otherwise have to do in distribution. They may receive mail and handle orders. The manufacturer may supply the warehouseman with accredited lists, which are lists of customers in good credit standing, and the warehouse will fill orders for those on the list without the orders having to pass through the manufacturer's home office. Under such arrangements transportation costs can be saved by getting through freight rates and carload rates as well as by eliminating some trucking.

Selecting Warehouses. The selection of warehouses is sometimes done by the traffic department. In selecting a warehouse the city in which it is located must be decided on first. This is done on the basis of several factors. The total costs of the transportation to the warehouse in carload lots, plus those from the warehouse to buyers in smaller lots, plus the warehouse charges must be compared with the transportation costs which would be incurred by direct LCL shipments. The sales volume is another factor in selecting a city. The warehouse is a factor in bringing about better delivery service if the sales volume warrants the outlay. Competitive conditions are another factor. They may be such as to demand immediate deliveries in particular localities. The taxation of personal property

in one city as against the lack of it in another is an additional factor of importance.

Once the decision on the city or cities in which to select a warehouse has been made, the specific warehouse can be selected on the basis of its location, the facilities available, and the services.

Conclusion. In some types of large businesses, traffic management is a complex job requiring a good deal of specialized knowledge. It is essential not only to understand the company's own operations but also those of other companies as well as the characteristics and operations of the shippers.

QUESTIONS

1. How is freight carried? What are the prospects for air freight?
2. What are the important factors in tariffs? What special charges may be incurred?
3. How should loading, unloading, and delivery be arranged for?
4. What do freight forwarders do?
5. What is included in traffic management?
6. What do traffic departments do?
7. Why is packing important?
8. When is title transferred and what is the effect of this?
9. Distinguish between public and private warehouses.
10. What determines the rent of warehouse space? What procedures should be followed in selecting a warehouse?

CASE: General Products Company

The General Products Company, which makes a line of toys, needed an additional 50,000 square feet of warehouse space to make its Northland plant meet its needs. The company employed 150 people. Northland is a small town with a population of 2300. The company decided to move out of town. This decision was encouraged by the fact that the company leased and did not own its present 45,000-square-foot manufacturing plant.

When the decision became known, a small group of local businessmen talked with the president and learned that the company would remain if some kind of suitable arrangements could be made. The businessmen then took the matter up with nearby banks, one of which agreed to a $250,000 loan on the building presently leased by General and a proposed new building to provide the warehouse space. But the bank stipulated that the townspeople would have to finance the project partially by buying $125,000 in 5 per cent debentures.

An industrial committee was organized to issue the debentures, buy the existing building, and construct the new one. It was proposed that the company agree to buy the enlarged property on a ten-year contract. If it agreed, the loan and debenture issue would be retired in ten years. The industrial

committee learned within a week that the debenture issue would be oversubscribed. General agreed to the plan.

1. Is this a sound arrangement for the company?
2. What would the advantages and disadvantages be to the company and the town?

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UNIT 7

ORGANIZING AND DEVELOPING THE HUMAN RESOURCES

Chapter XVI

Human Factors in Organization

In chapter IV, which dealt with formal organization structure, only passing reference was made to the human aspects of organization. This was essential in order to provide background material on organization which would permit a better understanding of material in the chapters which followed. However, human relations within an organization or firm have always been important even though comparatively little attention was directed to this subject in management literature until relatively recently.

It is sometimes said that material along the lines of our earlier chapter was too narrowly and exclusively associated with the earlier scientific management movement which excessively extended the concepts of standardization to individuals in an organization. Although this point of view has some merit, it does not follow, as is sometimes implied, that such matters as organization charts can be ignored. All modern managers find considerable use for a basic understanding of formal organizational structure, no matter how enlightened they may be about matters to be considered in the remainder of the present chapter. Indeed, one might say that the proper way to approach the study of management is to view it as an evolutionary subject, the various aspects of which have been introduced and integrated into its theory and practice over time.

Human Relations. Toward the end of the 1920's, studies conducted in the Hawthorne Plant of the Western Electric Company marked the beginnings of interest in human relations. The objective was to determine the relationships between the conditions of work and the incidence of fatigue and monotony among employees. These studies showed that the efficiency of a worker is the result not only of the physical conditions of the work or the level of his wage, as had been previously thought, but that his efficiency is also influenced by how he feels about his job, what he thinks about his associates, and his relations with his supervisors as

well as with officials above him. Accurate and unbiased perception of the reactions of individuals in their human relations was thus shown to be important enough to warrant further study.[1]

Later investigations therefore gave attention to the attitudes of workers, to the social organizations within the work situation, and to the role of subgroups within the work group. It was found that the strength of the work group could be greater than that derived through the rules and discipline established by management. A group often operated quickly and effectively to protect itself from violations within the group as well as from outside.

As a result of such studies, human relations between one worker and another, as well as between a worker and his manager, were recognized as important factors in output. Changes in productivity were thus no longer assumed to be principally the result of such matters as changes in wages, hours, illumination, and physical fatigue.

Behavioral Sciences. The desire to learn more about the role of human relations in industry has led to the application of the behavioral sciences to this study. These sciences are psychology, sociology, and cultural anthropology. As a result of the efforts to apply the behavorial sciences to the study of business, new insights have been developed which should be of considerable significance to management. For example, it is suggested that the earlier scientific management approach and conventional organization theory not only tied men to limited jobs which did not utilize their capabilities fully, but that they also discouraged the acceptance of responsibility. The significance of encouraging as much participation in decision-making as possible is that it may contribute to morale as well as to greater output. A better understanding of the role of workers in groups will help to improve supervision and in turn morale and output. These and similar matters will be considered presently.

The Organization as a Social System. An organization may be viewed as a closed social system having institutional goals independent of the personal goals of those participating in its activities. Hence, although the particular technological and work processes must be taken into account in planning the organization structure, management must also take into account the social demands of the situation if the organization is to function efficiently. The objective should be to develop a situation in which the members of the organization orient their behavior cooperatively to achieve the goals and objectives of the organization. This requires that each one must have a general knowledge of the behavior of others if the behavior of all is to be properly coordinated.

Managerial Behavior. We have already discussed the functions of

[1] Cf. Harry W. Hepner, *Perceptive Management and Supervision* (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1961).

management in organizing, directing, and controlling. Organization requires the determination of the degree and type of specialization, as well as of the relationships which are to exist among the specialized units decided upon. Direction involves planning and formulating the broad objectives as well as the lesser objectives of the business, devising the methods to be followed in achieving the objectives, and initiating and approving decisions. Control involves the use of authority to assure the attainment of the organization's objectives by the methods and procedures devised.

Managers may be said to head groups in formal systems of coordination and to make decisions which affect the behavior of their subordinates. In order to achieve the objectives of the business, they must coordinate the activities of responsible subordinates and the groups they head by organizing, directing, and controlling them. In exercising authority, they are subject not only to the authority of their superiors but also to subordinates to whom they will not issue orders which they know will not or cannot be obeyed.

Authority. Mandeville writes that there is something more fundamental to the concept of authority than the inclination of someone to work or not to work for an organization.[2] Authority, he says, arises because of the formation of an organization and is implicit within the organization.[3] Even though it may or may not be exercised to its fullest extent, authority as such is inherent within any organization on account of the existence of the organization. If authority is rejected by all the component parts, there can be no organization. It will inevitably disintegrate and die, even though the process may be prolonged.

The behavior of a supervisor in exercising authority involves the giving of a command or order with the expectation that it will be accepted by the subordinate to whom it is given. The behavior of the subordinate is ordinarily governed by a decision to accept or follow it without making a conscious or critical choice between doing so and another alternative. However, authority is not inherent in the person or office of the superior or leader. It must be accepted by the subordinate. Theoretically, authority will be accepted only when the advantages outweigh the disadvantages. Yet, as already mentioned, much, if not most authority is accepted without making a conscious choice between acceptance and rejection.

Although the actual range of acceptance of commands which will be obeyed by subordinates will vary, the area of acceptance depends ultimately on the sanctions available to authority for the enforcement of its orders. In the normal course of events, resort or threat of resort to

[2] Merten J. Mandeville, "The Meaning of Authority," *The Journal of the Academy of Management*, Vol. 3 (August, 1960), pp. 107–117.

[3] "Reply to C. Edward Weber," *ibid.*, Vol. 4 (April, 1961), p. 62 f.

sanctions does not arise, although its possibility may be part of the background thinking of the subordinate. In fact, of course, authority is usually not exercised by command but by a combination of suggestion, persuasion, and leadership.

Leadership. Since authority must ultimately rest on the acceptance of orders by those to whom they are given if an organization is not to disintegrate, those to whom authority has been delegated must exercise leadership. Leadership is an interpersonal influence which is exercised in situations and directed, through the communications process, toward the attainment of a specific goal or goals.[4] It involves influencing others to identify their own goals with those of the organization and helping them to achieve the desired goals.

Communications. Organizational arrangements include a formal system of oral and written communications, including records, reports, and manuals. Communication of management objectives and policies to employees through supervisors and foremen must ordinarily be supplemented by the use of bulletin boards and other devices.

The importance of adequate communications is perhaps best emphasized by stressing the frequent difficulties encountered in achieving and maintaining proper understanding of what it is meant to communicate. A so-called mental set or readiness to think or react in a predetermined way may be encountered. Another reason for difficulty in communicating between individuals in superior and subordinate positions is that they differ in their status relationship. Those in management and labor groups may readily interpret a communication in terms of characteristics of the context of their own group's communications patterns.

Participation. Since the abilities of workers have improved considerably and the authoritarian approach of an earlier day is no longer desirable, there is a growing belief that employees below the supervisory level should be encouraged to share responsibility for recognizing problems and contributing to their solution. This practice, which is called participation or participative management, encourages employees to have mental and emotional involvement in their work situations. It is likely to result in greater cooperation as a result of a feeling of importance and an awareness of responsibility for getting work done and achieving objectives. Instead of issuing an order to correct a poor practice, it may be found more desirable to state the problem and to ask for suggested solutions. The idea of participation is in line with the belief that it is desirable to have decision-making as diffused as possible in order to take advantage of the abilities of those in a position to make a contribution.

Individual Goals. It has been pointed out that, given adequate wage

[4] Robert Tannenbaum and Fred Massarik, "Leadership: A Frame of Reference," *Management Science*, Vol. 4 (October, 1957), pp. 1–19.

and salary administration, few people give much thought to the financial side of their relations with their employer.[5] However, they have attitudes on various matters and individual attitudes tend to generalize into favorable and unfavorable; moreover, attitudes also tend to spread from one individual to another. Attitude surveys or what might be called social audits may therefore be desirable to determine how well or how poorly the company is considered to be doing in satisfying the basic needs of its employees.

Douglas McGregor is an outstanding proponent of the view that people generally want to work and that decentralization of work by delegation and job enlargement is desirable.[6] Most employees have the potential for growth and development, the capacity for assuming responsibility, and a readiness to direct their behavior toward organizational goals.

It is one of management's tasks to recognize, encourage, and develop these characteristics in order to stimulate high and favorable morale. Employee identification with the organization may be encouraged by symbols of identification and status such as authority and prestige. At the same time, status anxiety or disturbances arising from concern over status must be avoided.

Identification should also be encouraged by providing goals which employees consider personally worthwhile. Organizational conditions should be so arranged that individuals can achieve their own goals by directing their own efforts toward the organization's objectives. Although people are goal-oriented, they must be motivated to continue pursuing the desired goals. By creating opportunities, removing obstacles, encouraging growth, and providing guidance to employees, management may be said to become management by objectives rather than by control. Performance appraisal by self-evaluation is also likely to be worth encouraging.

Group Dynamics. Since individuals in an organization develop interpersonal relations within groups, attention must be directed to group dynamics, which is concerned with the forces operating in groups and does not focus exclusively on assigned leaders. In this sense, leadership involves providing the desired or preferred goals.[7] The individual in the group achieves a feeling of security when accepted as a member of a group which shares beliefs or has a social attachment because of the work, political attachments, or other features in common with the other members. Employees desire to share the experiences of their group by participating in the work and in any discussions as well as by having the

[5] Lyndall F. Urwick, "How the Organization Affects the Man," *The Management Review*, Vol. 46 (July, 1957), pp. 54–61.

[6] Douglas McGregor, "The Human Side of Enterprise," *The Management Review*, Vol. 46 (November, 1957), p. 22 ff.

[7] Cf. Alvin Zander, "The Nature and Consequences of Leadership," *Michigan Business Review*, Vol. 13 (January, 1961), pp. 29–32.

opportunity to influence group decisions and the results. The needs of all members as individuals are thus satisfied through the group.

An effective work group will reflect a cooperative attitude and pride and loyalty to the group. Since the workers usually work in accordance with the standards of output of the group, they resent excess effort of one or more of the members, but at the same time they may generally be expected to protect a given member who has made some kind of error. Of course, groups differ in the cohesiveness of the members; some are merely loosely bound together, while others which are more closely drawn together are strong enough to command the active support of most of the members. On the other hand, a few individualistically minded individuals may be isolates who do not value the goodwill of the group and whose loyalty to a management point of view may exist without group orientation.

Group Morale. A cohesive group with a good attitude toward the company and high morale is likely to contribute to improved production, particularly if those in the group select their own members. Employee participation and decision-making may frequently be achieved by looking at and motivating the group to teamwork. In order to secure participation, it is essential that groups accept the necessity of reaching a decision when there is a problem which has to be met. Of course, the problem and the necessity for action must be clearly set forth and the goals sought must be understood, with proper follow-up, review, and appraisal provided for.

Successful group leadership involves helping others in the group to achieve their goals. The more this is done the more effective is the leadership and the greater the acceptance of the leader by the group. Informal leadership may arise within a group as illustrated by instances where deference is paid to the authority of an older, experienced worker whose advice and suggestions are accepted and even sought.

Supervisors and others should know and understand the role of groups and cliques as well as their leaders and under favorable circumstances they should even encourage the development of such groups. In doing so, it is essential to guard and develop employee social sentiments toward each other. By arranging conditions so that small numbers of individuals work closely together in groups in which they can readily communicate with each other, a feeling of security and cohesiveness may be stimulated through the sense of belonging to the group.

Informal Organization and Communication. Informal organization may be described as the interpersonal relations which develop in an organization and which affect decisions within it. Formal organization must set limits to the informal relations which are permitted to develop.

Formal communication systems are usually supplemented by a network

of informal communications based on the social relationships which develop in the organization.[8] On the assumption that the existence of grapevine communication may be taken for granted, it has been advocated that use of the grapevine should be encouraged for the dissemination of counterrumors. On the other hand, it is necessary to keep in mind the fact that the grapevine may be to a large extent mainly a reflection of the lack of good communications in the first instance. Moreover, there can be no control over the content of a message after it is leaked out as information or as a counterrumor.

Sensitivity Training. Sensitivity training is an interesting behavioral-science approach to facilitating the development of human relations understanding and skills.[9] It aims (1) to increase a person's sensitivity to and knowledge about personal and interpersonal factors as well as their influence on thought and action and (2) to help him in his efforts to behave more effectively in different and changing interpersonal relationships.

Sensitivity training provides the participant with opportunities to learn more about himself and his impact on others, to understand his own feelings and how they affect his behavior toward others, to become more sensitive to the ways people communicate with each other, and to learn active listening. In the book just cited, the authors, who have carried on sensitivity training programs, describe it in some detail. They believe that those who have taken the training function more creatively, productively, and comfortably as individuals and in group situations.

Conclusion. The emphasis on human relations is increasing in industry. The influence of the behavioral sciences in the schools and colleges of business is likely to strengthen these tendencies as graduates move on into industry. It may be noted, however, that various aspects of the behavior of individuals in groups which are now described in specialized terminology have long been observed by many on the job in actual business contexts. It would also seem that behavioral science-oriented studies could profit from closer contact with business. Moreover, it is important to avoid neglect of individual initiative and responsibility by overstressing the group and individual conformity to group consensus.

QUESTIONS

1. How can you explain why attention to human relations was so long delayed?
2. How does looking at the organization as a social system help in understanding organizational relationships?

[8] Cf. Keith Davis, "The Organization That's Not on the Chart," *Supervising Management*, Vol. 6 (July, 1961), pp. 2–7.

[9] Robert Tannenbaum, Irving R. Weschler, and Fred Massarik, *Leadership and Organization* (New York: McGraw-Hill Book Company, Inc., 1961), p. 119 f.

3. What is the relationship between organization and authority?
4. What role should be assigned to communication? Why do difficulties arise in achieving effective communication?
5. What problems may arise in connection with efforts to promote participation?
6. What are the essential problems in achieving employee identification with the company's goals?
7. How would you handle the problem of racial discrimination? What legislation might affect your plans in this area? How would you handle certain reliable, experienced employees who might object to working with people of a different race?
8. To what extent is it desirable to take the initiative in stimulating informal communication?
9. What limitations or difficulties might lie in a program such as sensitivity training?
10. To what extent can management interest in human relations be viewed as the desire to achieve employee loyalty in competition with labor unions?

CASE: Judson Power & Light Company

The Judson Power & Light Company's linemen and those engaged with them in outdoor work were required by the company to wear their safety helmets on the job. The practice of wearing helmets had recently not been fully enforced by the supervisors and foremen. One of the heavy hammers fell and hit Joe Gannon, who was not wearing his helmet. Although he was rushed to the hospital, the hammer had fortunately only grazed him and only several sutures were necessary.

The incident led to a crackdown on supervisors and foremen, who were told to enforce the safety regulations. Shortly thereafter, one of the supervisors, Al Loring, noticed lineman Paul Jeffers on the job without his helmet. The following was the beginning of the conversation:

LORING: "Paul, put your helmet on and keep it on while you're on the job. As you know this is an important part of the safety regulations and Joe Gannon was just lucky."

JEFFERS: "Is that in the [union] contract?"

1. How should Loring have answered this if it is not in the contract?
2. Should such a provision appear in the contract?
3. In industry, is it the company or the union which is more interested in safety?

CASE: Bergen Telephone Company

The Bergen Telephone Company was arranging its annual program of upgrading several linemen to telephone installers. The program involved selection of the men for a brief training period. The union contract had a statement to the effect that in selecting the men for this purpose seniority should be given some consideration if possible. Although the statement was

not strong enough to be binding, precedent had been established to the same effect and the company was satisfied with the policy.

John Barrett, one of several linemen with top seniority, was approached by Fred Lionel, his supervisor, and asked whether he wished to be considered for selection to the training program. Barrett said he would and Lionel included his name with the others he recommended to his superior. Barrett was in due course notified that he had been accepted, as was to have been expected in the normal course of events. On the Friday before the week the training was to begin, Lionel mentioned to Barrett that he was expected at the training center the following Monday. Barrett said he had changed his mind and would not go since he would rather continue as a lineman.

Lionel was convinced in his own mind that if Barrett had not been selected in the first place he would have entered a grievance with the shop steward. Lionel had also anticipated that Barrett would reject the possibility of promotion because he had had the same experience with him the year before. He had therefore taken the trouble to check with his superior as to whether Barrett would be required to follow through on the assignment. Since Lionel's superior had replied in the affirmative, he told Barrett: "You're going to the training school Monday."

On Monday morning Lionel was called to the office as he had anticipated. The shop steward presented Barrett's grievance as consisting of being required to be promoted. In reply to Lionel's query as to whether the steward had all the facts, the latter said he did. Thereupon Lionel said: "Well then let's not waste time. I made my decision and you can take it to my superior." Shortly thereafter Barrett reported to his job as lineman.

1. Should Lionel's superior have reversed his own position?
2. Did Lionel do the right thing in letting this come to a head in view of the fact that he anticipated the outcome?
3. What could be done to avoid situations like this one in which the worker may have a grievance either way?

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Chapter XVII

Personnel Management

Objectives of Personnel Management. Personnel administration or personnel management places the emphasis in the control of labor on human factors. The objective is to eliminate sources of friction, stimulate cooperation, and foster the general well-being. This does not mean that the emphasis in such labor-relations programs is exclusively humanitarian, for the underlying purpose is to achieve greater efficiency, reduce labor turnover, develop loyalty to the company, and minimize labor difficulties with their attendant costly outlays. The achievement of these results is sought by taking an interest in the welfare of the worker and recognizing his worth as an individual. The worker is also encouraged to a feeling of belonging to his group in the plant.[1]

Personnel Department. The personnel or employee-relations department is organized as a separate and specialized functional staff department, which carries out its functions by use of various specialized techniques (Fig. 107). In addition to a practical knowledge of management, the work requires a broad concern with such fields as economics, psychology, and sociology.

The department is headed by a personnel director who is in some instances a vice-president. If the collective-bargaining representative of the company is the head of the personnel department, he should be a major officer. In the case of many manufacturing companies the term "industrial relations" is used instead of personnel. The various subdivisions of the department in any given company depend on the scope of its activities. Assuming the maximum development of a personnel department, we would find, in addition to a section responsible for employment, various sections to handle health, safety, and sanitation, training and education, research, welfare, and some arrangements for

[1] National Industrial Conference Board, Inc., New York, *Statements of Personnel Policy*, Studies in Personnel Policy No. 169, 1959.

Fig. 107. Section of a personnel department.

— Standard Oil Co. (N. J.)

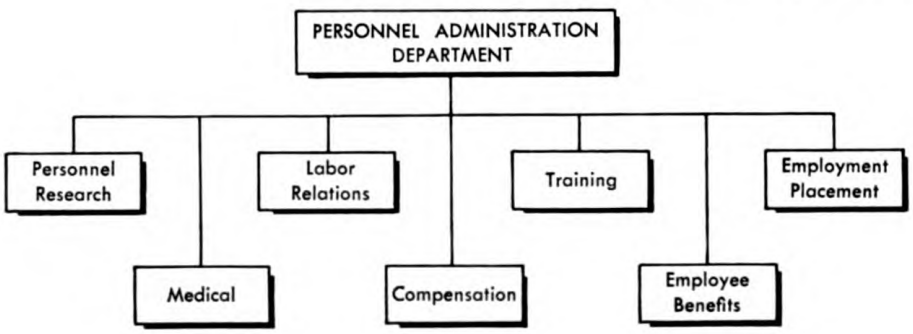
handling grievances and maintaining discipline. Figure 108 is one possible organization of a personnel department.

Development of Personnel Administration

The leaders of scientific management laid the most emphasis on orderly procedures, standardized conditions, and standardization of jobs and time. They tended to overlook or at least to minimize the human factors in labor relations. Although the intentions of men like Taylor were of the best, it was widely thought that what was primarily essential was to interest the men in maximum production, an objective which they felt would be fostered by the proper incentive wage system. Beyond this there appeared to be no need for additional concern.

It was in the period of World War I that management discovered the importance of employment management as such. The reasons for this were related to the growing shortage of workers resulting from the cutting off of immigration and the wartime boom, which began as early as perhaps a year or so after hostilities had broken out in Europe and which

Fig. 108. Personnel department organization.



became more intensified during the next several years as American participation in the war approached and finally took place. In those years it became difficult not only to get satisfactory workers, but also to get satisfactory output from available workers. The turnover of labor with continual quitting, firing, and hiring was extensive and was soon discovered to be adding costs in various ways. Clerical costs in the employment office, the cost of breaking in and training new workers, and similar requirements mounted considerably. It was soon realized also that the high labor turnover was a measure of worker dissatisfaction which could be expressed only by quitting, striking, or reducing output.

Labor unrest spread especially during American participation in the war. Government policy encouraged the formation and expansion of labor unions because it was easier to deal with large groups through leaders in developing national labor policy. Existing labor unions expanded and new ones were organized on a wide scale.

These were the general factors which led management to develop labor policies more closely related to welfare work. As personnel management came in as a supplement to the earlier exclusive preoccupation with scientific management, the first step was to centralize the function of hiring and firing in the hands of a professional and specialized employment department, which soon became widely known as the personnel department. To these functions of hiring and firing there were added the responsibility for training workers and promoting their welfare.

Under earlier arrangements the foreman was responsible for hiring and firing. Henceforth the work of recruiting men meeting the general requirements for jobs was to be the function of the personnel department. It makes a preliminary selection partly on the basis of various tests. Men thus selected are then referred to the foreman for his final selection. Foremen could no longer summarily fire men from the company. The hasty and often ill-advised action of both foremen and workers was supplanted by an impartial investigation of quits and discharges. This provision for review and investigation became in itself a deterrent to such quits and discharges. The rule was soon adopted that those workers with whom foremen were dissatisfied were to be referred back to the personnel department which might arrange to place them elsewhere in the plant where vacancies existed.

From the beginning, personnel departments were considered desirable by many employers in order to offset the attractions of unions and limit their growth and expansion. Nevertheless, unions did expand considerably as has already been noted. After the war, however, many employers joined in an open-shop drive which was assisted by the collapse in business in 1921. As a matter of fact, it was at the time of that depression that personnel administration met its first setback when a number of com-

panies dismissed their personnel managers. With the decline in unions and the belief that personnel work was merely an added frill, some managements felt free to dispense with the department. It is only proper to add that some personnel men were not especially competent. Some of them had little knowledge of business and many knew little about the interests of the workers or the labor problems of industry. It is worth noting that even those companies which cut or actually dispensed with their personnel departments soon gave evidence that they realized the importance of personnel work by establishing foreman-training programs since it had become evident that foremen must become more familiar with better personnel practices.

Within a relatively brief time the so-called "new capitalism" of the 1920's, which took form following the 1921 collapse, demanded increasing personnel work. Hence, those companies which had retained their personnel departments were soon joined by other companies which added such departments. Personnel departments became responsible for recruiting and selecting workers, for training programs, and for health and other welfare activities. They were influential in spreading acceptance of the emphasis on high wages and in the development of profit sharing, employee stock ownership, and welfare activities generally.

The depression beginning in 1929 raised havoc with personnel work. Within a few years the department was drastically cut or dispensed with altogether by a number of companies, although by no means by all companies. Despite the fact that the paternalism of the 1920's faded, the publication of personnel studies, reports, and articles reflected continuing interest on the part of those interested in improving personnel administration. A much broader view was coming to supplant some of the earlier more or less naïve ideas.

It was not long before industry was faced with increasing unionization, encouraged by the provisions of the National Industrial Recovery Act and the subsequent National Labor Relations Act. The response of workers to the appeals of unions certainly reflected incomplete satisfaction with management's handling of labor problems. Whether greater encouragement to wider programs of personnel work during the early years of the depression might have discouraged some of the labor difficulties which arose later cannot be stated with any degree of assurance. Personnel departments were, however, soon expanded somewhat and many of them became involved with general labor relations, including the development of methods for handling grievances and participation in collective bargaining with the unions.

It was not until the approach of and involvement in World War II that outlays for personnel administration increased considerably. Many

of the ideas long being evolved by personnel men were translated into expanded programs which were continued throughout the war and thereafter. Progress in such matters as selection, training, job evaluation, and merit rating has been considerable and may be expected to continue.

Employment Procedures

Requests for Workers. As has already been indicated, foremen in the past did their own hiring directly. Although the procedures they followed differed somewhat, in general the hiring procedure was not very systematic. In place of the more or less haphazard procedures then followed, the steps in the hiring procedure are now definitely recognized and systematically followed by the employment division of the personnel department. As we shall later see, job analysis makes possible the description of jobs, after which job specifications are prepared indicating the requirements sought of workers who are to fill the different jobs. The job specification may include the name of the job, the kind of work, the nature of the operations, the working conditions, the kind of skill necessary, previous experience required, rates of pay, the prospects of promotion, the type of worker, and other pertinent details.

Both the foremen and the personnel department have copies of the job descriptions and specifications. When a foreman needs a worker, he sends his request to the personnel department with the title specified and possibly with the job description. The personnel department can refer to the job description as a preliminary to determining the specifications required of the worker who is to be hired. Sometimes the applications of one or more qualified individuals are at hand in the personnel department and can be referred at once to the department requesting the employee. In any case, the personnel department makes a preliminary selection of one or more persons, who are referred to the foreman needing the worker. Since the personnel department when viewed as a staff function in theory only refers suggested employees, it endeavors to service the line departments as carefully as possible with the result that its work often appears to be of an authoritative type. In any event, although the foreman makes the final choice, his choice is limited to the personnel department's referrals.

Sources of Labor Supply and Recruitment. Although there are various sources of labor supply, for some jobs workers may be available from only one or perhaps several of these sources. For those companies following a policy of promotion from within, the existing work force is a source of supply. Of course, when an employee is promoted to an opening above, it will still be necessary to get a replacement unless his earlier job has

been eliminated. Former employees are often considered a good source of supply, relatives and friends of present employees may be available for work, and employees may be sought through fraternities, lodges, and churches.

Workers looking for jobs frequently apply in person when there is no suitable vacancy and they may be asked to leave information about themselves, often on an application blank. Although such information might be useful when a vacancy arises, the information is usually collected and filed without being referred to later. One reason why there is a tendency not to look up such material at a later date when a vacancy arises is the belief that applicants who called and left information about themselves will have meanwhile become located in a job elsewhere. Correspondence resulting from letters of interested workers is likely to meet the same fate unless a letter happens to be received at a time when there is a vacancy, in which event it may serve as an introduction to a further interview leading to employment.

Since schools and colleges may be good sources of prospective workers for some jobs, high schools, vocational schools, and colleges and universities are often used. If academic achievement is important, it is essential to inquire into course content and the meaning of grades unless tests are given by the company since standards in schools and colleges differ.

Although advertisements are used to get many workers, they are generally used to recruit specialized workers. Their use for unskilled or semiskilled workers who can be easily trained would at certain times result in too many applications, which might simply complicate selection unnecessarily.

Private employment agencies are often used for the same reason even when more or less specialized workers are sought. Under the law these agencies are considered agents of the worker who if he secures employment through one must pay a commission. When considerable difficulty is encountered in getting a particular type of worker the employer pays this fee. Since some of these agencies in the past occasionally engaged in fee splitting with a representative of the employer and in other undesirable practices, they were the subject of considerable criticism and they are now regulated.

Public employment agencies, which had long been advocated by many, were provided for in connection with the unemployment insurance legislation of the 1930's. Although the state employment services were coordinated during the war period into a federal system, they are now under the jurisdiction of the states subject to the maintenance of standards required by the federal government. The wartime labor shortages encouraged a much wider use of these public agencies by employers, some of whom became sufficiently accustomed to using them that they continued to do so.

Labor unions are also a source of labor, and in some industries it is customary to utilize this source extensively. Although some workers are ordinarily present at union headquarters or hiring halls, others can easily be located by the labor organization, or their names can be given to the interested employer.

In the past, when scouting was widely used to get labor, workers for some industries were sought in foreign countries and induced to come to the United States. However, scouting was not confined to getting workers abroad and was frequently used in inducing workers within the country to move to new areas. The practice was often accompanied by certain reprehensible features such as exaggerated claims made for the jobs and inadequacies of housing, which was sometimes either not available at all or was provided by the company without regard for satisfactory living standards. Difficulties of this sort disappeared with scouting and the rise of a generally far more enlightened attitude. What scouting remains is on a much different level and is probably best known in connection with recruiting on college campuses.

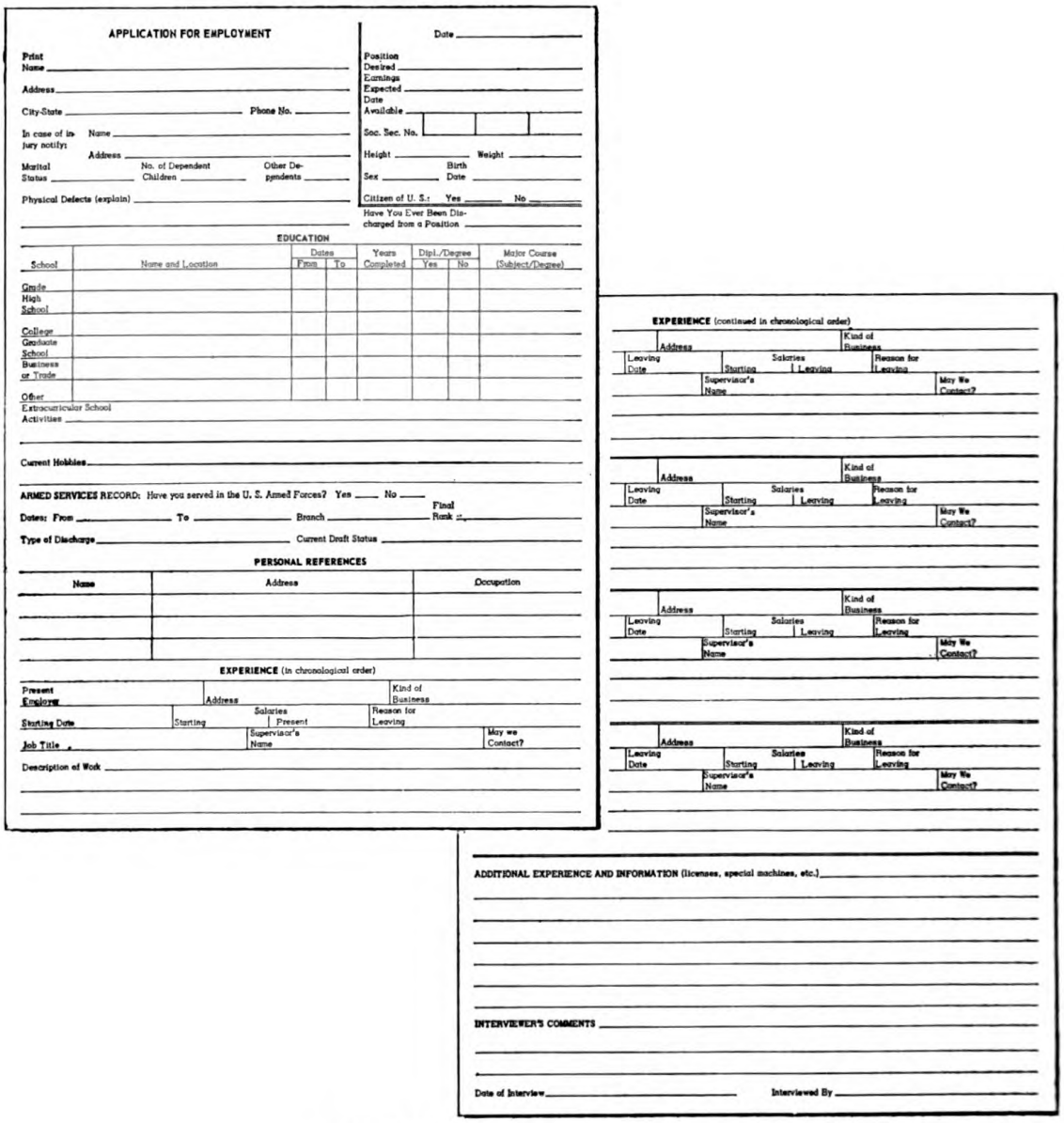
Selection. After recruiting workers, the number needed are selected from among the applicants. The following quotation helps to illustrate the aim of the personnel department to select employees on as objective a basis as possible:

> There is a story in Boston that in the palmy days of the Twenties a Chicago banking house asked the Boston investment firm of Lee, Higginson & Co. for a letter of recommendation about a young Bostonian they were considering employing. Lee, Higginson could not say enough for the young man. His father, they wrote, was a Cabot, his mother a Lowell; farther back his background was a happy blend of Saltonstalls, Appletons, Peabodys and others of Boston's First Families. The recommendation was given without hesitation.
>
> Several days later came a curt acknowledgment from Chicago. Lee, Higginson was thanked for its trouble. Unfortunately, however, the material supplied on the young man was not exactly of the type the Chicago firm was seeking. "We were not," their letter declared, "contemplating using Mr. —— for breeding purposes."[2]

Selection is made on the basis of the job specifications. The general objective is to select workers who most closely fit the requirements. Under certain conditions in the labor market, it may seem possible to get workers who meet the requirements practically 100 per cent or even better, but sometimes much less in the way of requirements may have to be satisfactory.

The usual procedure in selection is to have a short preliminary interview to determine whether or not further investigation will be at all

[2] Cleveland Amory, *The Proper Bostonians* (New York: E. P. Dutton & Co., Inc., 1947), p. 11. By permission of the publishers.



APPLICATION FOR EMPLOYMENT

Print Name _____ Date _____

Address _____ Position Desired _____

City-State _____ Phone No. _____ Earnings Expected _____

In case of injury notify: Name _____ Date Available _____

Address _____ Soc. Sec. No. _____

Marital Status _____ No. of Dependent Children _____ Other Dependents _____ Height _____ Weight _____

Sex _____ Birth Date _____

Physical Defects (explain) _____ Citizen of U. S.: Yes _____ No _____

Have You Ever Been Discharged from a Position _____

EDUCATION

School	Name and Location	Dates From	Dates To	Years Completed	Dipl./Degree Yes	Dipl./Degree No	Major Course (Subject/Degree)
Grade							
High School							
College							
Graduate School							
Business or Trade							
Other							

Extracurricular School Activities _____

Current Hobbies _____

ARMED SERVICES RECORD: Have you served in the U. S. Armed Forces? Yes ____ No ____

Dates: From _____ To _____ Branch _____ Final Rank _____

Type of Discharge _____ Current Draft Status _____

PERSONAL REFERENCES

Name	Address	Occupation

EXPERIENCE (in chronological order)

Present Employer _____ Address _____ Kind of Business _____

Starting Date _____ Starting Salaries Present _____ Reason for Leaving _____

Job Title _____ Supervisor's Name _____ May we Contact? _____

Description of Work _____

EXPERIENCE (continued in chronological order)

Address _____ Kind of Business _____

Leaving Date _____ Starting Salaries Leaving _____ Reason for Leaving _____

Supervisor's Name _____ May We Contact? _____

Address _____ Kind of Business _____

Leaving Date _____ Starting Salaries Leaving _____ Reason for Leaving _____

Supervisor's Name _____ May We Contact? _____

Address _____ Kind of Business _____

Leaving Date _____ Starting Salaries Leaving _____ Reason for Leaving _____

Supervisor's Name _____ May We Contact? _____

Address _____ Kind of Business _____

Leaving Date _____ Starting Salaries Leaving _____ Reason for Leaving _____

Supervisor's Name _____ May We Contact? _____

ADDITIONAL EXPERIENCE AND INFORMATION (licenses, special machines, etc.) _____

INTERVIEWER'S COMMENTS _____

Date of Interview _____ Interviewed By _____

Fig. 109. Employment application blank.

useful. The applicant then fills in an application blank, which calls for such information as his name, address, telephone number, social security number, date of birth, age, sex, marital status, education, military status, experience, references, and last wage received. Although the form is frequently developed for use in selecting workers for all departments, it would often be better to have different forms for different types of jobs. However, the use of too many kinds of blanks would become cumbersome and prove to be merely additional red tape. Figure 109 is a typical application for employment form.

The information on the application blank, together with that developed

from a further interview and perhaps testing, is the basis for selection. Although the important factors have already been indicated in describing the application blank a few additional comments may be in order. The age of an applicant is presumably important in indicating his capacity to do the required work. It is obvious that older men cannot do certain heavy or fast jobs as satisfactorily as younger men. It is also clear that younger men cannot perform jobs requiring considerable experience and maturity as satisfactorily as can older men. At the same time, it should be mentioned that the age requirements which employers think are most satisfactory are frequently rather arbitrary. Investigation will sometimes also show that what is required of the applicant could not have been acquired by him at the age specified.

Somewhat analogous comments may be made with respect to experience. Although experience is of the greatest importance on some jobs, there are occasions when too much stress is laid on it. What is worse, the experience which is sought may not even exist as was shown in the months that priorities were first imposed on industry in World War II and while the system was evolving when help-wanted ads appeared by means of which employers were seeking men experienced in priorities. There were of course no such men since no one could have had the experience.

The application blank will also indicate other factors of importance in selection. Any specialized education which may be necessary will have been noted. The applicant may be interested in a temporary or permanent job, either of which may also be the type of job available. Although applicants interested in advancement rather than immediate earnings may be preferred when there is the possibility of advancement, they should not be hired for jobs on which this opportunity does not exist.

Some of these points can be partly cleared up in the interview which follows the filing of the application blank or the taking of a series of tests. Other factors which the interview reveals are physical characteristics and appearance, which may be thought to be important for some jobs. Although some consideration of adaptability might be desirable in view of possible changes in such matters as production processes, the possession of this ability may be hard to determine.

Interviews. The general objectives to be achieved from interviews may be said to be to gain such information about the applicant as his qualifications, his interests, and whether on the whole he would fit into the organization. In the course of the longer interview following the filling out of the application blank, information about the company and its policies should be given by the interviewer. Although this information ought to be quite specific, too often some important matters are slurred

over. The company is stronger than an individual worker and can afford to acknowledge any weak points or possible disadvantages from the point of view of a worker. Morale would be enhanced over the longer run if this were done.

Interviews should be held privately and in an unhurried manner in order to give the applicant the opportunity to speak and act as he normally would. The interviewer is, of course, responsible for getting certain information and he should have a clear understanding of just what he is after. Sometimes the application blank, which the interviewer has before him, contains spaces for his use. The titles of the spaces as well as the notations which he jots down in the course of the interview are in code. Although he should avoid asking questions already answered on the application blank, it sometimes seems desirable to start the conversation on an informal plane by referring to an item on the application. In all instances, however, the comments should be such as to make the applicant feel at ease, and they should certainly seek to avoid giving any offense.

References. It is customary to ask for business and perhaps personal references. Business references are usually previous employers. Although some references may be checked by telephone, for some purposes letters or forms are sent out. It sometimes happens that the time sequences are such that the employee is already at work before all the references are in. There are some serious limitations to the value of references, especially personal references. Since it is obvious that no one will give as a personal reference the name of anyone he is not entirely certain will support his case and since personnel men thoroughly understand the limitations of such references, application blanks which request the names of personal references may be said to do so largely as a matter of custom. Even references from previous employers are sometimes not checked, especially when new employees are hired for a probationary period before being considered permanent. When there are indications of any irregularities concerning an applicant, however, considerable effort to check references may be made.

There are certain limitations in references from previous employers. For one thing, such references cannot be easily secured from employers for whom applicants are still working. At any rate, it is not customary to do so since this practice would at one time affect employers adversely and at another time employees. A difficulty with references from former employers is the basic assumption on which their usefulness must rest, namely, that the executives or supervisors of any business are necessarily capable, just, and fair. The direct opposite might be true in some cases and the employee might have been too good for the job or company. However, the development of the so-called exit interview within the

recent past has made it possible to depend to a much greater extent on the statements made by the personnel departments of former employers.

Exit Interviews. In the exit interview (Fig. 110) the personnel man interviews employees who have quit or been discharged.[3] Since this interview is very important, it requires considerable care and discrimination on the part of the personnel man. The former employee should be encouraged to speak freely about his job and the company. Since he is no longer with the company and has no further interest in the job he held, he is likely to be inclined to speak frankly. The personnel man should take an objective attitude and indicate no partiality to the company. He will, of course, frequently notice that some employees interviewed on leaving the company will direct malice and express vigorous dislike against one or more individuals who will be blamed, especially by discharged employees, for their difficulties. Since some of the blame may be mistaken while some may be warranted, it is the personnel man's job to separate the wheat from the chaff. The information secured in exit interviews is important and may even lead to changes in the plant. An employee leaving the company may reveal relationships as between foreman and employees or among employees which made it impossible to adjust himself properly and which should be corrected for the benefit of the company as well as other present and future employees.

The personnel department keeps a record file for each employee. When an employee leaves, the information secured at the exit interview is carefully noted and added to the employee's file which is then removed from the files of present employees and placed with those of former employees. Whether or not the company itself was in any way at fault, the information is noted in the file and given to prospective future employers who may ask for references or information regarding former employees. It is for this reason that employer references prepared by personnel departments have taken on added value. They are more objective than they were in the past and certainly far more so than personal references. Unfortunately, exit interviews are not as yet universally provided for.

Tests. The various tests which are available for use in selecting workers fall into four groups, namely, intelligence tests, aptitude tests, trade tests, and special tests. A single test or a battery of tests in combination may be given.

Although they had been known before, intelligence tests first came into prominence when the army needed a way to sort men in World War I. Intelligence tests are supposed to measure such qualities as ability

[3] Cf. Erwin Schoenfeld, "The Non-Directive Exit Interview," *Personnel*, Vol. 34 (November–December, 1957), pp. 46–50.

REPUBLIC AVIATION CORPORATION
FARMINGDALE, NEW YORK

EXIT INTERVIEW

Name _____ Badge No. _____ Day _____ Night _____

Code _____ Date Released _____ Time _____

If Resignation, How Long Considered _____

Reason for Leaving:

_____

_____

Employee's Plans _____

_____

Ass't. Foreman _____

Foreman _____

General Foreman _____

ATTITUDE TOWARD:

	Good	Fair	Poor	Comments
Company				
Working Conditions				
Hours				
Wages				
Job Training				
Employees				

Employee's Comments and Suggestions _____

_____

_____

_____

_____

_____

_____

L-1-8 REV. 1/52

— Republic Aviation Corporation

Fig. 110. An exit interview.

to learn, general alertness, and ability to reason clearly. They do not, however, distinguish aptitudes. A person may have a general ability to learn, but he may have no special aptitude for or interest in certain kinds of work. The original enthusiasm for intelligence tests has been tempered by the development of a better understanding of their limitations.

Special aptitude tests which have been developed for the purpose of determining whether the applicant has the interest in or type of mind necessary for learning and doing the particular kind of work vary considerably both in content and reliability. Some of them attempt to evaluate reasoning power, others to evaluate such qualities as imagination, memory, initiative, and attention. The reliability of some aptitude tests has been called into question. Tests are also used to measure such qualities as acuteness of vision, width of vision, sensitivity to sound, and dexterity.

Trade tests are used to test the actual ability to perform a job. Oral, written, or performance tests may be developed, or some combination may be used. The questions on the oral or written tests are worked out so that they can be answered only by those who know the particular trade or occupation. Some of the written questions may require graphic answers. Performance tests require the actual doing of a piece of work. For many types of jobs, especially where there is a training program or promotion from within, a performance test is not particularly useful because the ability to do a particular job is not the most important requirement.

Although character and personality tests have been developed, the qualities measured, which are vague and difficult to define, have not always been defined by those who prepare such tests. Such tests are of limited use in personnel work.

Although the widespread use of tests in World War I was followed by their use in industry thereafter, the limitations of available tests soon became apparent. A wide variety of tests was developed for use in sorting men in World War II. The much greater volume of testing resulting from the mobilization of so many individuals for the armed services not only made a good number of people test-conscious, but it also resulted in a larger corps of persons whose assignments were connected with testing during the war. In some quarters testing appeared to have virtually developed into a fad, which among some was assumed to be a panacea for a wide variety of problems. However, industry has apparently not adopted excessive testing programs. In general, tests should be used only when supervised by someone who has extensive training in measurement.

In deciding on the usefulness of tests, it is important to keep in mind

Outgoing personal telephone calls are not to be made on Company phones. Public coin telephones are located in the plant and the cafeteria for use during rest periods and lunch hours.

YOUR FIRST DAYS

The first few days on your new job will naturally require adjusting yourself to your work. Our Employment Office people try to get you started as quickly as possible and make the process as easy as they can. You have an important job, however, and defense regulations require us to be extremely thorough in our employment procedures.

The job application form enables the Employment Office to make a careful study of each applicant's qualifications. Anyone who applies is given fair and careful consideration. Job openings are filled by those considered best qualified for the positions available.

The Company accepts your application with the understanding that all statements are truthful to the best of your knowledge. Misstatements of fact on an application are sufficient cause for dismissal.

YOUR FIRST DAYS

PHYSICAL EXAMINATIONS

Your pre-employment medical examination was given by doctors and nurses of the Company Medical Division. Every new employee has to pass this examination and may be asked to take further physical examinations, such as at the beginning and termination of absence due to illness.

Physical examinations are primarily to detect contagious diseases, to protect the health of all employees, and to make sure you are assigned only to a job you are physically capable of performing.

PHYSICAL EXAMINATIONS

— Republic Aviation Corporation

Fig. 111. A page from an employee handbook.

that the objective is to determine whether an applicant for a job has what is necessary for job success. A test or group of tests which can determine this should be used when it is available.

Physical Examinations. Physical examinations (Fig. 111) are commonly required on the theory that they make it possible to place workers in jobs for which they are physically qualified, that they protect other employees, and that they reveal persons who may be susceptible to

occupational diseases. In some companies periodic physical examinations are provided. Workers sometimes voice dissatisfaction with the requirement of a physical examination.

Placement. The final selection of an employee is commonly made after a short interview with the foreman or head of the department where he is to work. In this interview the foreman makes a brief inquiry to determine whether the applicant seems to be appropriate for the department and the work. If the applicant has met all the other requirements and is found satisfactory by the foreman, he is assigned to the position for which he was selected. This is called placement. In the process of introducing him to his job he is told something about the history of the company and its policies. The wage plan, the payroll procedures, the status of the union, health and safety rules, and any medical or other services are explained. If a company handbook is available a copy is given to the new employee, together with a copy of the latest issue of the plant magazine or house organ. At some time in the course of these details, but occasionally a few days later, the employee is asked to fill out various forms for social-security and income-tax purposes, as well as for whatever company pension and insurance plans there may be. If there are voluntary features in the pension and insurance plans, it is considered best to allow a few days to think them over on the basis of the literature which is generally provided.

In the process of placement the new employee is introduced to his fellow workers. Although the personnel man may have explained some of the rules of the plant or department in which the new man will work, frequently the foreman does this when the worker goes on the job. The foreman will in any event make a more detailed explanation than that given by the personnel man.

Frequently a personnel man comes around somewhat later, perhaps in a day or so, to make a general inquiry of the new worker on how he is finding the job, whether he has any questions, and similar matters.

It will be noted on the face of the accompanying "Starting Notice" (Fig. 112) that such a notice must be in the hands of the foreman before a new employee can go to work in the company which uses it. Although the face of the card provides for some fairly basic data, the back of the card is perhaps of more interest. The company which uses it has a three months' probationary period for new employees. At the end of each month the foreman rates the probationary employee on the qualities listed horizontally above the blank spaces to be filled in. Although the letter ratings have a rather general meaning, as is indicated on the bottom of the card, the system provides a satisfactory means of checking the progress of the employee. If he has to be warned about a particular matter, the foreman makes a notation in the appropriate

STARTING NOTICE

Date.....

This card must be received by Foreman before starting to work

Employ.....Clock No.....

for Dept.....Effective.....

Nature of work.....

Rate per hour.....

Signed.....

Fig. 112a. Starting notice.

PROBATIONARY EMPLOYEE RATING

Month	Adaptability	Attitude	Quality	Dependability	Attitude to Safety	Quantity	Foreman Date	Supt. Date
1st								
2nd								
3rd								
12th								

Remarks.....

.....

Recommended as follows: Date.....

A—Good B—Fair C—Poor Fin. Appr.....

Fig. 112b. Probationary employee rating (reverse side of starting notice).

space and the absence of further notes of the same kind in subsequent periods is taken to indicate progress. Changes upward in the letter grades would also show progress. It will be noted that the superintendent also initials the ratings. The personnel director of this company reviews the record and the qualities of the new employee at the end of six months when he is asked to come to the personnel office to sign up for insurance. The final review at the end of twelve months is more or less a formality.

Promotion and Transfer. Policies on promotion, transfer, demotion, and layoffs must not only be carefully formulated, but they should also

REPUBLIC AVIATION

APPLICATION FOR TRANSFER

TO BE COMPLETED BY EMPLOYEE:

NAME:	BADGE NUMBER:	DEPT. NO.:
JOB TITLE:		GRADE:
TYPE OF JOB REQUESTED:		
QUALIFICATIONS: LIST ONLY EDUCATION & BUSINESS EXP. RELATED TO REQUESTED JOB. — SCHOOL:		DATES:
SCHOOL:		DATES:
BUSINESS EXPERIENCE: (SHOW DATES)		

THIS REQUEST FOR TRANSFER IS MADE VOLUNTARILY AND IN ACCORDANCE WITH COMPANY POLICY.

EMPLOYEE'S SIGNATURE:	DATE:

TO BE COMPLETED BY EMPLOYEE'S SUPERVISOR:

WILL YOU APPROVE TRANSFER? YES ☐ NO ☐ - IF NO, EXPLAIN ON BACK.	EMPLOYEES RATING: ABOVE AVERAGE ☐ AVERAGE ☐ BELOW AVERAGE ☐	
WILL YOU REQUIRE REPLACEMENT BEFORE TRANSFER? YES ☐ NO ☐	SUPERVISORS SIGNATURE:	DATE:

TO BE COMPLETED BY INDUSTRIAL RELATIONS REPRESENTATIVE:

DATE OF HIRE:	AGE:	D.N. CODES AND DATES:	NUMBER OF DAYS ABSENT LAST YEAR:
RAC EXPERIENCE - JOB TITLE:	NO. MOS.	JOB TITLE:	NO. MOS.
RECOMMENDED FOR TRANSFER: YES ☐ NO ☐	I.R. REP. SIGNATURE:		DATE:

DISPOSITION					
REFERRED TO:	DATE:	RESULT:			
REFERRED TO:	DATE:	RESULT:			
TRANSFERRED - NEW JOB TITLE:	DEPT.:	GRADE:	RATE:	EFF. DATE:	

NOTIFICATION OF TRANSFER

TO: WAGE AND SALARY SECTION:

NAME:	BADGE NO.:	DEPT.: FR. TO	REQUISITION NO.:	
NEW JOB TITLE:	GRADE:	RATE:	EFF. DATE:	SHIFT:
REMARKS:				
NAME OF NEW SUPERVISOR:	I.R. REP. SIGNATURE:		DATE:	

RAC 1-1-903 - ORIG. 5/10/60

— Republic Aviation Corporation

Fig. 113. Application for transfer.

be followed in practice. A promotion is an advancement to a higher-ranking position with greater importance in responsibilities, duties, skill, and wages. A transfer, on the other hand, is a change from one department to another with no change in rank. When an employee is transferred, his new job is one in which his responsibilities, duties, skill, and wages are evaluated the same as the job from which he is transferred.

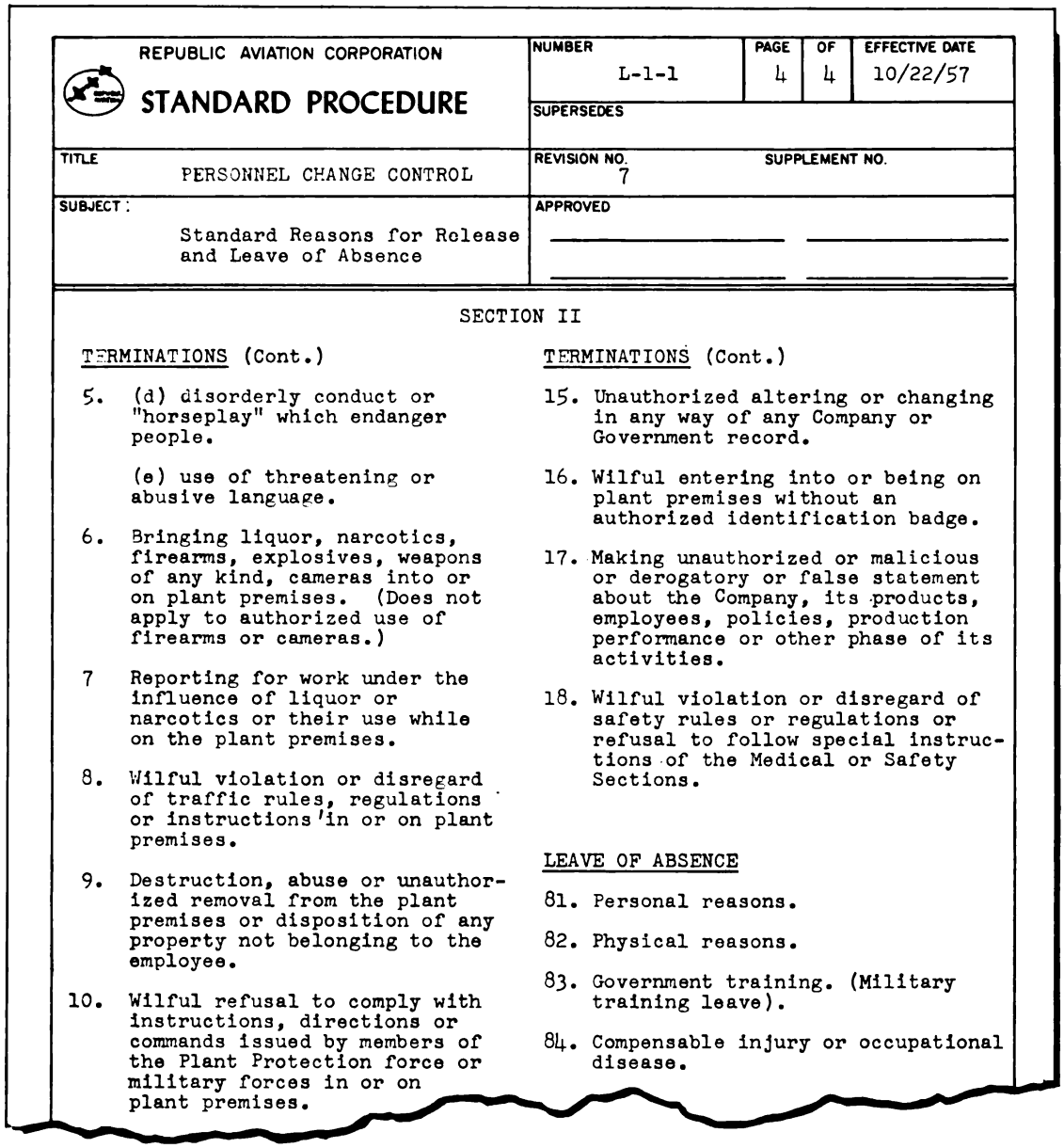
The policy of promotion from within is now widely practiced for several reasons. It is recognized that unless promotion is possible capable workers are likely to leave as soon as an opportunity arises. Promotion also makes it possible to use the abilities of workers who are already known. Future needs for workers can be provided for in this way. Promotion should be on the basis of capability and accomplishment rather than on the basis of seniority alone. Although seniority should be the determining factor only when two or more workers are equally competent, unions lay greatest stress on seniority as the determining factor. A promotion policy contributes to morale and helps to reduce labor turnover provided, of course, that the promotions are wisely made. If they are not, workers will soon discover weaknesses of the procedures being followed.

A satisfactory promotion policy requires that definite lines of promotion be established and also followed. A systematic program provides for making promotion according to a plan in which experience on a job helps to prepare for the next higher jobs.

There may be instances where promotion from within is not the best policy. For example, if it is desirable to bring in new ideas, this can best be done by getting men with experience elsewhere.

Transfer may be made for a variety of reasons, including the desire of employees (Fig. 113). In the past, workers were frequently being hired in one department while layoffs were taking place in other departments. Since it is now considered good policy to avoid such a situation as far as possible, arrangements are worked out to make transfers from one department to another where possible. There are, however, additional reasons for making transfers. Probably the most obvious one is to correct faulty placements of one kind or another. But in order to make possible the transfer of workers from one department to another when work falls off in their department, it is desirable if possible also to make transfers for the purpose of developing versatility. It is also desirable to develop a certain amount of versatility to permit transfers within the department in the event of absence. A variety of other reasons might be cited as requiring or at least suggesting the desirability of transfers, including difficulties with other workers, changes in the job interests of workers, the desirability of relieving monotony, and discipline.

Discipline. Although rules and regulations of various sorts are neces-



REPUBLIC AVIATION CORPORATION

STANDARD PROCEDURE

NUMBER	PAGE	OF	EFFECTIVE DATE
L-1-1	4	4	10/22/57

SUPERSEDES

TITLE: PERSONNEL CHANGE CONTROL

REVISION NO. 7 SUPPLEMENT NO.

SUBJECT: Standard Reasons for Release and Leave of Absence

APPROVED

SECTION II

TERMINATIONS (Cont.)

5. (d) disorderly conduct or "horseplay" which endanger people.

(e) use of threatening or abusive language.

6. Bringing liquor, narcotics, firearms, explosives, weapons of any kind, cameras into or on plant premises. (Does not apply to authorized use of firearms or cameras.)

7 Reporting for work under the influence of liquor or narcotics or their use while on the plant premises.

8. Wilful violation or disregard of traffic rules, regulations or instructions in or on plant premises.

9. Destruction, abuse or unauthorized removal from the plant premises or disposition of any property not belonging to the employee.

10. Wilful refusal to comply with instructions, directions or commands issued by members of the Plant Protection force or military forces in or on plant premises.

TERMINATIONS (Cont.)

15. Unauthorized altering or changing in any way of any Company or Government record.

16. Wilful entering into or being on plant premises without an authorized identification badge.

17. Making unauthorized or malicious or derogatory or false statement about the Company, its products, employees, policies, production performance or other phase of its activities.

18. Wilful violation or disregard of safety rules or regulations or refusal to follow special instructions of the Medical or Safety Sections.

LEAVE OF ABSENCE

81. Personal reasons.

82. Physical reasons.

83. Government training. (Military training leave).

84. Compensable injury or occupational disease.

— Republic Aviation Corporation

Fig. 114. Page of a standard procedure for personnel change control.

sary in all plants (Fig. 114), they differ widely in details from firm to firm and industry to industry. Some rules are unwritten and traditional, while others are found in formal regulations. The general objective is to promote efficiency by eliminating such undesirable practices on the part of individuals as tend to interfere with the maintenance of as great a degree of cooperation as possible. Along with this are rules regarding smoking, safety precautions, absence and lateness, and similar matters. Incompetence and insubordination would naturally be reflected in re-

peated violations of the rules. Definite rules governing violations of regulations and the extent of punishment should be established.

Since difficulties which arise from the inability of an individual to cooperate harmoniously with fellow workers or the foreman may become increasingly serious, they should be investigated at once. Bordering on this type of difficulty are real or imagined grievances of one kind or another which, if not located, isolated, and settled at their inception, or at least at the earliest possible moment thereafter, often snowball into large and serious problems going far beyond their original relatively small importance. The settlement of grievances is a problem in itself and is mentioned here only because occasions might arise when discipline is called for.

A disciplinary problem of any kind requires as a first step the making of a proper analysis of the problem. In the course of doing so, interviews are usually held with the offending individual or individuals. Investigation of and inquiry into surrounding factors must be made to establish the extent and significance of the offense preliminary to taking action. Sometimes such investigations are not undertaken by management representatives alone, a committee of employees being appointed for the purpose. Contracts with unions generally provide for elaborate grievance procedures in which the steps to be followed are specifically stated.

Disciplinary action ranges from reprimand to discharge. Demotion, which is the opposite of promotion, may be considered a satisfactory solution in some instances. As noted previously, the foreman alone can no longer discharge an employee, and personnel policy may seek to avoid discharges on a more or less summary basis. Beyond this, however, discharge has been limited further by collective bargaining agreements which may require hearings and the setting up of specifically defined powers of discharge.

Absenteeism. The analysis of absenteeism requires that a distinction be made between voluntary and involuntary causes. Involuntary absences are the result of death or illness in the employee's family or the illness of the employee himself. On the whole, there is little which the company can do to control such absences unless the employee is ill very frequently, in which case some kind of permanent solution may be necessary. When voluntary absenteeism is found to be the result of irresponsibility of one kind or another on the part of the employee, disciplinary action is likely to be necessary. But what may appear superficially to be voluntary absenteeism may turn out upon analysis to be caused by dissatisfaction with the foreman, the working conditions, or similar factors. In general, employees dissatisfied with the company on various grounds will have a low morale, which may be reflected in frequent absence from the job. Such causes of dissatisfaction can be overcome by transfer,

safety provisions, the improvement of working conditions, an education and training program, and other general measures to improve morale.

Layoffs. When layoffs become essential, it is desirable to follow definite policies laid down in advance. Competence, seniority, family status and dependents, the general value of the employee to the company, and possible placement in another department are the most important considerations in deciding on who should be laid off. When it is possible to do so in advance, notice of layoffs should be given to regular employees; and it is also desirable to give information as to the probable reemployment date if a reasonably satisfactory estimate can be made. Unless a full explanation of the reasons prompting the layoff is given, erroneous and possibly dangerous rumors will circulate. Some companies pay a definitely specified amount of dismissal compensation.

Seniority provisions in union contracts under which layoffs take place in the order of least seniority have become widespread. The employee with seniority is said to bump another with less seniority whom he replaces. Seniority provisions result in many complications. For instance, if a man has seniority in one department but is transferred or promoted to another department, the question arises as to what his seniority is. The ability and experience of some workers may be transferable to some but not to other departments. Although a plant-wide seniority system may seem to be the answer, it actually raises still further difficulties in a large plant. Bumping which extends all along the line and across departments may result in considerable disruption.

The widespread increase in seniority provisions has introduced considerable inflexibility in industry generally. Workers feel they cannot afford to leave jobs without forfeiting seniority rights even if they could do better elsewhere. The tendency, consequently, may be to reinforce dependence on the unions to make intensified demands on present employers.

Employment Stabilization. For various reasons business firms seek to stabilize employment so far as possible. The fixed charges continue even when the equipment is not used. Labor costs are higher when production is irregular because of the loss of efficient workers, the cost of training new workers, and the spoilage and accidents which arise with inexperienced workers. The experience rating provisions of some state unemployment-insurance laws offer an incentive to stabilize employment by levying a substantially lower tax on employers whose record of labor turnover is low.

Irregularity in employment is the result of internal or external causes. Among the internal causes may be poor production planning, lack of coordination between departments, and failure to anticipate changes in demand. External factors are seasonal and other fluctuations, new competition, and changes in demand.

Although the personnel department is very much interested in the possibilities of stabilizing employment, its own efforts must be primarily confined to developing a system of transfers, which may also involve a training plan for workers. The production planning department, the product and process research and development laboratories, the market research and the sales departments are necessarily responsible for their specialized contributions to coordinated efforts toward employment stabilization.

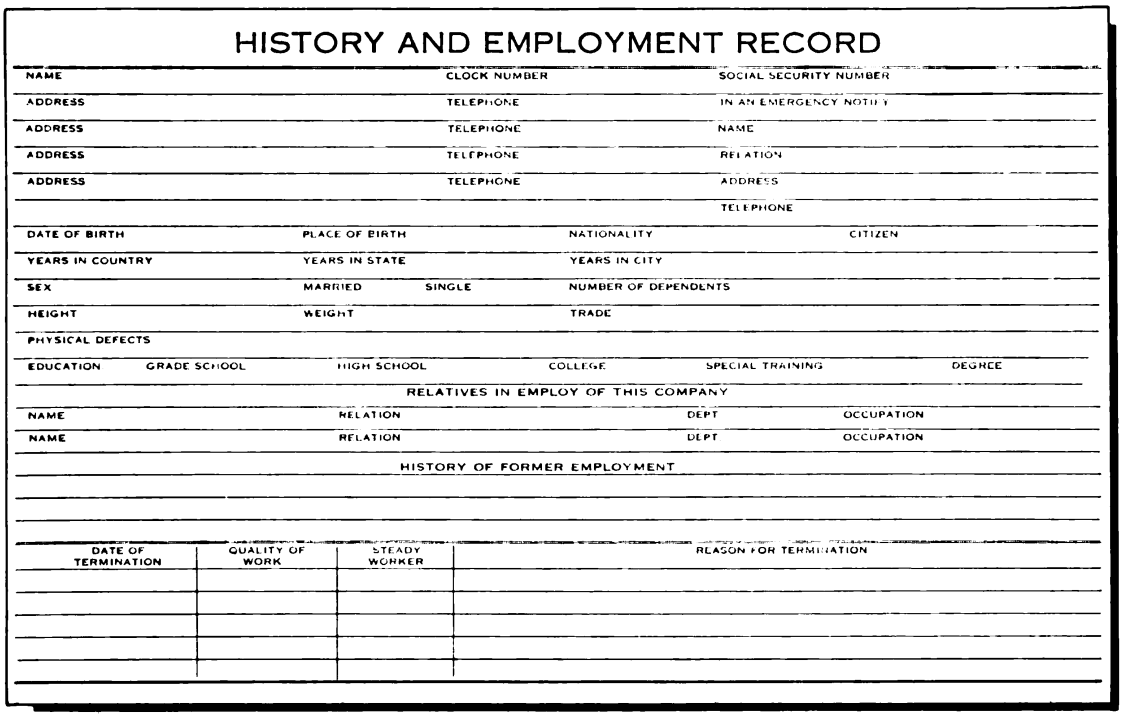
Labor Turnover. High labor turnover is costly. The expense incidental to hiring new workers includes not only the outlays for the employment department, but also the cost of training new workers as well as the loss of production from inefficiency and waste. There may also be intangible results of an undesirable type, such as the reputation which develops and spreads about the company. For reasons such as these, considerable attention is directed to the question of turnover. The effort should be to make as careful an advance estimate of personnel needs as possible. The possibility of transferring workers to other departments has already been mentioned. Consideration might also be given to arrangements to close the plant in slack periods for maintenance work and vacations. Figure 114 is part of a personnel change control procedure covering standard reasons for release and leave of absence.

Of course, some turnover is necessarily unavoidable and some of it may even be desirable. For example, some workers may be on jobs which they do not like or for which they are not suited, and some jobs will open up as a result of promotions or retirement.

In analyzing turnover the separations from the company may be divided into voluntary and involuntary separations. Some of the voluntary separations arise for reasons somewhat similar to those which cause voluntary absenteeism. A worker may live too far from the plant, he may consider the work uninteresting, or he may have difficulty in getting along with his fellow workers or his supervisor. In addition, a worker may also get what he regards as a better job elsewhere.

Involuntary separations may be divided into two groups. Ordinarily, most of them are layoffs resulting from a decline in output which makes a smaller work force necessary. The second group includes those which are really discharges for disciplinary reasons, the important features of which have already been discussed.

Labor turnover can be calculated by using formulas. If T is the turnover, S the separations, and W the average working force for the period, then $T = S/W$. Thus, if the separations are 75 and the average working force 150, then the turnover is .5. By multiplying this result by 100 the rate of turnover per hundred employees is found to be 50 in this example. The formula for finding the turnover per 100 workers is therefore



HISTORY AND EMPLOYMENT RECORD

NAME | CLOCK NUMBER | SOCIAL SECURITY NUMBER

ADDRESS | TELEPHONE | IN AN EMERGENCY NOTIFY

ADDRESS | TELEPHONE | NAME

ADDRESS | TELEPHONE | RELATION

ADDRESS | TELEPHONE | ADDRESS

TELEPHONE

DATE OF BIRTH | PLACE OF BIRTH | NATIONALITY | CITIZEN

YEARS IN COUNTRY | YEARS IN STATE | YEARS IN CITY

SEX | MARRIED | SINGLE | NUMBER OF DEPENDENTS

HEIGHT | WEIGHT | TRADE

PHYSICAL DEFECTS

EDUCATION | GRADE SCHOOL | HIGH SCHOOL | COLLEGE | SPECIAL TRAINING | DEGREE

RELATIVES IN EMPLOY OF THIS COMPANY

NAME | RELATION | DEPT | OCCUPATION

NAME | RELATION | DEPT | OCCUPATION

HISTORY OF FORMER EMPLOYMENT

DATE OF TERMINATION	QUALITY OF WORK	STEADY WORKER	REASON FOR TERMINATION

Fig. 115. History and employment record.

$T = S/W$ (100). In a period when general layoffs are not usual, such as during a sustained boom, the separations would be equal to the replacements and would for the most part represent quits and discharges, not layoffs.

Some personnel men are not satisfied with a calculation of the general turnover and therefore make separate calculations for layoffs, discharges, and quits, to help in analyzing the causes more carefully.

Personnel Records and Research. The personnel department keeps detailed records covering jobs and employees.[4] The record file for each employee includes a folder and a separate card file. The file folder of an employee includes his original application blank, references, results of tests, and his subsequent job history with the company. All the original data concerning apprenticeship training, if any, together with a copy of the contract, promotions, transfers, and so on are retained in the file. The separate card file (Fig. 115), which is generally also kept as a cross index, involves the preparation and keeping up to date for each employee of a history and employment record card containing information taken from the data in his folder. The cards are kept in alphabetical order and are cross-indexed with the folders, which are in numerical order, by the clock or check number of the employees.

The personnel department also sets up procedures to classify and

[4] National Industrial Conference Board, Inc., New York, *Forms and Records in Personnel Administration*, Studies in Personnel Policy No. 175, 1960.

reevaluate employees. Records of absences, lateness, and accidents may be kept not only, or necessarily, for each employee but also for statistical study, while turnover data are collected for analysis and study. If the department does systematic research in personnel and related management problems, full-time research employees who prepare studies on such matters as wage systems, job analyses, time and motion studies, and so on, may be on the staff.

Conclusion. Personnel administration is found in manufacturing, banking, public utilities, and retailing. In manufacturing, the department may deal with and be called industrial relations. However, since there are various existing and possible arrangements for dealing with at least some aspects of industrial relations, further generalization is difficult.

QUESTIONS

1. In view of the fact that the activities of personnel departments were severely cut during periods of poor business conditions in the past, should it be expected that under similar conditions this would happen again?
2. In what sense is the personnel department "staff" or "functional"?
3. What are the sources of labor supply? To what extent would they be the same for all kinds of positions?
4. What is the procedure in selection? To what extent may selection be said to involve discrimination?
5. What principles are involved in good interviewing? Would you expect all interviews to be along similar lines?
6. Do you think the exit interview desirable (*a*) from the point of view of the company in order to get information, (*b*) from the point of view of the employee who is leaving and whose future job may depend on it?
7. In view of the widespread practice of testing in industry, for admission to college and graduate school, to discover aptitudes, in the services, and so on, can a case be made for the idea that testing, like seniority policies, may tend to encourage inflexibilities and discourage innovations and progress by directing individuals along the paths seemingly indicated by the requirements of tests? In answering this question, try to recall how many and what kinds of tests (other than tests in courses) you and your friends have taken in the past ten years.
8. What difficulties arise in connection with seniority?
9. What should good promotion and transfer policy involve?
10. Conduct an interview with one student playing the role of a campus interviewer for a company's college graduate trainee program and another student acting as the interviewee.

CASE: Dover Company

Five years ago the Dover Company had an employee attitude survey made. The answers were generally favorable. The employees were satisfied with their jobs, working conditions, and supervisors. However, an analysis of some unfavorable comments and suggestions led management to take the following

steps: (1) provide rest periods and coffee breaks; (2) make merit rating the basis of pay raises; (3) invite the purchase of company stock at less than the market price. No employee names had appeared on the questionnaires and, of course, no individual employees felt any repercussions from the survey.

Although there was no special reason for assuming that employee attitudes had changed, the management felt that after an interval of five years a second survey might be in order. Questionnaires were sent to the employees and almost all of them responded. Over 80 per cent of them included comments in addition to their written answers. Analysis of the results indicated that employee attitudes toward management and wages were favorable. However, the general attitude toward the company had dropped. There were also considerable differences among different departments. It appeared that some employees were not familiar with company activities and policies. There was a wide impression that favoritism played an important part in filling jobs. Analysis of the data for different departments showed a considerable difference in the answers to the question concerning how the employees thought jobs were filled.

1. Would the change in employee attitudes be primarily attributable to unfamiliarity with company policies and the belief there was favoritism in filling jobs?
2. What difference does it make that the employees have the attitudes which they have in any company?
3. What do you think the Dover Company should do to improve attitudes?

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Chapter XVIII

Evaluating Jobs and Workers

Job Evaluation

Job Analysis. After jobs have been standardized in accordance with the procedures already discussed, they must be analyzed and carefully described so that they may be evaluated in relation to each other. In job analysis the jobs themselves are studied, and not the men presently occupying them since some of the men may happen to be doing a combination of work which will not be typical of the job in the future.

Job analysis, which is the basis for a written job description, involves the study of the essential features and requirements of each job. The *job description* shows in detail the work which must be done on each job, including the conditions of work and the responsibility involved. After the job has been analyzed and described, a *job specification*, which is a statement of the requirements sought of the worker who is to fill the job, is written (Fig. 116).

Job Evaluation. As personnel work expanded during and after World War I, some method of evaluating jobs in relation to each other had to be developed. Although the personnel men devised systems of job evaluation for their purposes, job evaluation took on a larger role with the passage of time. When the unions expanded, for example, and union officers frequently asked why certain wage differences existed, management found itself without adequate answers so that job evaluation became essential in order to justify whatever differences seemed reasonable and proper.

Since job evaluation is essential for other reasons even if unions did not exist, it is increasingly used.[1] Job evaluation makes it possible when the occasion arises to explain to given individuals why particular jobs

[1] Cf. Leonard Bono, "Job Evaluation — An Effective Tool for Management," *Boston University* (College of Business Administration) *Business Review*, Vol. 7 (Fall, 1960), pp. 20–23.

JOB RATING SPECIFICATION

CODE NO. 535-9
DEPT. _____
GRADE H-9
POINTS 341

JOB NAME Electronics Technician

FACTOR	SPECIFICATION	RATING	
		D	PTS.
EDUCATION	Requires use of fairly complicated drawings, variety of electronic recording instruments. Some trade knowledge in electronics field. Equivalent to 2 years high school plus 2 to 3 years trades training.	3	42
EXPERIENCE	Over 3 years up to 5 years.	4	88
INITIATIVE AND INGENUITY	Requires ability to plan layouts of difficult electrical circuits and troubleshoot from incomplete information, where considerable ingenuity, initiative and judgment is required.	4	56
PHYSICAL DEMAND	Work with light weight material or occasionally with average weight material.	2	20
MENTAL OR VISUAL DEMAND	Must concentrate mental and visual attention closely planning and laying out complex work, tracing circuits, from incomplete information.	4	20
RESPONSIBILITY FOR DAMAGE TO EQUIPMENT	Probable damage to equipment or process through carelessness would seldom exceed $1,000.	4	20
RESPONSIBILITY FOR MATERIAL OR PRODUCT	Probable loss due to damage to material or product through carelessness would seldom exceed $500.	4	20
RESPONSIBILITY FOR SAFETY OF OTHERS	Compliance with standard safety precautions would be sufficient to prevent lost-time accidents to others	3	15
RESPONSIBILITY FOR WORK OF OTHERS	Responsible for instructing and directing up to 10 persons.	3	15
WORKING CONDITIONS	Good working conditions, little contact with disagreeable elements.	2	20
HAZARDS	Occasional exposure to high voltage which could result in total disability or death.	5	25

— Republic Aviation Corporation

Fig. 116. Job specification.

are not suitable for them. It is also useful in determining whether men are properly placed, whether given applicants should be hired, and which person is most suited for a particular promotion. Probably more important is the fact that job evaluation bears an important relationship to the setting of wage rates.

Methods of Job Evaluation. The simplest form of job evaluation is called *job ranking*. One way to rank jobs is to select the jobs of highest and lowest importance and then to pick out the jobs of average difficulty and importance to be placed in the middle of the list. All of the other jobs to be rated are then compared with the jobs already on the list and placed in what is considered the right order. When there are so many jobs that the list becomes too long, the job titles may be written on cards which are sorted into a series of job grades in the order of their importance. This method is sometimes listed separately as job classification. Since the job-ranking method involves the ranking or grading of jobs on the basis of a rough measure of their increasing importance or difficulty, it is frequently difficult to justify the ranking if exception is later taken to any job thus ranked.

The *factor-comparison method* goes a step further by evaluating from 15 to 25 key jobs with a rating scale which attempts to rate such factors as skill, effort, responsibility, and working conditions. After the key jobs have been determined, they must be ranked factor by factor. Point values are assigned for these factors to the key jobs, which can then be ranked in the order of their total point values. Part of the base pay for each job is then allocated to each factor. After the job values for the key jobs have been thus determined, each of the other jobs is evaluated by comparing it with the key job to which it is most similar. Evaluation in dollars is then carried out by assigning, on a factor by factor basis, factor values to the similar factors of individual jobs.

Under the *point system* of job evaluation, the four essential factors common to all jobs — skill, effort, responsibility, and working conditions — are assigned values or points ranging from a minimum to a maximum. Each job is evaluated by assigning values or points ranging from a minimum to a maximum to the four factors. This procedure in effect weighs each one of the factors according to its importance, so that when the points are totaled the job is evaluated and may be compared with other similarly evaluated jobs. It is, of course, essential to translate the evaluation in points into dollars. This is done by comparing the wages of selected representative jobs with the wages being paid for similar jobs by other companies in the community.

Since it is sometimes felt that more accurate measurement is possible by using more than the four factors mentioned, in practice many point systems have at least several more although they are in reality sub-

divisions of the four basic factors. Some systems, which use as many as 10 to 25 factors, include among the additional factors such features as education, experience, complexity of the work, initiative, hazards, physical and mental demands, and so on. Although it may be theoretically true that the greater the number used the greater will be the possibility of accuracy in the evaluation, it should also be kept in mind that the system may become too cumbersome and in the end defeat the purpose of achieving greater accuracy.

When there are hundreds or even thousands of different kinds of jobs in a company, jobs are grouped into labor grades on the basis of their point values. For instance, all jobs with total point values from 100 to 130 might be grouped in one labor grade with all jobs in that grade having the same base pay. Each grade or class also has a range of pay and the scale is sometimes worked out so that this range overlaps both the next lower and the next higher grade.

If job evaluation is to be done properly, it requires a thorough technical understanding of the jobs and a good deal of experience. Although the aim is to get as objective a result as possible, it is clear that a certain amount of judgment necessarily enters into the results.

Example of Point-System Job Evaluation. The procedures in job evaluation by the point system may be illustrated by reference to an example in the drop forging industry.[2] Although the four main factors in the job evaluation are those which were previously mentioned, they are subdivided as follows so that there are eleven in all:

Skill

1. Education or trade knowledge
2. Experience
3. Initiative and ingenuity

Effort

4. Physical demand
5. Mental or visual demand

Responsibility for

6. Equipment or process
7. Material or product
8. Safety of others
9. Work of others

Job conditions

10. Working conditions
11. Hazards

These factors are broken down into degrees, 5 for each, and each job in the forge shop is given ratings in degrees for each factor, which are transferred to the job-rating sheet made out for each job. A job rating sheet is shown here (Fig. 117) for a die sinker "A."

It will be noted from the rating sheet that the basic points assigned to each factor as shown in the next to the last column add up to 100.

[2] *Job Evaluation in the Drop Forging Industry*, Drop Forging Association, Cleveland, Ohio, n.d.

JOB RATING SHEET

Job Title Die Sinker "A"

Job Definition (if other than standard) ✓

OBSERVER'S RATING

Factors	1st Deg.	2nd Deg.	3rd Deg.	4th Deg.	5th Deg.		Points
1. Education				X		14	56
2. Experience				X		22	88
3. Init. and Ingenuity				X		14	56
4. Phys. Demand			X			10	30
5. Ment. or Vis. Demand				X		5	20
6. Equip. or Process			X			5	15
7. Mat. or Product			X			5	15
8. Safety of Others		X				5	10
9. Work of Others		X				5	10
10. Working Conditions		X				10	20
11. Hazards		X				5	10
					Total points		330

Date..... By.....

Fig. 117. A job rating sheet.

A rating in which all factors were of the first degree would therefore be only 100, whereas a maximum rating would be 500 points.

Job Evaluation and Wage Rates. In deciding on wage rates for the different grades of labor, it is desirable to make a survey of wage rates for similar jobs in the community. In making this survey, the job descriptions for a certain number of key jobs may be compared with those at other companies from which information is sought. When the information regarding the wages they pay for similar jobs has been secured, together with related information on any benefits, bonuses, and other fringe benefits, the next step is to convert the data into comparable rates which will take into account the details of the system which it is desired to install. Some of the factors which must be taken into account in doing this are (1) whether there is to be one base rate for each labor grade, (2) whether there is to be a maximum and minimum rate for each grade, with the rate increasing periodically according to a predetermined scale on the basis of individual employee merit, (3) whether there is to be a maximum and minimum, with the rate increasing up to a certain point on the basis of length of service and thereafter on the basis of merit, (4) what the relationship should be between the base rate and other factors, such as the bonus system, supplementary benefits, and so on.

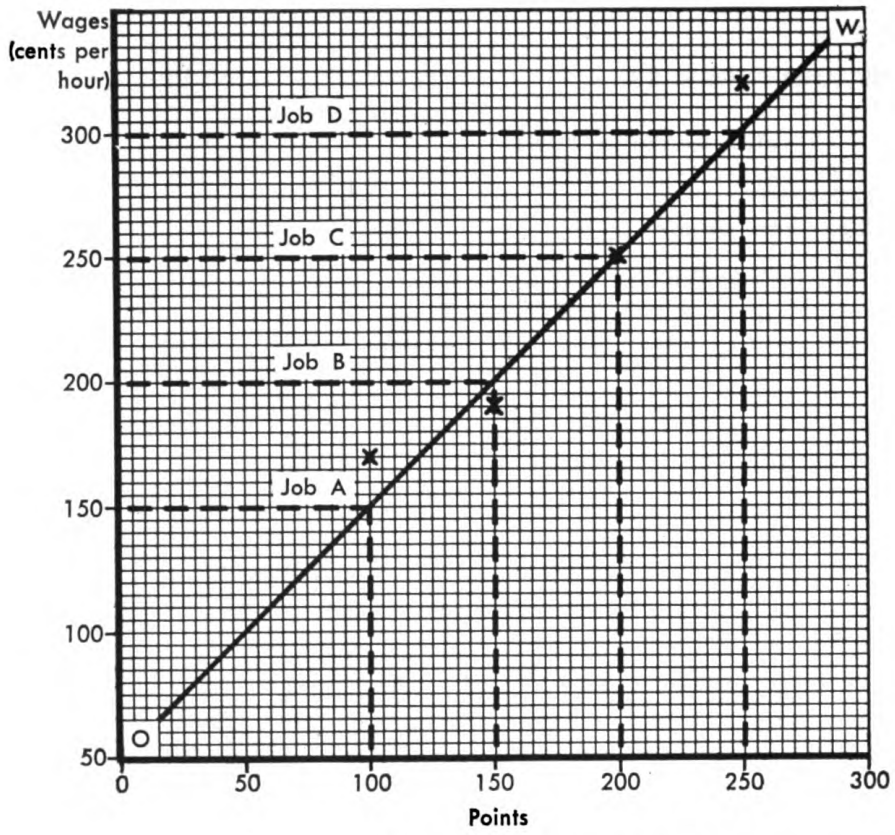

Fig. 118. A hypothetical wage curve.

When such factors have been decided on, the rate structure is worked out. A minimum hourly rate of say $1.50 is made the basis to which an addition is made of say 25 cents from one grade to the next, up to the maximum rate paid the grade of labor with the highest point values.

These standard rates are the basic hourly rates which constitute the basic wage structure. When incentive devices are used, such rates are worked out as the guaranteed rates, with the bonuses or premiums being additional.

Although it is oversimplified, the hypothetical wage-rate structure shown in Figure 118 helps to explain some aspects of how a wage-rate structure can be worked out. If *OW* is the wage-rate structure, the wage rate for any new jobs which are introduced can be found when their point values have been determined. Such a diagram makes it possible to determine whether certain existing wage rates for individuals or jobs are out of line. It may happen, as a result of hiring men over a period of time, that some of them were able to command a higher rate because of the labor-market situation at the time they were hired and that as a result the wages paid some men with lower ratings are higher than those paid men with higher ratings. This result is not too likely, however, when there is wide unionization.

The x's on the accompanying diagram represent actual wage rates being paid for the jobs. Although the rate for job C is satisfactory, the rates being paid for jobs A and D are 20 cents higher than they should be according to the wage-rate structure, while the rate for job B is 10 cents too low. A final advantage of a diagram of this kind is that a general upward or downward wage-rate change can be reflected by simply shifting all jobs upward or downward by the same amount.

A wage curve which plots as a straight line reflects equal arithmetic increases from one grade or job to the next, whereas one which plots as a line that curves upward reflects equal percentage increases. A wage curve based on the arithmetic plan may result in the tendency to overpay the lower-paid jobs and underpay the higher ones. The percentage plan provides a wider dollar range for jobs in the higher point ranges.

Merit Rating

Meaning and Purpose of Merit Rating. Job evaluation, which is essential for various purposes, is the evaluation of the job or position, while merit rating is evaluation of the merits of the person who occupies the job. In merit rating the general objective is to measure various characteristics or qualities of each worker in order to arrive at an evaluation of his performance on the job. When the merit ratings of all employees in a group have been secured, comparisons can be made and, on the basis of such comparisons resting on merit rating, employees can be selected for promotion, transfer, and layoffs. The ratings may also be used as the basis for demotion and wage increases or decreases. Sometimes they may be useful in giving advice to employees.

Rating Sheet and Qualities Rated. The development of a merit-rating system for a company requires the preparation of a standard rating sheet as well as rating procedures. The preparation of a rating sheet involves a determination of the qualities or characteristics to be rated. These qualities are what the particular management or personnel head considers most important. Among the qualities rated are performance (including quantity), mental, personal, supervisory and leadership, capacity for further development, initiative, perspective, appearance, and attitudes. All the characteristics are not of the same importance for all types of jobs. For instance, ability to learn, skill and knowledge of the job, and safety habits are of considerably more importance and significance in rating production workers than are organizing ability, leadership, originality, and similar qualities which are, however, of importance in rating supervisors and minor executives.

It is particularly important that the qualities be defined as carefully as possible in order to keep any misunderstanding on the part of raters

EMPLOYEE MERIT RATING CHART

Name _____ Date _____

Clock Number _____

CHARACTERISTIC	EXCEPTIONAL	ABOVE AVERAGE	AVERAGE	BELOW AVERAGE	UNSATISFACTORY	
ABILITY TO LEARN ....How quickly does he: a. Grasp new ideas b. Master new work c. Remember instruction	Has "know how." Catches on the first time.	Learns quickly. Remembers well.	Requires some instruction, but does think for himself.	Needs detailed instructions on every point.	Learns slowly. Poor memory.	
DEPENDABILITY a. Is his attendance regular? b. Does he stick to his job?	Always on the job. Drives himself hard. Very conscientious.	Never absent without cause. Hard worker. Tries to do his best.	Lays off occasionally. Takes a "five" now and then. Visits around a little.	Requires watching. Is easily distracted from his work	Has no sense of responsibility. Kills time.	
QUANTITY OF WORK Does he turn out an honest day's work? (Disregard quality.)	Very fast and productive.	Turns out good volume.	Cannot criticize volume.	Could produce more.	Very slow. Never turns out a job on time.	
QUALITY OF WORK Is his work neat and accurate? (Disregard volume.)	Rarely find errors in his work.	Few errors for amount he turns out.	Average number of errors in terms of amount he produces.	Work often needs careful inspection.	Careless and sloppy in his work.	
INITIATIVE Does he a. Take hold on his own? b. Suggest and try new ideas?	Has Suggested and developed several good ideas.	Always manages to keep busy at some worthwhile job.	Will do things if suggested to him.	Rarely shows interest or willingness to keep busy.	Never shows any desire to better himself or his work.	
JOB KNOWLEDGE Does he have enough background of experience or training?	Has fine background and experience. Knows how to use it.	More than is needed for this job.	Enough to handle this job.	Needs training in fundamentals.	Has no idea of what the job requires.	
ATTITUDE TO JOB a. Is he interested? b. How does he react to supervision?	Doing a fine job is his greatest interest.	Welcomes criticism. Appreciates help.	Does what is expected and asked of him.	Just another job. Lacks interest.	Indifferent to help. Does not take kindly to supervision.	
COOPERATION Does he hold up his end with superiors and fellow workers?	Goes out of his way to cooperate cheerfully.	Always willing to do his share willingly.	Usually a good team worker.	Not a good team worker.	Unwilling to take part.	
HEALTH AND PHYSICAL MAKE UP How does it affect his work?	Lots of pep. No physical handicap.	Has health and energy. Keeps in shape to stay on job.	Able to do his job.	Causes slow-down and absences	Health poor or physically unable or physically unadapted.	
SAFETY HABITS How does he handle himself, materials, and equipment?	Never jeopardizes himself, others, machine, or materials.	Observes all safety regulations.	Works with reasonable care.	Must be warned of common hazards.	Careless and reckless worker.	

Rated by _____ TOTAL

Checked by _____ Rating at _____ SCORE _____

Approved by _____ Last Scoring _____ SHCO. FORM 40

Fig. 119. An employee merit rating chart.

at a minimum. On the accompanying "Employee Merit Rating Chart" (Fig. 119) it will be observed that the meanings of most of the various characteristics are suggested to the raters by questions. The various grades of the different qualities are all briefly defined. Weights are given to the items according to their importance and then totaled to get a score. In some rating systems the qualities are to be scored "yes" or "no," but in others the rater is asked to assign percentages or letter grades to the qualities listed.

Merit rating involves an effort to get quantitative measures of qualitative factors. Since judgment and opinion underlie the whole result, it is essential to define the qualities as carefully as possible in order to insure as objective a result as possible. However, the achievement of objective results is obviously dependent on the attitude of the raters.

The use of a printed form helps to impress the raters to develop a careful attitude. Merit rating as a whole encourages supervisors and executives who do the rating to consider specific qualities and thus attempts to force an objective judgment in place of general impressions. It may also be helpful to the raters in giving them more insight into the men and perhaps also the jobs they do. These possibilities suggest that it may be a help in maintaining good employer-employee relations and also in increasing production.

Rating Procedure. The development of a rating procedure requires that for rating purposes the workers be divided into groups determined by occupation, department, or other factors. It is also essential to decide who should do the rating, and careful consideration must be given to developing instructions for the raters. The frequency with which ratings should be made and the question "who should check them" must be decided on. Although rating should be done periodically, it should not be too frequent.

Raters. Proposals have been made that employees be rated by fellow employees with the results to be kept confidential and suggestions have also been made that supervisors be rated. However, the most commonly found merit-rating systems provide for the rating of employees by supervisors, foremen, or department heads, who may themselves be rated by their superiors, and so on up the line. As a matter of fact, rating by supervisors, although it has its limitations, does meet some of the important requirements of satisfactory rating. For one thing, although the rater should not be too close socially and personally with the ratee, he must at the same time know the ratee. If the supervisor's objectivity can be depended upon, and to some extent the type of rating sheet used is a factor in achieving this, he is in a better position than anyone else to rate the various qualities.

Instructions to Raters. The importance of getting the most accurate

possible results in merit rating requires that carefully prepared instructions be given to raters. Although this may be done by furnishing them with written instructions, group instruction prior to rating may be more satisfactory or it may be combined with written instructions. It is probably best to start out with an explanation of the system as a whole and its purposes. The possible shortcomings of merit rating should be explained to raters with a view to getting them to try to avoid them. The need for taking ample time, for careful thought, for avoiding prejudices, and for seeking as objective a rating as possible must be clearly explained. Raters must be told not to rate anyone of whom they have little or no knowledge and to avoid rating qualities of which they are uncertain. It should also be explained that they must take care to avoid letting their general impressions influence the ratings they give to the specific qualities.

Explanation of System to Employees. Since secrecy in merit rating has been found to be undesirable, the system is explained to employees in well-managed companies which use merit rating. The employees should be told the qualities which are being appraised, and it should be explained that the aim is to get an objective and impartial result. If a provision is possible for a review of the ratings by an impartial judge, the system will more readily gain the confidence of the workers. A number of companies advise the individual worker of his rating and use it as the basis for counseling, but in many instances the desirability of this practice has been seriously questioned. It is probable that an employee who is rated low on one or more items will resent the rating unless he stands in some sort of awe before the rater, which is not ordinarily to be expected in modern business. Therefore, the practice of advising the worker of his rating may simply result in higher ratings than are justified. A similar result is likely when the ratings are the basis for (expected) periodic raises and such a result will be intensified if the ratings are discussed with the employees.

Limitations of Merit Rating. There are certain other limitations to merit ratings which make too heavy a dependence on them somewhat questionable. The basic difficulty is inherent in the scoring of qualities which cannot be accurately measured, although quantitative results at the end of the process appear as objective numerical data. Quantitative data, however derived, are convenient to use and the tendency to overlook the original source is always present.

In spite of careful instructions to raters, they may nevertheless differ in their conceptions of the meaning of particular qualities as they rate different workers. To some extent this can perhaps be avoided by requiring the raters to define and describe each characteristic, but it is

probable that some differences will always arise, however slight in some instances.

Another difficulty is that raters may judge an individual as a whole, and their general opinion then tends to be reflected in the rating they assign each quality. This is known as the halo effect. A supervisor would in the normal course of his work have some opinion as to the general ability of the different workers under him, and he might readily translate this into his judgments on the specific qualities he is asked to rate.

A final possibility is that the working conditions might not be satisfactory or that there may even be some limitations in the general managerial capabilities of the rater. In this connection, it should be kept in mind that, as Professor Sumner H. Slichter pointed out a number of years ago, many able men have in the past risen from the ranks to high positions in management and that this is also likely to be true in the future. On this assumption, it is clear that many foremen and plant managers have under them men more able than themselves. It is the task of management to discover such men, to get ideas from them, and to provide satisfactory opportunities for them.

Conclusion. Job evaluation has become very important in modern industry for reasons such as those mentioned in this chapter. Merit rating is widely used and has many advantages, including the obligation of the rater to give careful thought to the qualities of the ratees. Nevertheless, it also has certain limitations along the lines suggested above.

QUESTIONS

1. For what purposes is job evaluation needed?
2. What is the difference between the job description and a job specification?
3. Describe the following methods of job evaluation: (*a*) ranking, (*b*) factor comparison, and (*c*) point system. What are the merits and defects of each?
4. How is job evaluation related to wage rates?
5. The text states that, in deciding on wage rates, it is desirable to make a survey of wage rates for similar jobs in the community. Just what would you consider the "community" to include? How were the rates in the other companies which are surveyed determined in the first place?
6. What are the advantages and pitfalls of merit rating?
7. Who should do rating and how should the rater be instructed?
8. With two other students in the role of middle managers, discuss extemporaneously before the class the desirability of discussing ratings with individual ratees.
9. With one student in the role of a union officer and the other in the role of a management representative, discuss extemporaneously before the class the desirability of discussing merit ratings with ratees.

10. Discuss the limitations of merit rating from the point of view of the employee. How does this compare and contrast with self-appraisal? In which direction might it be desirable to move and under what circumstances?

CASE: Younger Foundry

The management of Younger Foundry, noting that a molder was no longer working on complicated molds, reduced his rate from Class A to Class B. According to the job description, a Class C molder was required to work only on simple molds, a Class B man on less complicated molds, and a Class A man on any and all molds. The chief difference was in the degree of supervision required which reflected differences in experience. The molder, however, filed a grievance with the union. The company maintained that the reduction was permitted by a contract clause to the effect that the rate of pay for each production job should apply to an employee during such time as he is required to perform that job. The union called attention to a negotiated job description which said that a Class A molder was required to work on any and all molds. Under the circumstances, it maintained, once a man was classified as Class A he could be deprived of his rating only if he ceased doing any molding at all. The union also pointed out that past practice had been to increase rates when workers moved to higher jobs but not to downgrade them during periods of work at less than their maximum skills. Management insisted that nothing was relevant but the contract clause it referred to, as indicated above. The case therefore had to be arbitrated according to the arbitration provisions of the contract.

1. **State the issues clearly.**
2. **How would you decide if you were the arbitrator?**

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Chapter XIX

Wages: Theories and Some Practical Considerations

Wage Theories

Subsistence Theories. The commercial and industrial revolutions, together with the emergence of wage labor, gave rise to much speculation about wages, and as a part of the efforts to explain economic phenomena systematically wage theories were developed. The earliest of these was a subsistence theory, which was held by the Physiocrats, who developed their theories in France between 1756 and 1778. They considered manufacturing unproductive on the ground that it did not add extra wealth. Although the slow development of industry in France and the dominance of agriculture even at a much later date help to explain their view that only agriculture was productive, nevertheless they scarcely took account of workers on farms since their attention was primarily directed to the owners. Despite the various shortcomings of the views of the Physiocrats, they were important because of their influence on other and more influential writers on economics, notably Adam Smith.

Before referring further to Adam Smith's views, note should be taken of the Mercantilists, whose influence from about the middle of the seventeenth century until 1775 exceeded that of the Physiocrats. According to the Mercantilists, who also subscribed to a subsistence theory, wages should be at the minimum necessary for the physical subsistence of the workers and their families. The Mercantilists thought that the cost of labor determined prices and that higher wages would necessarily result in higher prices. Since they laid so much emphasis in their theories on the desirability of exports, they stressed the importance of keeping labor costs low so that the resulting low prices would encourage exports.

Adam Smith. Since Adam Smith, whose *Wealth of Nations* appeared in 1776, was a keen observer and a careful thinker, it is not surprising

that his ideas included not only the subsistence theory but also anticipated the subsequent wages fund, exploitation, productivity, and bargaining theories. Although these theories are somewhat contradictory, each one of them stressed significant features related to wages. Smith could in any case scarcely be expected to have detected the complexities revealed by subsequent lengthy discussions in the course of which the various theories were clarified. As a matter of fact, exclusive adherence by later writers to a particular theory prevailing at the time it was clarified shows that such writers had unrealistic conceptions of the real world.

Ricardo. According to David Ricardo's analysis, which stressed the subsistence theory, the cost of producing and maintaining labor was the normal price for labor, and if this price went up the population would soon increase and bring the price down. To do justice to Ricardo's analysis, it should be added that he recognized what subsequent writers omitted when they discussed his theory, for he himself held the view that the normal price for labor was not permanently fixed but depended upon custom and habit, which might require increases in food, necessaries, and conveniences. Since the followers of Ricardo usually did not add this qualification, the first part came to be called Ricardo's iron law of wages while the socialists called it the brazen law of wages.

Marx's Surplus Value. Both Smith and Ricardo had expressed the view that labor creates all value. Karl Marx followed Ricardo mainly in pressing the same view, which he made the cornerstone of his reasoning. He maintained that the exchange value of products is determined by the socially necessary labor time spent in producing them. Since the worker received a wage covering only the cost of reproducing labor power, even though he works longer than necessary to produce this wage, he created more value than he received. Marx called the difference between the value he asserted was created by the worker and the wage he received surplus value, which he claimed was expropriated by the capitalist and distributed in the form of profits, interest, and rent which he maintained had no justification. The appeal this theory might have to workers is apparent.

Wages Fund Theory. The orthodox generally accepted theory in the period in which Marx wrote was called the wages fund theory. Although this theory was vague in many respects and the different writers by adding their own refinements contributed further to its vagueness, it is nevertheless possible to understand the general idea rather easily. The theory was that wages must be paid out of a wages fund which was in the hands of capitalists. The wages fund constituted the demand for labor and the number of workers, the supply. Since this fund would increase by further savings of the capitalists, the theory was convenient for the capitalists of the period inasmuch as the only way workers could get an increase in real wages according to the theory was an increase in the income of the

capitalists which when they saved it added to the wages fund. It followed that any successful efforts on the part of one or more trade unions in getting wage increases would simply result in a reduction of the wages of other workers.

Residual Claimant Theory. Although a number of writers thought this theory incorrect, it was not successfully demolished until the period following the Civil War, when the American economist Francis A. Walker developed the residual claimant theory of wages by 1875. According to this theory, the worker is the residual claimant to the product of industry. Rent is fixed by Ricardo's theory of rent, interest is the amount necessary to induce saving and the accumulation of capital, and profits depend on the degree of skill of the enterpriser. With rent, interest, and profits thus accounted for, they can be added and wages can be determined by deducting the total going to these three factors from the total product of industry. Under this theory, wages could increase as a result of the introduction of more economical ways of production and because of greater efficiency on the part of labor. Since the amounts going to other factors would not increase, increases in the product would go to labor.

Marginal Productivity Theory. The impact of Marx's theories and the vigor of the socialist movement stimulated efforts to disprove Marxian doctrine. Although the full import for economics of the various discussions and contributions cannot be explored here, the important point is that, while earlier writers had pointed out that wages were based to some extent on productivity, there was now developed a well-rounded and logical theory in which the explanation of wages was a part of the larger whole to which it was properly related. This is the marginal productivity theory, which was fully developed by the American economist John Bates Clark and is still the basis of the accepted theoretical explanation of wages. According to the marginal productivity theory, employers will add workers and other factors up to that point to which it pays to expand production. The wage necessary to attract the last worker will be the wages of all of them. Each of the factors will be added up to the point where the cost of the last additional unit (the marginal unit) equals the value of the additional product (the marginal product) created by the last unit added. Marginal productivity determines the limit to the price it is profitable to pay for a given quantity of a factor. The marginal net product is now explained as the increase in the employer's total receipts resulting from the hiring of an additional unit of labor. This increase is called marginal receipts or marginal revenue.

Although there is no doubt that productivity is an important factor in wages, the theory oversimplifies matters considerably. First, the economist's calculations cannot as yet be made in the real world. Second, the theory assumes that the labor supply is in homogeneous units whereas the con-

cept of noncompeting groups complicates matters. For example, most carpenters are not in the same market as electricians, while bricklayers are not in the same market as plumbers. Moreover, the theory assumes that on the supply side the labor market is perfectly competitive and without unions. On the demand side, the absence of varying degrees of employer monopolistic positions is assumed. Finally, the theory is a static theory in the sense that it assumes the value of the monetary unit as fixed, whereas the fact that it is not fixed may give rise to serious problems from time to time. It is interesting to note that in recent presentations of economic theory wages are more realistically discussed, with such matters as monopolistic influences and bargaining power considered.

Bargaining Theory. According to the bargaining theory of wages, which was first systematically developed by John Davidson in 1898, no single principle can be said to determine wage rates. Since the forces at work in the labor market are complex and interact on each other, demand and supply do not necessarily and definitely determine wage rates. In fact, there are upper and lower limits to wages, the upper limit being the highest wage employers will pay and the lower limit being the lowest employees will accept. The upper limit depends on such factors as the productivity of workers, the amount of capital investment, the cost of borrowing, competition, and the possibility of substituting machinery for labor. The lower limit, which is the workers' supply price or the lowest price at which they will be available for work, depends on such factors as the workers' self-respect, their regard for the opinions of others if they take too low a wage, their knowledge of conditions elsewhere, labor legislation, the availability of unemployment insurance, trade-union policy, and general economic conditions. The wages actually paid will be somewhere within these two limits but exactly where depends, according to the bargaining theory, on the relative bargaining strength of the two parties. Among the factors strengthening the workers' position are labor unions, labor legislation requiring such things as minimum wages, unemployment insurance, and possibly old-age pensions and the force of public opinion. Among the factors strengthening the employer's hand are the immobility of labor, the fact that labor has relatively little ability to hold out very long, and the very financial strength of a business compared with an individual.

Theory as Theory and as Used in Practice. A theory is a statement supposedly descriptive of a general tendency. It does not attempt to be entirely precise because its objective is to cover the greatest possible number of cases which, although they can be properly included in the general statement, nevertheless do differ in less important details. If a theory does not describe and fit the facts, it is of little value as a theory. However, since theories may be put to another important use there is considerable

usefulness in the preceding review of the major wage theories which have been dominant at different times. The fact is that one or another or a combination of theories is used in part by both employers and workers to justify their position at different times. An understanding of the foregoing theories is therefore useful in appraising positions taken in wage controversies. To be sure, the theories are not identified as such, but such parts of them as seem to lend support to a particular side are nonetheless stressed as occasion seems to warrant. The use of theories in this way does not mean that they are thoroughly understood by those who use them. In fact, the general idea may be used by some who do not realize that there is a well-developed theory covering it.

Some Practical Aspects of Wages

In modern economics the analysis of wages rests largely on productivity. Difficult as it is in practice to calculate with any precision the relative contribution of the different workers to the product, it is of course fundamental that if a firm is to survive and prosper its workers as well as the management must be sufficiently productive in the long run to be able to produce at costs which will be at least equal to selling prices. But in the management of a complex organization with many different types of workers in a variety of jobs, the precise calculation of the contributions of different workers and classes of workers is impossible. This very fact, however, is in itself a major reason why wage administration is of the utmost importance. Moreover, the management of a company is faced with a dynamic situation in which workers' demands may have little relationship to the management's concept of additional productivity. In periods of high levels of business activity, for example, when workers can generally demand increases, with or without government assistance, management cannot rest its final decision on theories since it is also essential to keep in mind the relationship between labor costs and alternative sunk costs in machinery and equipment. These complications must be evaluated and acted upon in a realistic way.

Factors in Wage Administration. Although the administration of wages is historically a top-management prerogative, in recent years unions have been demanding an increasing share in the determination of policy. Apart from the role of unions, wage administration is a staff function participated in by personnel men, production managers, and superintendents. Industrial engineers specializing in time study may make a contribution. Although foremen have no part in formulating wage policy, they must interpret policy to the workers.

In the determination of policy and the fixing of wage rates, it is necessary to define the real objectives. Wages are costs but they are unlike

costs sunk in machinery and equipment. Whereas the latter are fixed, labor is a cost which can be varied to some extent if there is sufficient pressure to do so. Rising labor costs, therefore, always suggest the desirability of seeking out more automatic equipment.

Even if it were possible to calculate with approximate accuracy the productivity of different workers and groups of workers, the wage rate must be determined in relation to other costs. On the one hand, there are fringe benefits such as vacations, pensions, and so on which must be provided for, while on the other hand the wage policy may include provisions for wage increases varying with length of service rather than with individual efficiency.

The general wage level of a company will frequently, but not necessarily, be about equal to the general wage level in the community. A particular company may pay a higher wage in order to outbid competitors because of the desire to do so as a matter of policy, or in order to attract a better class of workers, or for some combination of reasons. On the other hand, it must always be remembered that it is logically fallacious to suggest that an average company might pay more than the average wage.

Although a wage-incentive system is desirable where it can be properly applied, the day rate may be essential for some jobs because of the nature of the work, because a good many new employees are being hired, or for other reasons. If a wage-incentive system is adopted, standards of performance must be set and the policy should provide that there will be no change in wage rates unless there is so substantial a change in the methods and equipment as to be alone responsible for an increase in output. The day is past when rates can be indiscriminately cut, and good labor relations are possible only if the integrity of the rate is unquestioned.

Wage plans should be clear to the workers. Some plans are so complex that they cause difficulty in understanding them. If the workers themselves cannot easily calculate what is due them, long explanation is necessary, after which they may still be unconvinced. As a matter of fact, management formerly also had an interest in choosing a system which is not too complex for easy calculation since complex calculations increased clerical costs, but with modern calculating machines this is of little importance.

Real and Money Wages. Although wages are paid in money, the value of money in the sense of its purchasing power is by no means fixed for any lengthy period. Changes in prices, and therefore in the purchasing power of money, have been frequent even in periods before the rather extreme rises in recent years. The fact that changes in the purchasing power of money take place makes it necessary to draw a distinction between wages as stated in money and wages as the command over goods. Although prices and wages go up in wars and inflations, for example,

there is no corresponding increase in the output of goods for consumption, and therefore the additional wages do not command any more in goods. Assuming for the purpose of illustration that all prices go up 50 per cent and that wages also go up 50 per cent, the money wage has increased but the real wage, or what the money wage will buy, has remained fixed. Of course, this is a very much oversimplified example especially since one of the fundamental causes of the difficulties arising from changing prices is that they do not change uniformly, and this is as true of wages and salaries as it is of other prices.

During the period after World War II unions sometimes sought and achieved across-the-board increases. An across-the-board increase is an increase of a certain amount per hour, say 20 cents, which is given to all the union workers in the plant. In more recent years union contracts have included a cost-of-living provision according to which the basic wage is increased with a rise in the cost-of-living index number.

When an upward adjustment is granted a union, a comparable adjustment is made in the wage or salary of any unorganized workers, especially those in the office.

Conclusion. The foregoing brief review of wage theories when contrasted with the subsequent discussion of some practical aspects of wages suggests that successful wage administration requires supplementing the necessary generalization of theory by an understanding of the complexities of reality. The discussion of some of these practical matters in this chapter has briefly anticipated some of the factors involved in selecting the wage plan which are discussed in the next two chapters.

QUESTIONS

1. What theory or theories could be said to be reflected in the claim that an increase in the cost of living requires a wage increase? Why?
2. What theory or theories could be detected in the claim that profits are too high and that wages could therefore be increased? Why?
3. What theory or theories could be detected in the claim that wages cannot be increased because the productive facilities of the nation are not expanding adequately? Why?
4. State what you understand by the marginal productivity theory. What are its limitations? How is it likely to be used in claims concerning wages?
5. Can the bargaining theory as such be used in disputes concerning wages? Why or why not?
6. Why is it difficult to determine the productivity of different kinds of workers in a company?
7. How is it possible to decide whether wages have outrun or have fallen behind productivity?
8. Who and what are involved in wage administration?
9. Distinguish between real and money wages. What problems arise from this difference?
10. To what extent do wage rises contribute to rising prices?

CASE

BUSINESS STUDENT (taking an evening course) to Professor before class: "Sir, I am wondering whether I might be permitted to leave the economics class early in order to attend a meeting."

PROFESSOR: "What kind of meeting?"

STUDENT: "A labor-union meeting. I am a union delegate and organizer for the building service and maintenance workers' union. Most of my work is in the daytime but occasionally I have something to do at night."

PROFESSOR: "Well, I see no reason why you should not go. You might learn more there than in class. However, I am interested in hearing more about your work."

STUDENT: "My job is diversified. Tonight, however, we're going to discuss a grievance which we think is important. Are you familiar with grievances and grievance procedure?"

PROFESSOR: "Yes, but I can't follow all the details of all the cases I hear about and they are, of course, only a small sample. I only hear parts of the story, don't have time to digest even what I do hear, and after all some men in positions like mine get paid for being arbitrators. What else do you do?"

STUDENT: "I have been involved in organizing new workers but this has been dull recently. One thing I noticed is a lot more self-service elevators even in old buildings. They must have replaced the old ones."

PROFESSOR: "Do you think your union may have had something to do with this?"

STUDENT: "Union work shows that the business world is a lot different from the theory we learn in the economics and business courses."

PROFESSOR: "Do you think so?"

STUDENT: "Yes. When you take these courses you almost get the impression that the texts and the instructors are unfamiliar with pay increases, improvements in working conditions, and other concessions as meetings like tonight's bring out."

PROFESSOR: "Well, we have to go to class now."

1. Was this a logical discussion?
2. Of what could this be the basis of discussion in one of the professor's classes?
3. What can the professor learn from a conversation like this?

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Chapter XX

Selecting the Wage-Payment Plan

WAGE rates are based on the two factors of time and speed. Some of them are based only on time, straight piecework is based on speed, and some are based on a combination of these two factors. Since wages based exclusively on the time spent on the job do not necessarily stimulate the best effort, some form of incentive is often considered necessary. These incentives take a variety of forms, some of which will be examined in the following paragraphs.

Day Rate. The oldest and simplest form of wage payment is based on straight time and is called the day rate. It is paid on an hourly, daily, or weekly basis. If E is earnings; T, the time worked in hours; and R, the rate per hour, the wages may be stated as $E = RT$. The day rate has certain features which make it appear attractive. Since it is easily calculated, it facilitates payroll work. When there are delays and interruptions in the work, it is about the only method of payment which is fair because other methods would penalize workers for an inability to produce which is not of their own making. When work cannot be standardized and jobs are difficult to measure, the day rate is necessary. The extremes of work which cannot be standardized are highly skilled work on the one hand and very unskilled work on the other. A good deal of maintenance work cannot be standardized; even though job analysis is sometimes made of scheduled repeat maintenance jobs for which standard procedures are set, time standards are generally not set and the day rate is paid. Quality workmanship may require the use of the day rate because other methods stress speed. The day rate not only appeals to workers, but unions favor it because they want a standard rate for all workers. However, unions have usually had to agree to incentive plans in instances where they were in use when the union came in.

Against these apparent advantages of the day rate there are several significant disadvantages. The most obvious is the fact that the day rate

offers workers no incentive to increase their output. Since some of them may tend to do as little as they think necessary to keep the job, the responsibility and problems of foremen are increased. The day rate discriminates against some workers who do more work than average and inferior workers. Finally, under this method of wage payment cost standards cannot be determined.

When the production process is highly standardized and mechanized as on the automatic assembly line, the work itself is automatically standardized as to time and depends on the speed of the assembly process. In such instances the day rate on a straight hourly basis may sometimes be as satisfactory as various incentive methods.

Merit Rating and the Day Rate. In later sections of this chapter incentive wage plans worked out by engineers will be taken up. Although these are the most important types of incentive wage plans, there is a day-rate method which was not introduced by engineers but based on the personnel man's merit rating. This plan has been receiving consideration by some companies in recent years. Merit rating has been combined with job evaluation in attempts to measure daywork. The job rating is the basis for the base rate, but this is modified upward or downward by the periodic merit rating. Merit rating is sometimes also used in determining the sequence of promotion or layoff. Although the rating is supposed to be the incentive factor, such ratings are, as we have seen, not necessarily satisfactory from several points of view. In any case, the use of merit rating is not, strictly speaking, a wage-incentive method. An advantage claimed for the method is that the foreman or supervisor is brought close to the worker because of his obligation to report on individual efficiency and to justify the variations in his reports.

Piece Rates. The difficulties with the ordinary day rate, especially with reference to the lack of incentive, led to an early use of piece rates. Under the straight piece-rate system, which is the earliest form of incentive system, the rate is established for each unit of work turned out and the wage is the number of pieces (N) times the rate per piece (R), or $E = NR$. When such a system is first established, the simplest way to get a rate, if prevailing wage figures are not available, is to take the day rate and divide it by the average previous output. An estimated amount is subtracted from this average in the expectation that the output will go up so that, if the rate is not kept somewhat below the average formerly earned, the workers' incomes will increase by an unnecessarily large amount.

Straight piece rates, which were in use long before equipment, materials, and jobs were standardized, are still found in small shops where standards are not highly developed. The straight piece-work system under unstandardized conditions has always caused difficulties. Employers have

practically always cut the rates as the workers increased the output and therefore their earnings. Obviously what happens is that the workers are in effect themselves standardizing conditions in order to improve their output insofar as they can do so with the existing equipment. However, the workers, knowing that the employer will cut the rate if the output increases beyond a certain point, make an estimate of what they think the employer will regard as the point after which he will cut the rate and by tacit agreement they set this as their maximum output. This reaction on the part of workers is typical and takes place whether or not they are organized.

When as sometimes happens the employer himself contributes to the possibility of greater output by getting improved machinery and equipment there is a justification for a cut in piece rates, but the workers will nevertheless resist it.

Where quality of workmanship is an important factor, piece rates are unsatisfactory unless conditions and procedures, including provisions for inspection, are adequately standardized. They are also unsatisfactory where the work is subject to delays beyond the control of workers or if some workers can slow up others. In general, piece rates may be said to be applicable to repetitive work not subject to delays.

Piece rates, like the day rate, may be based on job study and standardized conditions. In such instances, the difficulties of the ordinary day rate and the straight piece-rate system do not exist, since the work is standardized and the base rate can be guaranteed.

Incentive Plans Other Than Straight Piece Rates. Beginning in the 1880's attention was directed to various incentive plans other than straight piece rates. From that time until about 1910 various engineers developed and presented their own wage-incentive formulas, a number of which are still basic to present-day wage payment plans. Various later modifications were in essence simply unimportant changes in the original formulas which were first being worked out at the same time that standardization of equipment and jobs was taking shape. As is to be expected, therefore, some of them were based on the existence of carefully established standards, whereas others were not. However, some of those not originally based on predetermined standards can be used after such standards have been adopted. On the whole, the publicity attendant upon these wage plans in some quarters was for some time probably greatly in excess of their actual use. It was in the 1920's following the depression of 1921, during which wage-cutting schemes were widely discussed, that wage-incentive schemes together with job analysis came to be used more extensively. At the present time they are fairly widely used.

In connection with the description in subsequent paragraphs of some of the many incentive plans, it will be noted that the general idea is to

get a base rate for a stipulated task with an additional amount, called a premium or a bonus, to be paid for any output in excess of the predetermined task. In order to avoid the difficulties which arose with straight piecework, the base rate is guaranteed until there is a change in the conditions of production.

General Considerations in Incentive Systems. As incentives to greater efficiency and output, financial incentives are extremely important. Of the financial incentives, those connected with wages are perhaps most important, or at any rate most common. Although the basic wage is, of course, itself an incentive, premiums and bonuses are used to stimulate greater effort as we have seen. Other financial incentives include quality bonuses, foremen's bonuses, profit sharing, executive bonuses, suggestion awards, and salesmen's commissions. Many nonfinancial incentives including prestige, prizes, awards of various sorts, and so on are in use.

Periodic review of rates is generally provided for. Wage incentives are set for a definite period of time, say a year, because unlimited guarantees are considered impossible in view of frequent changes in operations and methods. However, it is of the utmost importance that provisions regarding changes should be clear and explicit. Any practice bordering on rate cutting, or which may easily be interpreted by the workers as rate cutting, is fatal to the continued success of a wage plan. Employees would rapidly lose confidence in the whole procedure from the time study to the wage-incentive system.

James F. Lincoln, who advocates what he calls incentive management, stresses the importance of encouraging all employees in a company to develop their latent abilities and of providing proper incentives and rewards.

Taylor's Differential Rate System. In the 1880's Taylor devised a wage system in which there were two sets of piece rates for each job. The lower piece rate was paid when less than the established standard task was accomplished, whereas the higher rate was paid if the task was accomplished or exceeded. The standard task was based on time studies and was expected to be attainable by the average worker without undue fatigue. If R_1 is the rate for work below task and R is the rate for achieving or bettering task, then below task $E = NR_1$ and for output at or above task $E = NR$. The rate paid workers who fail to achieve the task set was definitely fixed at a punitive figure. For example, suppose R_1 is 3 cents and R is 4 cents. If the standard output is 100 and one worker produced 120 while a second produced 80, then the earnings of the first worker are \$4.80, whereas those of the second are \$2.40. Thus, with a difference of 50 per cent in productivity, there is a difference in the wage of 100 per cent. Although this example is extreme, it illustrates the principle. Taylor's object was to discourage the worker who could not

achieve the standard task from continuing on the job. He expected that such workers would leave the job voluntarily. It will be noted that Taylor's system did not guarantee a basic day wage. When it was used by employers who did not install Taylor's system of improved management, standard working conditions, and good equipment, the plan was unsatisfactory. It was, however, also not entirely satisfactory if workers were to be moved from one job to another, for they would clearly find it difficult to meet the standard task on all of them. As a matter of fact, Taylor's system was not widely used.

A modification of Taylor's differential piece-rate system was introduced by D. V. Merrick, who provided for three rates. There was a low straight piece rate for work below 83 per cent of the established task, an additional 10 per cent premium for output from 83 to 100 per cent, and a 20 per cent premium for output at or above task.

Halsey Premium Plan. Frederick A. Halsey got the idea for his premium plan from the profit-sharing system which Henry R. Towne had introduced in the Yale & Towne Manufacturing Company in 1886. Halsey's system, which was developed about 1890, set a guaranteed daily wage which the worker would be paid regardless of whether he produced to standard or not. If he produced more than standard, he was paid the regular rate plus a percentage premium of from a third to a half of the value of the time saved. Actually the standard of performance was at first merely the "normal" production based on average past performance since the system was introduced before time and motion studies were made. The guaranteed daily wage was therefore the day rate for average production. If S is the standard time, T the actual time, and p the premium percentage, then $E = RT + p(S - T)R$. If the hourly rate is \$1.50 and the worker produces in 6 hours' work for which the standard is 8 hours, he receives for the 6 hours' work \$9.00 plus \$1.50 (if the premium is 50 per cent) or \$10.50. Using the formula, $E = 1.50(6) + .50(8 - 6)1.50 = 9.00 + 1.50 = 10.50$.

Although Halsey's system was introduced without time study, there is no reason why it might not be used after time studies have been made. There is, however, not much point to its use if the standard time has once been determined, for the plan rests on the day rate for average work. For this reason it is considered useful in getting the workers' interest in the period while job studies are being made with a view to the adoption of a permanent incentive system.

The Rowan plan, which was devised by James Rowan in 1896, is somewhat the same as the Halsey plan. An hourly wage is fixed for the established task time. Although this wage is guaranteed, if the worker finishes the work in less time he receives in addition to the base rate a premium which is a percentage of the reduction he has made

on standard time. Since this plan is complicated and difficult to calculate in its details, workers find it difficult to understand and the employer's payroll computations become complex.

100 Per Cent Premium Plan. In the 100 per cent premium plan, a task time is set for each operation, but the worker receives a guaranteed rate per hour plus 100 per cent of any time saved. Thus, if the hourly rate for a standard task of 10 pieces is $1.00 and the worker makes 15 pieces, his wage is 15/10 or $3/2 \times \$1.00 = \$1.50$ This plan which is in effect a straight piece rate together with a guaranteed rate per hour is readily understandable and fairly widely used.

Gantt's Task and Bonus System. Gantt introduced his task and bonus system at Bethlehem Steel in 1901. Although it was introduced at first as a temporary measure until conditions would make possible the use of Taylor's system, the latter was never actually brought in. Although Gantt's system rests on the differential rate, there is an important difference from the Taylor system in that the base rate is guaranteed whether or not the high standard task set for a given time is achieved. The bonus, which ranges from 20 to 50 per cent, is paid for the achievement of task and above. For work done up to but not including task, $E = TR$, but for work done at or above task, if the bonus is 33⅓ per cent, $E = SR + \frac{1}{3}SR$ or $1\frac{1}{3}SR$. Thus, if the wage rate is $1.00 per hour for an 8-hour day and 40 pieces are standard output, the worker making 40 pieces will get $\frac{4}{3}(8)(1.00) = \frac{32}{3} = \$10.67$. The worker making 45 pieces will get $\frac{4}{3}(9)(1.00) = \frac{36}{3} = \$12.00$. The worker making 35 pieces, 5 less than task, will get 8(1.00) or $8.00.

The Gantt system is considered superior to Taylor's differential rate since it offers strong incentives at the same time that the minimum base rate is guaranteed.

Emerson Efficiency Plan. Harrington Emerson's wage system makes use of a schedule of bonuses for varying rates of efficiency. The worker receives a regular hourly rate, but in addition a percentage of this rate based on the degree of efficiency is added. The degree of his efficiency is determined by dividing the standard time by the actual time. A sliding scale of percentages of efficiency ranging from 67 to 100 was prepared, each percentage being entitled to the percentage of bonus indicated. The bonuses, which range from .25 per cent to 20 per cent, are paid over a period of time such as a week or a month, the object being to encourage sustained and steady effort.

If a worker were found to be 84 per cent efficient, the percentage of his bonus as read from the sliding scale is 6 per cent of his base rate. Assuming the base rate is $1.00 per hour for a 40-hour week, the base pay would be $40.00, the bonus $2.40, and the total wage $42.40.

Bedaux System. Under the Bedaux system standard task time, based

on time study with allowances necessary for the particular job, is expressed in points called *B*'s. The *B* is the amount of work a man should be able to do in 1 minute. It is thus a standard minute of work; 60 *B*'s constitute a standard hour of work and 480 *B*'s constitute the standard for an 8-hour day. A base rate is paid for each task whether or not the worker reaches the task. This feature thus corresponds to the guaranteed day rate. Under earlier installations of this system, the bonus was 75 per cent for time saved, the remaining 25 per cent going to supervisors, but later the worker was paid a bonus of 100 per cent of the time saved.

If the standard rate per *B* is 3 cents, and 500 *B*'s are completed during the day, the pay is $(480 \times \$.03) + (20 \times \$.03) = \$15.00$.

Another point system is the Haynes "manit" system in which the standard man-minute is called a manit. The manit represents four fifths of the amount of work that a normal worker can do in a minute of time without overexertion. The standard rate of production is 60 manits per hour. If the actual rate of production in an hour is, for example, 75 manits, the earnings are one fourth above the hourly base rate.

Scanlon Plan. The so-called Scanlon plan, which is named after Joseph Scanlon, who developed it, has been successfully used in a number of companies. This plan emphasizes the idea that satisfactions are derived from participation in meaningful work activity and participative management.[1] It is different from ordinary incentive systems which its proponents describe as being based on a belief in the innate unpleasantness of work. Although the real significance of the Scanlon plan lies in its general philosophy, it is desirable to review its contents in order to understand it better.

There are three features of the plan:

1. It is a method of sharing the gains from improvement in the organization's performance by payment of a monthly bonus based on the average level of productive efficiency of the organization as a whole. The formula for measuring the savings from the cost reductions which are shared is not only a method of calculating the monthly bonus, but it is also at the same time a method of providing information for evaluating the overall functioning of the organization. It is based on Scanlon's objective of finding an index of overall productivity which will reflect the success of the organization in improving its overall efficiency. By using this index as a target, the organization can evaluate its own performance. The index used is a ratio between the total manpower costs of the organization and a measure of output, such as total sales or value added by manufacture. Improvement in this ratio represents an overall economic gain. Some portion of this gain running variously to 100 per cent of

[1] Cf. Gilbert K. Krulee, "The Scanlon Plan: Co-operation Through Participation," *The Journal of Business*, Vol. 28 (April, 1955), pp. 100–113.

the resultant savings is paid to the participants on a monthly basis as a percentage of their base wage or salary.

2. A formal method is provided to give an opportunity for every member of the organization to contribute his mental ability and ingenuity, in addition to his physical effort, to the solution of production problems and the improvement of the organization's effectiveness. This is done by a series of production committees whose purpose is to receive, discuss, and evaluate every means which anyone can think of for improving the ratio and to put into effect those considered workable. Representatives from every group and function in the organization serve on these committees. The formalities of the committee operations are kept at a minimum.

3. The plan is introduced by means of participation by both employees as well as management in the discussions regarding both the details of the plan and its ultimate acceptance.

The Scanlon plan of participation has resulted in increased productivity in the companies where it is in use. Most of these companies are relatively small, with several hundred employees; although the largest has 8000 employees, the arrangements would probably encounter difficulties in companies with very large numbers of employees.

Conclusion. It should not be thought that the wage systems discussed in this chapter are the only ones in existence since there is actually a wide variety of systems although many of them differ from each other only in unimportant details. Those taken up here, however, are basic in the sense that some are in actual use at present, whereas others are reflected in existing wage plans which are either modifications of these plans or represent some combinations of them.

QUESTIONS

1. What are the advantages and disadvantages of the day rate?
2. How can merit rating be related to the day rate?
3. What problems arise in connection with straight piece rates? How can they be overcome?
4. Discuss the general problem of incentives. How important are wages as incentives compared with other matters?
5. How does Taylor's wage system differ from that of Gantt?
6. What did the plans of Merrick, Rowan, and Haynes provide?
7. Describe the essential features of Halsey's plan. What did Emerson's plan provide?
8. What do you consider the advantages and disadvantages of the Scanlon plan? Under what circumstances would it be appropriate?
9. Which of the different wage plans do you consider satisfactory and which unsatisfactory? Does your answer depend on the circumstances or industry you have in mind?
10. Having in mind a particular firm or industry, can you list several plans in an order of desirability?

CASE: Wade Company

The Wade Company has about half its 900 employees on an old incentive plan which seems to have permitted employees to peg production. The base rates on which incentives were calculated ranged from 45 to 75 cents per hour. Wage-rate increases totaling 90 cents per hour had been added to the base rates plus incentive earnings. For several years the union had tried to increase the base rates to include the full 90 cents. The employees were limiting production to 150 per cent of task. What they were doing was to examine a standard, compare it with the amount of work they had to do to produce 150 per cent, and decide whether or not the standard was acceptable. If it was not, they filed a grievance. The result was frequently relaxed standards. Average earnings were paid for all work not on standards. The company and the union agreed to review all base rates and incentive standards and to incorporate the wage increases into the base rates.

1. To what extent should the union participate in developing this new plan?
2. How should both parties go about doing this?
3. Is it possible for both union and management to gain?

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See Bibliography for Chapter XXI.

Chapter XXI

The Wage Plan and Related Factors

IN THE preceding chapter the object was to concentrate on the fundamentals of wage plans; but wage policy is related to a number of other factors some of which are fairly directly and obviously related to wages, while some are somewhat more remotely related. In the following paragraphs the more important of these factors will be taken up.

Group Payments. Sometimes the arrangements are such that an incentive system cannot be used for the individual worker. The work may be so varied, for instance, that individual performance cannot be accurately measured. On assembly-line operations where the output of each worker is dependent on the production of others, the output of the group has more significance than that of the individual worker. In such instances group incentive payments may be considered desirable. Although the size of the group will vary with the particular circumstances, it is desirable to keep it as small as the type of operations will permit. In small groups the incentive of the individual worker is greater than in larger groups because he can easily understand his relationship to the whole group and its output.

In setting up a method of group payments any one of the incentive plans applied to individual workers can be used. The day rate is generally guaranteed and the bonus for output in excess of the task is divided among the group, the base rate being one possible basis of apportionment. If a foreman's bonus system can be associated with such group payments, a bonus based on the productivity of the foreman's or supervisor's group may be an effective incentive for him.

There are certain advantages in group payments. The group may work out faster methods and the more efficient worker or workers may be so assigned that they become pacesetters for the others. At the same time it must be recognized that instead of promoting cooperation among the workers a group system may cause dissension since the more efficient workers may feel that the less efficient workers are preventing them from

earning as much as they might working alone. It is also difficult to add a new and inexperienced worker because he will for the time being hold back the group's output and therefore limit its incentive bonus. Under certain circumstances, it is best to exclude a beginner from the bonus and thereby leave more to be divided among the experienced members of the group.

Beginners' Rates. A person learning a new job requires time to break in to it. Although this is not much of a problem, at least to the worker on a day rate, under an incentive system he cannot meet the task very easily if at all. Under a piece-rate system, for example, he will make a relatively small wage. An arrangement can be made to offset this, however, by paying the piece rate plus an additional amount sufficient to bring the wage up to a more reasonable level, although not necessarily as much as can be earned by the experienced worker. The additional amount thus given can be reduced from day to day until it becomes zero at such time as it is estimated the worker should be able to produce enough to earn an average piecework wage.

Overtime and Odd-Shift Pay. Additional pay for overtime was frequently found even before the passage of federal legislation requiring such payments. The Fair Labor Standards Act provides that overtime pay must now be paid at the rate of time and a half for work in excess of 40 hours per week in industries in interstate commerce. Administrative, executive, and professional employees are exempt from the provisions of the law.

The regular day shift is necessarily supplemented in some industries by other shifts. In other industries such shifts become necessary from time to time as production demands increase beyond the normal daily-output capacity. The workers on these odd shifts are paid an odd-shift premium, the amount depending somewhat on the time of the particular shift. Although the details of the arrangements vary considerably, the basic incentive system is not changed.

Night shifts are frequently not as productive as day shifts since the workers may not be the best and night workers are more prone to take it easy, encouraged in part by the fact that the night supervisory personnel is itself often not the most capable. These factors combine to make odd-shift work frequently rather costly.

Bonuses. Various special types of bonus arrangements are in use. Bonus systems for foremen based on cost savings, company profits, or some combination are sometimes rather complicated, but the basis of all of them is similar. Although these bonuses are paid periodically, it is generally felt that they should be paid somewhat frequently, perhaps monthly, in order to serve as a continuing incentive.

When bonuses are paid to key operating men on the basis of cost

savings a percentage of the savings may be allocated as a bonus. The amount is divided up among the foremen in direct production and the key men in indirect production, including the superintendent, the head of stores, maintenance, and so on.

When quality is of considerable importance, bonuses for quality may be paid. A quality-wage bonus can also be combined with a bonus for quantity. The simplest form of quality bonus is a fixed percentage paid for output in which there are no imperfect pieces, with deductions from this percentage proportionate to the number of imperfections found. The importance of reducing material waste when material cost constitutes a large portion of the output gives rise to the desirability of incentives for this purpose also. Sometimes a bonus is paid for accident-prevention records.

Bonuses are sometimes paid in money or days off for attendance and punctuality. Although such arrangements are scarcely necessary when business is at a low ebb, they often seem necessary in periods of high levels of employment and they are generally eliminated when employment falls off. Occasionally bonuses are paid for length of service.

When any of the preceding types of bonuses are used, the arrangements should be a definitely fixed and announced part of company policy. Likewise, any change in the system should be made clear. There is, however, another type of bonus which may be paid annually but which is not announced as a fixed part of policy. If the company's earnings justify such an outlay, it is made at the discretion of the management, which reserves the right to make the decision as to whether and how much to pay every year. The method of payment varies in that an equal amount may be paid to everyone, or the amount may be related to regular wage scales, or there may be some maximum. A major difficulty with this type of bonus is that the workers come to expect it. Once a bonus is given at Christmas, the following year it will be spent by many of them before they receive it. With the increase in labor unions, bonuses of this sort will not be widely paid in the future. They are popular in Wall Street brokerage firms.

Vacations, Pensions, and Fringe Benefits. Vacations with pay have become widespread, and payment for holidays is increasing. Pensions, group insurance, and hospitalization plans have been adopted by many companies, frequently as concessions to unions. The future is likely to see an increase in such privately financed plans. Under a profit-sharing trust arrangement a percentage of the annual profits is set aside every year in a trust fund for pensions. When labor unions make demands for pensions, group insurance, hospitalization, and vacations, or for increases in such benefits, the demands are referred to as fringe demands, in contrast with demands for increases in wages.

With the considerably increased development of pension plans in recent years, several problems have emerged. So far as management is concerned, pension plans have been held by the courts to be subject to collective bargaining. Accordingly, union pressures in this direction increased considerably and the sums involved have been rapidly accumulating. Plans which do not provide for the vesting of employees' rights to benefits before retirement involve the forfeiting of accumulated benefits by those ending employment with the firm. Lack of vesting thus discourages flexibility and movement in industry. Broader economic problems arising from these pension funds revolve about such matters as the vast size of these funds, the ownership of the capital involved (most of it in securities), and the control of and responsibility for this property.

Office Salaries. Office and clerical positions are classified according to salary grades, just like nonoffice jobs for which rate ranges are set. The scale of pay may consist of a minimum and maximum for each grade with increments being made periodically to those employees who are thought to deserve them. Once the maximum has been reached, there is, of course, no further possibility of an increase unless the employee is promoted to a higher salary grade.

Executive Compensation. In general, executive salaries are in salary ranges for the different grades of responsibility in somewhat the same fashion as the office and clerical salaries.[1] The amounts paid executives depend upon their experience, their responsibility for policy-making, and their general importance to the company. Additional factors in determining salary ranges for middle management executives are the number of workers under their supervision and the amount of payroll these workers represent. It is essential that executive salaries be determined with due regard to what other companies are paying, for otherwise top and middle executives will go elsewhere. In addition to regular salaries, executive bonus and profit-sharing arrangements are frequent.

Salesmen's Compensation. A straight salary plan for salesmen has the same advantages and disadvantages as the day rate for production workers.[2] To this general statement an exception might be stated to the effect that when salesmen are paid a straight salary they are free to do such things as building up goodwill for future sales. However, this is somewhat analogous to instances in production where the importance of quality is so considerable as to require the use of the day rate.

In any event, there is no immediate incentive for salesmen on straight salaries. Although periodic salary adjustments regularly and impartially

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[1] National Industrial Conference Board, Inc., New York, *Compensation of Top Executives*, Studies in Personnel Policy No. 173, 1959.

[2] For a discussion of salesmen's compensation, see Richard C. Smyth, "How Industry Pays its Salesmen," *The Management Review*, Vol. 48 (December, 1959), p. 20 ff.

made would provide more incentive, adjustments are rarely if ever made downward. Some form of commission plan is generally considered the most satisfactory form of incentive for salesmen. If a straight commission plan is used, a drawing account is necessary for periods when earnings from commissions are insufficient. The amounts drawn against this account are of course repaid out of commissions earned. However, the most common arrangement is a basic salary plus commissions, and sometimes an additional bonus is provided for work in excess of tasks such as sales beyond assigned quotas and possibly promotional work. Although commissions are paid according to volume of sales, a single percentage of all sales is most common but the percentage is sometimes varied with the sales volume.

Profit-Sharing. Some companies have experimented with profit-sharing plans under which an amount based on the profits of the business is divided up among the employees. The advantages usually cited for profit-sharing plans are that labor turnover is reduced, that workers become more efficient, and that loyalty to the company is promoted. Although these plans have ordinarily been experimented with in periods of prosperity, they are widely abandoned when business falls off. There is, of course, no loss sharing, but on the contrary the workers may come to expect a regular distribution regardless of earnings, and they may even blame management for lack of profits. Another difficulty is that the customary annual distribution is not frequent enough to make for a sustained interest on the part of workers. Furthermore, even though the total distribution may be impressively large, many employees in the lower-wage brackets are not likely to be particularly impressed with their share. Finally, also, some departments may be more efficient and profitable even though all share in the profits.

As a matter of fact, for industry as a whole profit-sharing plans can only be fair-weather policies. They have been somewhat successful only when used by firms in industries in which there is relative stability in earnings. These are mostly consumer-goods industries, such as meat packing, food, drug, shoe manufacturing, and the mail-order business. Firms in these industries are not faced with the drastic cyclical fluctuations which are characteristic of the capital-goods industries, where profit-sharing schemes would scarcely be feasible.

Employee Stock Ownership. In the 1920's many firms adopted employee stock ownership plans in which shares of the company's stock were sold to employees at a price below the prevailing market price. The same advantages were generally given for employee stock ownership as have been mentioned in connection with profit-sharing arrangements. However, the collapse of the market in 1929 and the subsequent depression during which values remained very low and sometimes practically

disappeared clearly showed that employee stock ownership programs have certain dangers. Since workers sometimes lost both their jobs and their money, they could not be expected to retain a high regard for the company. There are at present a number of apparently successful employee stock ownership plans, the best known example being that of the American Telephone and Telegraph Company.

Guaranteed Annual Wage. In recent years a good deal has been said about guaranteed annual wages and a number of unions have favored them. Such arrangements have, however, not come into any widespread use as yet. As a matter of fact, these proposals encounter the same kind of difficulties as profit-sharing. Companies in cyclical industries, notably capital goods, would have considerable difficulty in making an effective guarantee. However, in some industries unions have succeeded in reaching agreements providing what are called supplementary unemployment benefit (SUB) payments. These payments are for only one half of the year, rather than the whole year, and they are tied in with state unemployment-compensation plans to which they are supplemental. Thus, a plan may provide that an unemployed worker receive $25 a week while he is receiving state benefits and $50 after state benefits have been exhausted. Some plans do not, however, call for an increase in the employer's obligation after state benefits have been exhausted, in which case the worker's income for the remainder of the period covered would be lower by the amount no longer being received from the state.

A complete system of guaranteed annual wages would be virtually impossible to achieve in a private-enterprise economy with only a moderate amount of control. The widespread voluntary or enforced acceptance of the guaranteed annual wage would itself very likely go far toward suggesting extensive controls including possibly the ordering of production, the direction of workers, and consumer rationing by central control authorities.

Hours. Closely allied with wages and financial incentives is the matter of working hours. Over the years hours have in general decreased considerably. Although legislation has to some extent been a contributing factor, it is probable that at best it merely hastened the reductions made. Federal legislation in the form of the Fair Labor Standards Act has been a strong factor in setting the standard pattern of hours beyond which time and a half must be paid. In many states legislation limits the hours of women and children as well as the industries in which they are permitted to work. In certain states the hours of men are limited in hazardous industries. Beyond legislation as an influence on hours, however, there are still other influences which may even affect in some measure whatever legislation is passed. Traditional and customary hours in a particular industry will have to prevail for all firms in the industry,

union influence may be a powerful factor in reducing hours, and the nature of the operations may be a contributing factor. Although some operations are continuous and may require odd shifts, the time of the different shifts may be influenced in some measure by the particular processes. Although general social considerations do not directly enter into the individual firm's decisions and policies, they influence the background. The relationship between the number of hours worked and health as well as the desirability of leisure-time and recreational activities have come to be more widely understood. The increasing availability of more time for personal affairs has undoubtedly also been a factor in morale.

Conclusion. Some of the features taken up in the preceding paragraphs such as group payments, for instance, will not concern some companies at all. Moreover, the policy of encouraging employee stock ownership is unlikely to be adopted again on as wide a scale as formerly. Many of the other features are found in varying combinations.

QUESTIONS

1. Under what circumstances should group payments be introduced? What problems may be encountered with such payments?
2. Why should a differential be paid for odd-shift work in view of the possibility that output will not be as great as on the regular shift?
3. Describe the different kinds of bonus arrangements.
4. Do you think it desirable to give executives options to buy stock in the corporation? In general, what should such a stock-option plan consist of?
5. What payment plans are best for salesmen?
6. What are the advantages and disadvantages of profit-sharing?
7. How feasible is a guaranteed annual wage? In cases where this does not seem to be altogether feasible, should the company arrange to pay benefits supplementary to unemployment insurance during periods of layoff within the year and possibly extending beyond the period covered by unemployment insurance?
8. It has been proposed that plant workers should be hired on a salary basis. What are the implications of this?
9. Why do you think hours of work have decreased over the decades?
10. Would you favor a more widespread introduction of employee stock ownership plans? Explain why or why not.

CASE: Atmost Foundry

The Atmost Foundry night shift was temporarily abolished because of the curtailment of production schedules. Eight men were transferred to daywork and assured they would go back to their old schedules when business picked up. This was done a few months later.

The night-shift pay schedule includes a 10 per cent differential but this was not paid to these men while they were on the day shift. They took the

matter up with the shop steward who thought they should be paid the shift differential because their temporary transfer was brought about at the company's initiative and a contract provision guaranteed shift employees the premium whenever they were temporarily transferred to aid and assist employees on the day shift. The management did not agree and replied that the contract requires payment of the night-shift rate only when a man is transferred for company convenience, not when a whole shift is laid off.

1. **If you were the arbitrator, how would you rule on this?**
2. **What difficulty seems to permeate this case?**

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Chapter XXII

Employee Training and Welfare Programs

Training Programs

Reasons for Training Programs. Training programs differ widely because they are developed to meet different needs. Among the various factors which give rise to the establishment of training programs are failure to meet production schedules, a large amount of spoiled work, a high rate of accidents, a rapid labor turnover, high costs, and a general lack of applicants qualified for positions. The objectives of training programs are to improve efficiency, to reduce lateness and absences, to interpret the policies of the company to the workers, and to improve morale generally. Not only are different methods obviously necessary to meet these varied objectives, but differing results will also be experienced in the way of cost reduction. In the case of those aspects of training programs which visibly improve the output the results will be much more obvious than in those features of the program which are designed to improve morale. However, although cost savings resulting from improved morale can be measured and compared with the expense of the training program only with more difficulty, this expense is frequently more than justified.

Development of Training Program. When a training program is being established, the objectives must be clearly formulated, and it should be kept in mind that the training program is not a substitute for supervision. A decision must be made as to what kinds of training are necessary and who is to receive the training. For some types of training all employees might be selected, for others only new employees, and for still others perhaps those employees selected by tests. The question of where the training is to be given is sometimes, but not necessarily, settled by the type of program. A training director may have to be specially appointed and an organization for training developed. Con-

sideration must be given to the selection of what seem to be the best methods of instruction, instructors must be secured, and testing systems must be worked out. Since a mere listing of these matters shows that a comparatively large cost may be necessary for a training program, careful thought must be given to the different aspects.

Job Training. Although training for a job begins in the public schools long before a person enters industry, we usually think of job training as beginning at the earliest with some form of vocational training such as is commonly given in trade schools and some high schools. A next step is training on the job with the assistance of some outside facilities which may be used at the same time. Job training is used not only to qualify new or old semiskilled and unskilled workers for particular jobs, but also for more highly skilled workers as well as foremen. There are also salesmen's training programs. Executive training programs may also be arranged for newly hired college graduates who are expected to be in line for managerial and executive positions. The importance of providing training for middle management and higher executives is being increasingly recognized.[1]

Job Training for Production Workers. The requirements in the training of production workers are determined from the job analyses. The most obvious kind of job training is *on the job* itself when the foreman or an experienced employee explains the work and supervises the new employee. Sometimes training on the job is supplemented by class instruction.

Another method of training is the so-called *vestibule school* in which a machine is installed in a space set aside for this purpose and the training is preliminary to actual shop experience although conditions are duplicated as far as possible. Under this method a new employee is given standard instructions in the best method of operating the particular machine. Although such training may be given by an experienced employee or employees, larger firms may have special instructors for this purpose.

Systematic *apprenticeship or craft training* may require as many as four or five years of apprenticeship before the apprentice becomes a journeyman. This kind of training dates from the period of the guilds and is frequently associated with craft unions, although a number of industrial enterprises have their own craft training programs which are independent of unions. The training of an apprentice is designed to provide complete mastery of the particular craft which he is learning. The apprentice and the company sign an apprentice-training contract which stipulates the number of years of training, the wages, the periodic

[1] Cf. John Douglas, "The Training and Development of Nonpromotable Middle Managers," *I L R Research*, Vol. 7 (Spring, 1961), pp. 10–15.

increases in wages, and other terms. The training is both on the job and at schools. Although some of the school training of apprentices in some industries was formerly haphazard, the Veterans Administration in approving apprentice-training arrangements under the G.I. Bill required prior approval of the schools, and thereby raised the standards of the school training, in some instances considerably. In the course of his apprenticeship the apprentice learns how to use the tools of the craft as well as whatever theory, mathematics, and reading of blueprints may be necessary. Although some of the older crafts have been hit by the vast developments in machinery which have rendered such lengthy and thorough training unnecessary, it is erroneous to assume as some have that apprentice training and crafts are no longer necessary or in existence. Sometimes, however, a trade is learned by less formal arrangements.

Colleges, Universities, and Technical Institutes. Reference has already been made to the role of public and vocational schools in training prior to industrial work. The junior colleges, which include both publicly and privately controlled institutions, aim to meet the needs of the communities in which they are located. They prepare for college or university and provide general education for those not intending to go further, specialized preparation for particular occupations, and courses of college grade for adults in the community. Junior colleges are being increasingly called community colleges. The recent movement toward more widespread establishment of these community colleges, to which the state and local governments contribute, with the student paying a modest tuition (as compared at least with that of the four-year private college), is generally supported on the theory that these colleges will raise the level of the local labor force.

The colleges and universities as well as the technical institutes play a role in training for higher positions of various sorts. Although the engineering graduate often finds that for one or more reasons the particular job which he had in mind is not available, he may easily turn to methods work, purchasing, industrial selling, several fields of insurance, or some other field. Except for differences in the alternatives for which he is best prepared, the same general statement may be made with respect to the graduate in business administration or some other field.

Some schools and colleges cooperate more directly with industry in working out cooperative arrangements which combine academic instruction with work in industry by alternating the instruction and the work in specified periods.

The facilities for higher education are, however, available in many areas for evening study by means of which courses may be systematically

taken on a part-time basis toward degrees in various fields, unless the individual prefers to take only such courses as seem to him desirable. Rather specialized courses, which are frequently available at evening sessions, are sometimes developed by cooperation between industry and the educational institution.

Some companies encourage employees to pursue educational activities in their leisure time for the purpose of advancing their individual cultural interests regardless of any direct or calculable advantage to the company. The company may pay all or part of the tuition for such courses as well as for courses which appear to contribute more directly to ability on the job. A tuition-refund policy, based proportionately on grades received with a penalty for a *C*, ignores the fact that an average grade is more significant at some institutions than at others.

Conferences and Lectures. Conferences, group meetings, arrangements for lectures, and the providing of various sorts of reading matter are educational devices helpful for different purposes. Since conferences and group meetings may be most useful for foreman training, they will be referred to subsequently in that connection. A series of lectures may be given to interpret company policies and possibly for other purposes such as safety. In developing lectures care must be exercised to see to it that they are actually informative and not merely the management's conception of what the employees should be thinking. Although there is considerable danger that such programs may be considered as so much hot air by the employees, management has sometimes seemed to be unwilling to understand this. Moreover, employees as mature individuals frequently like to participate and may not be favorably inclined toward formal lectures.

Adult Education. Adult education as a whole is most effective when it is approached with some understanding that it differs in significant respects from ordinary school and college courses. Not only are the classes composed of mature individuals, but in addition these individuals have a different interest in the work because they are more highly motivated. The more serious attitude which they have does not arise from the mere desire to get a good grade but rather from a desire to learn the subject. However, the serious purpose does not require a solemn approach on the part of instructors, and a relaxed and informal approach helps to put everyone at ease. Another point which has to be kept in mind is that men and women working full time cannot be expected to do outside work of the type and extent expected of students at colleges and universities.

Tests. In certain training programs objective tests are considered best because they give more reliable scores statistically, but such tests are hard to prepare properly unless the particular program makes it possible

Fig. 120. Cover of an employee magazine.

— Republic Aviation Corporation

to use mathematical problems. Although the essay type of test is sometimes considered not entirely satisfactory for some purposes, it is nevertheless frequently used and may give an accurate appraisal of performance.

Reading Matter. Reading matter of various sorts is made available to employees in different ways. Some companies publish a handbook of policies and established practices, while booklets and pamphlets may be published for other purposes as well, such as to explain the relation of the worker and his work to that of the company as a whole and to promote safety. Bulletin boards are used for notices and publications of various kinds, including sometimes the posting of job vacancies in the company.

Plant magazines (Fig. 120), which are published periodically by many companies, endeavor to foster mutual interest and goodwill by describing a company's work, especially new developments as they occur, interpreting new policies, publicizing contests, and carrying feature articles about employees.

Some companies prepare annual reports for employees, which may contain a summary review of the year by the president or chairman of the board, an explanation of the company's financial statements, discussions of expansion and improvement programs, production records made (if any), relief and pension plan operations, safety records, and key personnel changes. Needless to say, plant magazines and annual reports to employees should be interestingly written, attractively printed, and contain many illustrations to attract maximum attention. For similar reasons some of the other reading matter distributed should also contain illustrations.

Many companies have libraries which may be used by employees. Although the content of such libraries varies considerably, they are frequently useful for various purposes.

Education and Employee Welfare. Some of the educational provisions which have been mentioned clearly border on and might even be better classified under welfare programs. As a matter of fact, of course, even job training contributes to the individual employee's welfare in the sense that he can use it elsewhere should the opportunity arise. However, it is preferable to concentrate the discussion of education and training in one place rather than to repeat some points as would otherwise be necessary.

Supervisors and Foremen. The duties of supervisors and foremen vary in scope. In some industries they have a fairly wide variety of processes under their supervision, while in others they are in charge of specialized operations. In some plants foremen estimate labor costs, while in others specialized staff estimators do this work. In some plants foremen instruct new employees on the job, while in others this is done by other employees or special staff instructors.

In general, it may be said that the supervisor or foreman must be concerned with planning and organizing the work to be done, training the workers, supplying them with necessary resources, and maintaining the work group by person-to-person activity. He can be more effective and influential if he organizes his work and relations with the workers so that they are goal-oriented and if he behaves so as to help them achieve goals. Under such arrangements, workers are likely to be more satisfied with the foreman since they desire to perform their jobs as productively as possible by contributing their technical know-how and ideas based on their special knowledge and experience on the job. The effective supervisor does not attempt to tell each employee exactly what to do, when to do it, and how. Supervisors of more productive workers frequently do not supervise too closely but grant a good deal of discretion and control over the work to individual employees. They may be said to be more oriented to the needs of the employees doing the work

than toward the work itself. It should be kept in mind, however, that supervisors and foremen are responsible for the output and, since they can never afford to forget this, their problems are not easy.

Despite the basic role of foremen, their status was for some time minimized, apparently because they had been stripped of some of their older functions by the development of production planning and control. It was not until government labor decisions classified foremen at one time as workers and at another time as management that a real change in management thinking began to take shape, particularly after some foremen, who felt their status had deteriorated both financially and in other ways relative to that of unionized production workers, began to join workers' unions. It was eventually realized that with the rise of labor unions the foreman's role had become more important, and that the foreman is in a key position because he is the link between management and the workers. He must convey the views of workers to management but at the same time he is regarded as management by the workers because he administers management policies. What he does is of the utmost importance in matters of morale, grievances, labor relations, and unionization.

Additional developments which foreshadowed a greater stress on the place of foremen were the rise in the average level of education of the workers, the increasing attention to employee safety and plant housekeeping, and the increasing use of such new management techniques as job evaluation, merit-rating, and programs of work simplification and standardization.

Foreman Training Program. There are two broad categories into which foreman training falls. The first concerns production matters in general. Not only do foremen have to know about company policies, organization structure, and channels and procedures of communication, but they must also be familiar with scheduling, cost and quality control, accident prevention and safety programs, job analysis, and methods improvement. The second broad category into which foreman training falls and which may be of even more importance is concerned with the supervision of those under their direction. The responsibilities of the supervisor, including the giving of orders, the avoidance of time wasting, the maintenance of discipline, the handling of grievances, ability in communications, and a better understanding of human relations must be stressed in such training, with the general object of developing qualities of leadership. Since the more difficult tasks of supervising people center on human relationships rather than operating techniques, this should be kept in mind in selecting and training foremen.[2]

[2] Cf. Robert Hilkert, "Achieving Administrative Competence — The Supervisor," *Michigan Business Review*, Vol. 11 (May, 1959), pp. 1–7.

A foreman-training program not only provides training for persons who are already foremen, but it may also provide training for and help develop selected employees who can temporarily step into foremen's positions and who are slated under a policy of promotion from within for foremen's jobs when the opportunity arises.

In the past most foreman training was done on the job. The preparation of employees who would later step into the position of foreman was assisted by job rotation which helped to familiarize them with various phases of management. The tendency now is toward more formal lecture, study, and conference methods. In the lecture method, in which lectures are given on different aspects of supervision followed by a discussion period, the same difficulties mentioned before arise.

The most widely used method is the conference method in which periodic conferences are arranged. Under the leadership of a conference leader the foremen discuss their experiences and the problems which arise in their work. A good conference leader must command the respect of the men. He leads but does not dominate the discussion, nor does he answer the questions which arise. The conference method helps to develop leadership because the participants have to express their own ideas. Texts written by department heads, executives, or the training staff may be used. Several excellent filmstrips, each of which raises a serious supervisory problem in an interesting way without providing a solution, are available. In deciding on a program, the fact that the conference method requires a good deal of time must be taken into account. Formal instruction and classwork as well as correspondence and home study programs are not considered particularly productive.

Sales Training Program. A sales training program may be necessary for one or more reasons, as when the sales force or at least some of the men have not had much experience in selling, or when they are not sufficiently familiar with the company's products or with its customers.

Although the sales training program generally provides for training in knowledge of the product, it is also necessary to develop some understanding of market outlets so that prospective buyers may be located. More important in many ways is training in selling which involves such matters as the approach to buyers, the conduct of interviews, meeting objections to the product, and closing the sale. In cases where many sales are repeat sales, the development of buyer goodwill is of most obvious importance, but its importance in other instances also should not be overlooked.

Although it is often customary in setting up the program to provide time for the observation of plant operations, the exact length of time given to this varies considerably. Some observers think good salesmen

will become dissatisfied and leave the company if the period in the plant is too lengthy. The period, if any, during which plant operations are observed is followed by interviews with other salesmen, sales schools, training on the job, or a combination of these. If the program is informal, the specific allotment of the time to be given to each aspect of the training program is not especially possible. Under a formal program, however, definite periods of time are set aside for each part of the program.

Evaluating the Training Program. As has already been suggested at the outset of this chapter, the cost savings or the precise monetary value of some aspects of training programs cannot be easily determined. Other results can, however, be more easily evaluated by comparing the performance of those who have had the training with that of those who have not. Another and somewhat similar comparison can be made of the pretraining performance of those who have taken the training with their performance after taking it. By such means the results on production, sales, safety, and other similar types of performance may be readily measurable.

Executive-Development Programs

Programs for executive development take on varying forms. Traditionally, executives served as understudies to learn the job to which they were expected to be promoted. However, other methods and approaches have been developed on an increasing scale. One procedure is to provide executive management problems calling for decisions as though they were actual problems. The decisions thus simulate executive action and provide some measure of executive problem-solving ability.

Multiple management and junior boards of directors may also be utilized. Multiple management is a form of participation which may contribute toward the development of middle managers. In this kind of program, subordinate boards of directors consisting of executives, supervisors, and younger men who have management potential are given the opportunity to study company problems and to make recommendations for their solution. Several specialized junior boards of directors, such as sales, office, and factory employee boards, may be provided for. Continuation of membership on a board depends on capable performance. Recommendations unanimously approved by these boards are made to the company board of directors. Although membership on the junior boards represents a form of participation, the competition to stay on one for any length of time is very keen and it is often difficult to do so.

Executive development programs are available at several leading universities.[3] These programs, which take varying lengths of time, require

[3] George Bricker, Jr., "University Executive Development Programs," *Michigan Business Review*, Vol. 12 (January, 1960), pp. 6–12.

that the men selected live at the university for the duration of the course. Much of the work is based on the use of involved cases. However, time is available for discussions and related learning experiences. Although these programs are expensive, they have proved increasingly popular.

Service and Welfare Activities

In connection with employee training programs it was stated that, although some educational activities which are encouraged and sometimes paid for by industrial firms actually border on employee-welfare activities, all education and training activities would be considered together. For similar reasons the more important service and welfare activities commonly found will be considered together even though they are of as much importance to the company as they are to the employee. Safety and health, for example, which contribute to steady and efficient production are at the same time of obvious importance to the workers. Even the provision of such things as parking facilities and financial or legal assistance may be conducive to promptness and steadier attendance.

Although welfare and service activities of various sorts were first developed on a large scale during the 1920's, many of these were severely curtailed or abandoned in the depression of the 1930's. During the period of World War II these activities were expanded once again, and they have now become more widely accepted as permanently desirable.

Factors in Morale. That elusive quality called morale is a state of mind and attitude toward the work, the management, and conditions in general, and is influenced by a number of tangible and intangible factors. Individual morale influences the group's morale, which in turn reacts on individual morale. It is management's task to keep morale high by stimulating and maintaining as high a level of interest and enthusiasm as possible.

Since the most concrete factor in morale is the individual's job and the immediately surrounding relationships, the continuing objective in maintaining high levels of morale is to make the job as satisfactory as possible. When employees understand the relationship of their particular jobs to others in the production process they develop a sense of the importance of their own jobs. Rest periods help to break the monotony of jobs; giving employees as great an amount of responsibility as possible promotes an interest in their jobs; appropriate music has been found worthwhile in a number of instances. Continued attention to the possibility of making better placements often provides an opportunity to detect differences in interests and capabilities which suggest worthwhile changes.

Good working conditions include adequate sanitary and personal conveniences, proper lighting, ventilation and room temperatures, as well as orderliness and cleanliness in the plant. Accident-prevention efforts, safety devices, instructions regarding safe practices, regular inspection for fire hazards, and proper equipment and training for fire fighting are noticed by employees. Control of occupational-disease hazards is essential. Hospitalization, medical services, and pensions are now widely provided. Contests, social affairs, and clubs are frequently arranged.

Information on policies respecting such matters as job analysis, hours, and layoffs should be provided, and production information regarding models and changes in designs is helpful. Among the media used in publicity are magazines, newspapers, letters, a sound system, billboards, meetings, instruction booklets, books and pamphlets, local press releases, and motion pictures. The attitudes of employees toward the company and business generally frequently tend to be more favorable as a result of information provided them in annual statements, special reports, special training courses, and other means of publicity. Providing worthwhile information helps to promote industrial peace. When foremen are properly informed, their attitudes in answering questions which employees may ask are likely to be much better than when they are uninformed.

Health Measures. It has already been mentioned that a medical examination is frequently given to new employees and that physical examinations are often given periodically.[4] Sometimes the results of such examinations are used in placing workers on the kind of work for which they are best fitted.

Larger companies employ a full-time physician and medical staff, while smaller companies employ a physician on a consulting basis and utilize local hospitals and clinics. Frequently a nurse is employed. Some companies send a visiting nurse to call on ill workers. Occasionally medical service is extended to the worker's family. A few companies provide dental clinics.

The objective of medical service is both remedial and preventive. Treatment is provided for remedial defects by physicians and nurses. Sometimes hospitalization is provided. In the effort to prevent the development of illness where precautions can assist in doing so, health education is provided. Another important direction in which preventive medical work has developed is in connection with occupational diseases. In the past not very much was known about occupational diseases which arise from the materials used and the working conditions. The very fact that such diseases existed was not widely known except in a few indus-

[4] Cf. National Industrial Conference Board, Inc., New York, *Company Medical and Health Programs*, revised, Studies in Personnel Policy No. 171, 1959.

tries. But it eventually became clear in other fields that there were more of certain diseases among the workers in particular industries than in others. Although knowledge concerning occupational diseases has increased considerably, there is still much to be discovered.

Safety. Industrial accidents are caused by negligence on the part of both the employer and worker. The speed of the production processes is sometimes also a factor. Management was first made accident conscious and aware of the importance of safety methods by the National Safety Council. Since the fact that industrial accidents are very costly both to the company and to the employees is now well appreciated by management, considerable attention is devoted to safety work of various kinds. Employees are instructed in the best and safest methods of work, guards are placed around machinery, equipment is inspected and tested periodically, floors are kept clean and not overloaded, inflammable materials are stored in fireproof places, and open fire exits are provided.

Safety engineering is applied in the mechanical, electrical, and chemical fields, as well as in connection with tools, material handling, layout, and maintenance. In some hazardous industries such as steel the safety department is an independent department of considerable importance. The safety director organizes the department for the establishment of safety rules, safety inspection, and research into various aspects of safety and the department cooperates with state and industrial agencies.

Occasionally hostility toward new safety arrangements arises among workers and in such instances an educational program is distinctly called for, although it is also understood that workers need reminders from time to time. When the safety-training campaign appears to require a formal program, class instruction may be provided or meetings may be held. Less formal devices are available by material in employee handbooks, the use of bulletin boards for safety messages, articles in the plant magazine, and payroll enclosures. Safety contests are sometimes held with prizes for the winners. The importance of getting supervisors to assume responsibility for safety in their departments should not be overlooked. It has been suggested that the greatest progress toward safety is achieved only when this has been accomplished.

Recreation. Some companies sponsor various forms of recreational and social activities, including athletic contests, dances, picnics, and shows. Clubhouses may be provided for parties and dances. Vacation resorts for use by their employees are owned by some companies.

Financial and Miscellaneous Services. Many companies with cafeterias and lunchrooms serve meals at cost and sometimes even without charge. Although some companies make the purchase of household and other articles available at lower than prevailing retail prices, there is a

good deal of opposition to this practice as a general principle.

Credit unions to which employees contribute and in which they have an equity are sponsored by some companies to make employee borrowing possible. Employee savings associations are sometimes found. Mutual benefit associations, toward which the employer contributes amounts in addition to the dues paid by the employees, make sickness and death benefit payments. Participation in any of these arrangements is usually voluntary. Sometimes direct financial assistance is made available.

Since the possibility of necessary layoffs must always be provided against in advance even though it is hoped to avoid them, dismissal compensation plans related to length of service are established by many companies.

Some companies make arrangements for legal aid and provide counseling service.

Although experience with company housing was fairly bad in the past, with the passage of time some rather excellent housing facilities have been provided by some companies.

Grievances. Regardless of whether personal grievances of one kind or another are real or imaginary, they often become cumulative in their effects; and, therefore, grievance procedures should be worked out. Grievances should be settled at once by the employee's immediate foreman or supervisor. Sometimes excitement runs so high that a few minutes given to calming down may be helpful. Whenever a satisfactory settlement cannot be made by the foreman, a grievance should be referred promptly to a higher authority through the established channels made available to employees. A careful study of the causes of complaints often shows that minor adjustments will result in a considerable reduction in their number.

Employee-Suggestion Systems. Many companies have established employee-suggestion systems in which employees are encouraged to write up suggestions regarding possible improvements in methods, materials, operations, quality, working conditions, and safety and to drop them into a box provided for that purpose. The value of the prizes and rewards provided depends on the value of the suggestions. Although the exact procedures followed in evaluating suggestions vary, one method is to have a suggestion committee consisting of representatives of management and workers make the decisions. Employee-suggestion systems not only give employees an opportunity to make criticisms and express grievances, but they also often result in considerable savings to the company.

Opinion Surveys. In recent years some managements have given considerable attention to opinion surveys in order to determine the morale

and attitudes of employees.[5] Such information makes it possible for management to take corrective steps when necessary. Knowledge of employee dissatisfaction with management policies, plant and working conditions, or other matters makes it possible to rectify any errors which management has overlooked. On the other hand, employee attitudes of dissatisfaction on some matters may be based on misunderstanding or misinterpretation, in which case correction can be made by properly directed publicity, or in extreme cases by a training program.

The following five factors, which have been identified as defining the basic dimensions of employee morale, can be used as the basis for determining employee attitudes:

1. The employee's relationship with the management and the organization which management represents to him. This reflects sentiments of identification with the organization and of security for the present and future. It is also an evaluation of communication in the organization and of management's efficiency, effectiveness, and concern for employee welfare.
2. The employee's attitude toward his immediate supervision. This includes both human relations and purely administrative aspects of supervision.
3. Material rewards in pay and benefits.
4. Interpersonal relations with other employees, friendliness of other employees, and their ability to work together.
5. Job satisfaction, including the belief that the job is worthwhile and affords opportunities for growth and development.

When these factors are defined in terms of thirty selected items understandable to employees and to which they can respond, it is suggested that they can be used as a core of items for an attitude-survey questionnaire for particular types of employees.[6]

Conclusion. Although the objective of training programs is basically to achieve benefits for the company, it is clear that in preparing employees and executives to make better contributions to the company they also contribute to the advantage of those in such programs. A somewhat similar statement can be made of the various aspects of welfare programs since they are designed to promote morale and increase output, but in doing so undoubtedly contribute to the satisfactions of employees.

QUESTIONS

1. What should be considered in organizing a training program?
2. How should production workers be trained?

[5] Cf. National Industrial Conference Board, Inc., New York, *Following Up Attitude Survey Findings*, Studies in Personnel Policy No. 181, 1961.

[6] Melany E. Baehr and Richard Renck, "The Definition and Measurement of Employee Morale," *Administrative Science Quarterly*, Vol. 3, pp. 157–184.

3. Do you think the community colleges are effectively achieving their objective of raising the level of the local labor force?
4. How does adult education differ from school and college work? Is it more or less effective than the latter?
5. What kind of reading matter would you regard as most useful in communicating company objectives?
6. What are the chief duties and problems of the foreman? How should a foreman training program be organized?
7. In what ways are sales training programs different from others?
8. What are the important factors to be kept in mind in improving morale?
9. Since one would imagine that workers have a regard for their own safety, it would seem that company safety work needs to be only at a minimum and yet the text says that such activities may be very extensive. Discuss.
10. In attempting to determine the attitudes of employees, might not reports of supervisors based on observation and interviewing be better than the opinion surveys mentioned in the text?

CASE: City Manufacturing Company

The maintenance workers of the City Manufacturing Company are in the usual crafts — carpenters, electricians, millwrights, plumbers, and others. The company has no union contracts. The management is of the opinion that broader maintenance classification would be desirable and that it would benefit both the employees and the company. A general classification would mean a better pay scale and broadened experiences for the men with more of a chance for steady employment because they would be more valuable. For the company, the advantage would be in getting the work done more efficiently and at less cost. There would be no disputes as to who should do a job. Worker morale would be improved. Some maintenance jobs now requiring five trades could be done by two employees. Any displaced men would be given other jobs at the same rate of pay. A special training program would be needed to give the maintenance men an opportunity to become more proficient in various skills and, in view of the general approach and point of view, such a program would have to be provided on a continuing basis.

1. **Do you think this would be a desirable program?**
2. **If it is to be adopted, how should the company go about doing so?**
3. **What disadvantages can you see in such a program?**

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Chapter XXIII

Collective Bargaining

Not very many years ago labor unions and collective bargaining were the exception rather than the widespread rule that they are today. Although they are not universal, they are so common that any treatment of labor relations must consider them if it is to be adequate. In order to understand present conditions, it is desirable first to give brief consideration to the development of unions and the labor movement.

Development of American Labor Unions

Early Craft Unions. The earliest American labor organizations are traceable to the 1790's when the workers in particular crafts combined in an effort to secure concessions from their employers. Unions of this sort were scattered and at first rather infrequent. During the first half of the nineteenth century they increased in number and membership, but there was little stability or continued existence for most of them.

Early National Labor Organizations. It was not until the 1850's that national labor organizations were formed by the local craft unions in some fields but not all of them survived. The National Labor Union, which was formed in 1866, was the first national organization in which the national craft unions were combined. This organization supported a variety of objectives. It favored greenbacks and the farmers and debtors generally; it supported producers' cooperatives; and it hoped to form an independent labor party. Since these aims were not to the immediate individual economic interest of workers, they were not so attractive as the promotion of higher wages and shorter hours would have been. The organization did succeed in getting an eight-hour-day law passed for federal employees with the objective of setting a pattern which it was thought private employers could then be more easily induced to follow, but this is about as far as it got in promoting the economic interests of workers.

Meanwhile, the Noble Order of the Knights of Labor had been formed in Philadelphia in 1869. Although this was at first a secret organization, it finally came into the open after 1879 because of the opposition of the Catholic Church to secret societies. The Knights was a reformist organization. It favored abolition of the wage system, it advocated cooperation and social reform, and it took into its ranks not only all workers who wanted to join, but also those in the middle classes and the professions, although later it excluded lawyers, doctors, and bankers. Although the organization came out in favor of national unions in 1878 and it also demanded a government labor bureau to gather and make public information helpful to labor, this was as far as it went in support of the economic interests of workers. The admission to membership of many individuals of different interests meant that it could not advocate a program with a singleness of purpose. With the passage of time the Knights became less humanitarian-minded and much more aggressive. In spite of the opposition of its leaders to strikes, it became involved in serious strikes in the 1880's and by 1886 it reached its peak, after which it declined rapidly.

American Federation of Labor and Business Unionism. Aside from the local and national craft unions which were in process of developing from early years, whatever there was of a labor movement was idealistic, reformist, and utopian until the American Federation of Labor (A. F. of L.) was formed in the 1880's as a combination of about thirty national craft unions, eighteen of which had survived from the 1870's. After mixed beginnings the A. F. of L. was formally launched in 1886, the basic constituent units being the national unions, a number of which were called international because they had locals in Canada, Mexico, and Central America. Each member of the locals was to pay a per-capita tax, which would be paid to the A. F. of L. The officers of the new organization were to promote favorable labor legislation, organize new unions, and generally carry on such activities as would assist the constituent national unions. The A. F. of L. itself was a loose federation with virtually no central control over the constituent national unions.

The philosophy of the A. F. of L., which was interested in pure and simple trade unionism and not in revolution or reform, was clearly in conflict with that of the Knights and other utopian or reform labor groups. The objective was to improve the status of workers here and now by increasing their bargaining power in what Professor Hoxie called business unionism. Union leaders representing the members of national or local unions were to sit around the bargaining table in a businesslike way in order to arrive at a trade agreement with the employer or his representative on economic matters of interest to both. If, of course,

this procedure did not succeed by itself, other methods including strikes, boycotts, and picketing would be resorted to in order to secure union recognition and the trade agreement. From its beginnings the A. F. of L. and its constituent unions were interested primarily in economic and not political power. Although unions in the railroads have a similar philosophy, they did not affiliate with the A. F. of L.

Revolutionary Unionism. In contrast with the A. F. of L. the Industrial Workers of the World (I.W.W.) was a syndicalist and revolutionary union movement which developed before World War I and reached its peak during that war. Its significance today is largely historical, but it serves as an example of revolutionary unionism.

Although the I.W.W. secured a good deal of notoriety and aroused widespread fear of revolution, this was out of all proportion to its actual influence, which was relatively small. Most of the new unions formed during World War I were chartered by the A. F. of L., while existing A. F. of L. unions grew in numbers at the same time.

Decline of Unions in the 1920's and Early 1930's. Many of the new unions formed during World War I disappeared shortly after the end of the war. The members had no traditions and common bonds in crafts as had those of the old-line crafts. An additional factor in the decline of unions and union membership in the postwar period was the open shop drive on the part of employers. An open shop is one in which no union is recognized and everyone seeking employment is on the same plane in this respect. There were, however, other factors in the general decline. Some industries, such as coal, clothing, and textiles, suffered depression in the midst of the general prosperity of the 1920's. Unions can be held together in a long depression only in the most highly skilled trades in which the members have a strong discipline. There were also shifts in the location of plants and industries. So-called welfare capitalism, with company-sponsored employee representation plans or company unions as one feature, sought to offset an interest in outside unions. Reflecting the lack of interest in expanding the union movement, some well-established labor unions began to engage in what was called labor capitalism which involved, among other activities, the establishment of labor banks.

The depression beginning in 1929 was accompanied by continually increasing unemployment, while labor unions and union membership declined. In many instances trade agreements were terminated or the unions got poorer terms. Although some companies paid out large amounts for relief purposes, the personnel and welfare activities of the 1920's were drastically cut.

Legislation Favorable to Unions. The union movement received a strong impetus with the passage of the National Industrial Recovery Act

in 1933.[1] Under the Act each industry was to establish a "code of fair competition," which would have the full force of law when approved by the President. Firms in an industry were permitted to organize trade associations with powers which would have been violations of the Sherman Act, the force of which was, however, not to apply in instances where codes were approved. In order to be approved each code had to contain provisions for labor standards for the entire industry, including minimum wages, maximum hours, and such other terms as could be agreed upon in collective bargaining. Section 7(a) of the Act provided that every code must contain conditions giving employees "the right to organize and bargain collectively through representatives of their own choosing," that no employee could be required as a condition of employment to join a company union or to refrain from joining a labor organization of his own choosing, and that employers must "comply with the maximum hours of labor, minimum rates of pay, and other conditions of employment, approved or prescribed by the President." The Act was subsequently amended to authorize the President to establish boards to investigate controversies arising under Section 7(a) and to order and conduct elections of employees for the purpose of determining their collective-bargaining representatives.

As a matter of fact, for a variety of reasons, including perhaps chiefly the structure of the A. F. of L., these provisions had not led to much expansion in union membership by the time the Act was declared unconstitutional in 1935. But this decision declaring the Act unconstitutional was followed shortly by the enactment of Section 7(a) into the National Labor Relations Act, popularly known as the Wagner Act, which provided that employees could join unions for the purpose of collective bargaining, and provided for a National Labor Relations Board to administer the Act. In general, the National Labor Relations Board was to designate bargaining units and to determine the proper representatives of those units. The Board could issue orders against employers charged with violations of the law. These orders were enforceable by appeal of the Board to the Circuit Court of Appeals and violation of its orders would subject an employer to contempt of court. The constitutionality of the Act was upheld by the Supreme Court and the way to a continued expansion of unions was opened up.

A. F. of L. and Industrial Unionism. The encouragement given to labor-union organization resulted in the rise of the industrial unions and the Congress of Industrial Organizations (C.I.O.). The A. F. of L. was incapable of undertaking this organization of industrial workers for several important reasons. In the first place, the most important of its

[1] Edwin E. Witte, "Government and Union-Management Relations: Past, Present, and Future," *Michigan Business Review*, Vol. 11 (November, 1959), pp. 22–29.

constituent unions were craft unions, which had practically no place for unskilled workers. Since the craft unions were capable of exerting economic power by their control of the market for the particular kind of labor organized in each union, they would actually stand to lose by supporting the demands of unskilled and semiskilled workers, for they would have to use their strength for such purposes instead of for achieving gains for themselves. In other words, they would spend their efforts and dissipate their power chiefly in raising the standards of others to their own level.

An even more serious difficulty arose in connection with attempted plant-wide organization. Since the Federation was loosely organized, its officers had no control over the rights of the individual national unions and their constituent locals. The constituent unions of the Federation had for some years been faced with jurisdictional disputes arising out of the conflicting jurisdictions among crafts concerning different types of work. Metalworkers, carpenters, and others had been unable to agree on a permanent delineation of their spheres of jurisdiction. In some instances, it appeared to be virtually impossible to come to an agreement and industrial developments have continued to impose productive requirements cutting across traditional craft lines. Hence, the attempt to organize workers in the mass-production plants would invite serious difficulties because existing crafts would make conflicting claims of jurisdiction. The A. F. of L. had granted so-called federal labor-union charters to new unions in a number of instances. The membership of such unions was heterogeneous, but it was always expected that they would somehow eventually be divided among the crafts. As a result of all of these factors, the field was left open to the new industrial unions, which were combined in the Congress of Industrial Organizations. Although an industrial union is open to workers in all departments, sometimes the workers in one or more departments may be organized on a craft basis with all others organized on an industrial basis as in the newspaper-publishing industry.

C.I.O. In spite of the difficulties inherent in the A. F. of L. structure, several of its constituent national unions were industrial unions. After the leaders of these unions, together with at least one of a straight craft union, tried unsuccessfully to persuade the A. F. of L. convention to undertake an organizing campaign along industrial lines, they formed a Committee for Industrial Organization, which was neither authorized nor recognized by the convention of the A. F. of L. But this Committee had almost immediate success in organizing workers in a number of industries. Later it became completely independent of the A. F. of L., the first convention of the Congress of Industrial Organizations being

held in 1938. The C.I.O. had within its membership the bulk of the workers in the basic mass-production industries in the United States. The constituent members of the C.I.O. were national unions in such fields as steel, rubber, automobiles, and electrical equipment. Two qualifications should be noted: (1) the workers of some companies were not organized at all, while in others they were organized in unions not affiliated with either the A. F. of L. or the C.I.O. and (2) in some of these industries both the A. F. of L. craft and federal unions as well as C.I.O. unions existed. In 1955 the A. F. of L and the C.I.O. merged into one loose labor organization called A.F.L.-C.I.O., but there are still jurisdictional disputes and considerable differences of opinion within this united labor movement.

In industrial unions there is sometimes a representation problem in collective bargaining so far as skilled craftsmen are concerned. They are often a significant minority whose goals are likely to be in conflict with those of the majority.[2]

Taft-Hartley Act. The Labor Management Relations Act of 1947, the so-called Taft-Hartley Act, which amended the Wagner Act, provided that an employer must bargain with the representatives of the majority of his employees organized in a proper bargaining unit, but it has the added provision that unions must bargain collectively with the employer. The last provision was added because some unions had in effect refused to bargain under circumstances which seemed to them inconvenient. The Act specified rights and duties for both employers and unions. Although it banned the closed shop, which is an arrangement in accordance with which all workers in a trade must be union members before they get a job, it permitted the union shop, which is one voted for by a majority of the employees in a bargaining unit. When a union shop has been certified as such, new workers must join the union. Although the new Act was sufficiently broad to change a great many of the legal details of labor relations, the broad framework of union structure and procedures remained intact.

Collective Bargaining

Aims of Labor Unions. The fundamental aim of a labor union is to control the labor supply available to any given industry, trade, or firm with the objective of representing that labor in collective bargaining with the employer. An underlying concept is to establish the principle of uniformity or standardization of all the workers in a group or class

[2] Cf. Muriel Beach, "The Problems of the Skilled Worker in an Industrial Union: A Case Study," *I L R Research*, Vol. 6 (Fall–Winter, 1960–1961), pp. 8–15.

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— Republic Aviation Corporation

Fig. 121. Index of a union-management contract.

who do the same work. Theoretically, the individual worker yields up any exceptional abilities he may have to the standard rate established for the group. Although management can and does grant increases for merit and seniority, unions look with disfavor on the practice of giving some workers a higher wage rate than the union scale.

Negotiation of Trade Agreements. In order for the representatives of a union to be able to bargain collectively, the union must first be recognized by the company. Once the union is recognized, collective bargaining takes place between the representatives of the union and the representatives of the company. Negotiations are carried on between the two groups on wages, hours, working conditions, the type of union shop to be established, grievance procedures, seniority, discipline, the rights of union agents, provisions concerning pensions, apprentices if any, the conditions under which the agreement to be arrived at may be reopened, the length of time the agreement is to be in effect, and strikes, stoppages, and lockouts. The terms agreed upon are embodied in a written trade agreement or contract which states specific details regarding the various points covered. Inasmuch as differences in the interpretation of various provisions may arise, machinery for the administration and interpretation of the agreement is included. Figure 121 shows the index of a collective bargaining agreement.

When the negotiators cannot reach an agreement, they may resort to an impartial outside arbitrator in whom both sides have confidence. The arbitrator makes his decision on the basis of a study of the issues as presented by both sides. An impartial arbitrator on a retainer basis may be agreed upon to settle day-to-day questions of interpretation.

Management Representatives. Since collective bargaining is a top-management function, the highest officials sometimes participate in some phases of it. But some individuals are not temperamentally suited to it and frequently a director of labor relations or the head of personnel represents management. Because of the importance of collective bargaining, some authorities believe the official to whom authority is delegated should be given the status of vice-president.

If an industrial-relations director is selected for this purpose, top management has the task of clearly defining and controlling his status, since he might otherwise tend to develop his own policies in dealing with the union on the one hand and management on the other. In practice, industrial relations is variously organized.[3] The department or division may be called industrial relations and be headed by a director of industrial relations with the personnel function under his jurisdiction.

Scope of Collective Bargaining. The scope of collective bargaining or

[3] Cf. Dalton E. McFarland, "The Scope of the Industrial Relations Function," *Personnel*, Vol. 35 (January–February, 1959), pp. 42–51.

the area it is to cover is a matter for management and labor to agree on. The general agreement to bargain does not mean agreement to grant any demand made by the union. The refusal to accede to a demand is therefore not the same as a refusal to bargain, although efforts are sometimes made to make such a refusal appear to be a refusal to bargain.

Procedures. To some extent satisfactory collective bargaining depends upon mutual agreement between the management and the union on procedures. Explanatory discussions between the representatives of both parties held before the actual negotiations begin and before formal contract demands and purposes are formulated help to establish the problems which each side considers of the greatest importance. When proposed contract changes are presented in writing in advance of formal negotiations, both sides have the opportunity to study the proposals. Work stoppages can be avoided if negotiations over the terms of a new contract begin sufficiently far in advance of the termination date of an existing agreement and if there are contract extension provisions which can be invoked in the event of failure to come to an agreement by that date. Before contract negotiations begin, it is desirable to specify the rules of meetings, their time and length, the procedures regarding press releases, the names of the representatives of each side as well as their authority, and the record to be kept of the meetings.

Environmental Influence on Collective Bargaining. It is somewhat unrealistic to treat collective bargaining in a general way without reference to the general climate of opinion which prevails at the time it takes place. It is impossible to understand collective bargaining without taking into account the factors which influence the strength and weakness of the parties doing the bargaining. Hence, also, there is some doubt as to just how much justification there would be in attempting to arrive at and state any "principles" of collective bargaining.

Responsibilities of Management and Labor Unions. When a union is first recognized the process of collective bargaining is likely to be somewhat rough. Mutual trust and understanding are likely to be limited, and differences of opinion resulting from a lack of knowledge of the facts are likely to be common on both sides. These conditions were widespread for some years after the great unionization drives of the 1930's and 1940's. With the passage of time, however, considerable progress has been made and both employers and unions have over the years collected and correlated information necessary on such matters as wages, wage incentives, time studies, vacations, and seniority. Industrial personnel and labor relations research has been greatly expanded; unions have established research departments; and the work of independent research organizations is also sometimes used. There is some doubt as to whether management has been as alert as unions in anticipating, studying, and presenting

issues. Management preparation for collective bargaining has frequently lagged behind that of unions.[4]

The mutual trust and understanding necessary for the best collective bargaining is the result of satisfactory day-to-day relationships. Management must have adequate personnel policies, procedures, and practices. Provision should be made for training supervisors on all levels of authority not only in directing the work of the employees, but also in seeking to maintain satisfactory employer-employee relations.

However, the responsibility for satisfactory collective bargaining is not unilaterally that of management. Union officers, shop chairmen, stewards, committeemen, and members must also meet their responsibilities without attempting to assume functions which are the prerogatives of management and without interfering with the orderly process of production. The organization structure as well as the procedures, policies, and practices of the union must be such as to encourage the observance of agreements and to place responsibility for violations. These conditions cannot be developed by management, although its own example may be a good influence. Unfortunately, the retention of union leadership may require new issues.

Management Prerogatives. When all is said and done, however, union-management relations may be viewed as systems of institutional power relations.[5] In what Sumner Slichter called the present laboristic economy, management is faced with union demands for bargaining about and controlling, to the extent possible, matters which were hitherto regarded as management prerogatives. These include such areas as employee stock-ownership plans, leasing, subcontracting of work, relocation of plants, and various others. The outcome of the developments is not yet clear.[6]

There is a difference of opinion as to how detailed management prerogatives should be specified in the contract. If detailed, an omission of some features taken for granted may be seized upon as a matter for bargaining. If the wording is general (Fig. 122), it is conceivable that unexpected areas may be brought up for bargaining. To some extent the role and importance in collective bargaining of the company attorney is a factor in determining the extent of detailed provisions in this and other clauses of the contract. While attorneys may be partial to technical legal-

[4] For a discussion of such preparation see National Industrial Conference Board, Inc., New York, *Preparing for Collective Bargaining*, Studies in Personnel Policy No. 172, 1959.

[5] Robert Dubin, "Power and Union-Management Relations," *Administrative Science Quarterly*, Vol. 2, pp. 60–81.

[6] Although the literature on this subject has been steadily increasing, the following present basic material: Roscoe Pound, *Legal Immunities of Labor Unions*, The American Enterprise Association, Washington, D. C., 1957; Edward H. Chamberlin, *The Economic Analysis of Labor Union Power*, The American Enterprise Association, Washington, D. C., 1958.

istic provisions, it is also true that unions may sometimes prefer such provisions for various reasons associated with their own welfare, including sometimes a desire for future differences in interpretation.

ARTICLE 30

Company Responsibilty

Section 30.1 It is recognized and mutually agreed that the Company has and retains the sole and exclusive rights to manage its plant and direct its affairs and working forces.

— Republic Aviation Corporation

Fig. 122. Wording of part of a union-management contract.

Independent Unions. In connection with the discussion of the decline of unions in the 1920's, it was pointed out that one of the factors in their decline was the sponsorship by employers of employee-representation plans and company unions. The company usually furnished facilities for meetings and such financial assistance as was necessary. These company unions were dependent on the company and were described as employer-dominated in contrast with the unions such as those affiliated with the A. F. of L., which were described as independent. Company unions of the kind which flourished in the 1920's were outlawed by the labor legislation of the 1930's. When the term "company union" is used today it refers to a union which has been voted on by a majority of the employees of a company and in which membership is open only to the company's employees, but which is not financed or dominated by the company. These unions are now called independent unions.

Management-Labor Committees

Joint management-labor committees, which may be set up whether or not there is a union, are sometimes found to be helpful in improving production. An equal number of representatives of management and labor are appointed to such a committee, whose authority is in general limited to matters concerning production. Sometimes formal cooperation may extend further, however, as was shown in the example of the working out of a job-evaluation program jointly by the United States Steel Corporation and the United Steelworkers of America. In general, joint management-labor committees have nothing to do with collective bargaining or with wages, hours, and related issues. Although some managements have found committees of this sort very helpful in securing considerable production increases, the idea does not appeal to others.

Conclusion. The unionization of large segments of American industry has resulted in a considerably changed environment for management. Collective bargaining raises many problems and requires considerable time and effort not only before and during periods when negotiations are in progress but also during the time the contract is in effect.

QUESTIONS

1. What were the reasons for the early success of the American Federation of Labor in contrast with other unions up to the time of its formation?
2. Is it conceivable that labor-union developments might again parallel those of the 1920's and early 1930's?
3. What were the significant factors in the legislation favoring the development of unions? Should the Taft-Hartley Act be included with this legislation?
4. What are the essential characteristics of the A.F.L.-C.I.O.? Do the continuing differences between the craft and industrial unions make any difference to labor's power so long as the labor movement is merged in this peak organization?
5. What is involved in negotiating the trade agreement or contract? What procedures should be followed?
6. What sort of factors are involved in the environment or what the text refers to as "the general climate of opinion" in which collective bargaining takes place?
7. What responsibility should be developed on the part of the management and the union?
8. Explain (*a*) company union, (*b*) independent union, (*c*) closed shop, (*d*) union shop.
9. It has been suggested that the existence of unions makes personnel administration unnecessary. Discuss.
10. What is a management-labor committee? Does this form of cooperation offer promise of greater development and future usefulness? Why or why not?

CASE: Standard Scale Company

The Standard Scale Company undertook a program of modernization which involved rearranging work areas, tightening production controls, and installing new equipment. By combining duties into one operation in a new classification, three jobs were eliminated. The union objected to this on the ground that in negotiating the contract a good deal of time had been spent on listing all of the jobs and the rates. Since all the jobs were itemized in the agreement, the union maintained that management could not make changes without bargaining. Union spokesmen stated that they wished to make it clear they were not saying they would not agree to the changes. They recognized the need for efficiency, but maintained they should have something to say before job changes were initiated in which some employees were laid off.

The company replied to the effect that the changes were made to be competitive and that negotiations would have delayed this objective. Moreover, there was nothing to discuss because the company had the right to make changes or eliminate jobs in order to stay in business. Since the changes were made for business reasons, there was nothing discriminatory about them.

1. **Could this dispute be settled without arbitration?**
2. **If you were the arbitrator, how would you rule on this?**

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UNIT 8

FINANCIAL MANAGEMENT

Chapter XXIV

Financing the Business

A BUSINESS requires both (1) working capital, which is often called circulating capital because cash is converted into inventories, accounts receivable, and back into cash, and (2) fixed capital consisting of land, buildings, and equipment. In general, both fixed and working capital are provided by long-term capital, except that depending on circumstances some or even all fixed capital may be rented or leased and working capital may be supplemented by borrowing on short term.[1]

The capital necessary to start a business is usually derived from the savings of the owner or owners, loans from friends, bank loans or mortgage loans, and the sale of stock to friends, customers, or suppliers. In a few instances, stock may be sold to a wider investing public. Securing adequate working capital is frequently a pressing problem for the small firm just getting started.

Concern has often been voiced regarding the availability of capital for small business. Although sometimes vigorously set forth, some of this concern is misinformed. In a study of the adequacy of financing for small business since World War II, it was concluded that ". . . in the postwar period, credit has become more readily available to small business, for more extended periods, and at a cost that has differed less and less from that of large businesses."[2]

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[1] For a theoretical model of the optimum capital structure of the firm, see Eli Schwartz, "Theory of the Capital Structure of the Firm," *The Journal of Finance*, Vol. 14 (March, 1959), pp. 18–39.

[2] Irving Schweiger, "The Adequacy of Financing for Small Business Since World War II," *The Journal of Finance*, Vol. 13 (September, 1958), p. 346.

Interesting details on the subject of "Long-Term Small Business Financing" were provided by several authors in *The Journal of Finance*, Vol. 16 (May, 1961), pp. 280–312.

Long-Term Capital

The long-term capital requirements of a single proprietorship or partnership are generally met from the above-mentioned sources or, with the passage of time if the firm experiences some success, from the profits of the business. Earnings retained in the business have always been an important source of capital for American business, and doubtless will necessarily continue to be so.[3] Although it is sometimes possible to borrow on real estate owned, where this is done the governing principles are the same as those in similar borrowing by a corporation.

In the financing of corporations two broad classes of securities are used, stocks and bonds.[4] Since stocks represent equity in the company, the stockholders are owners of the company who share in the profits in the form of payments made to them called dividends. Bonds represent borrowing by the corporation from bondholders who as creditors must be paid a fixed interest charge periodically during the life of the loan.

Capital Stock. The stock of a corporation represents the equity which the stockholders of a corporation have in the net assets, that is, what it owns less its debts. While the title to all property owned is in the corporation, the stockholders own the capital stock. The legal evidence of their ownership is the transferable stock certificate which represents the right to share in such of the profits as are declared as dividends, the right to vote for directors, the right to buy in proportion to existing holdings any new shares which are issued, the right to inspect the corporate books, and the right to share in any residue of property after the satisfaction of other claims in the event of dissolution.

A stock certificate is a negotiable instrument and when endorsed in blank it becomes payable to bearer. A stock certificate can be made out for odd numbers of shares as well as in hundred-share lots. In either case a stockholder can sell part of his shares only, but if he does so he must turn in his certificate and two new ones are issued, one to him for the remainder of the shares he owns and one to the person who bought part of his shares.

When stock is transferred to a new owner on the transfer books, the new owner is the one entitled to receive dividends and to vote. When a dividend is declared to be payable, a date is specified as that on which payment is to be made to stockholders of record as of a given prior date, which is usually ten days or two weeks before the payment date. After

[3] Cf. John A. Griswold, *Financing Capital Expansion*, The Amos Tuck School of Business Administration, Hanover, N. H., Bulletin No. 12, January, 1956.

[4] Cf. the study of recent developments by Eli Shapiro, "The Postwar Market for Corporate Securities: 1946–55" *The Journal of Finance*, Vol. 14 (May, 1959), pp. 196–217.

the list of stockholders to whom payments will be made has been prepared as of the record date, the checks are prepared and mailed for receipt by the stockholders on the date set for payment. Until the record date the stock is worth more by the amount of the dividend. At the close of business on the record date, when the stock goes ex-dividend on the market, its value is reduced by the amount of the dividend.

Par Value. The value of each share of stock as stated in the charter and printed on the stock certificate is the par value. If stock is issued for less than its par value, when there is a par value, the stockholders are liable for the difference. The stock is then said to be sold at a discount. If the stock is sold for more than the par value, it is said to be sold at a premium, and the excess paid in is included in capital surplus or paid-in surplus. When a stock is issued and sold at par, it is described as "fully paid and nonassessable."

For several reasons par value does not have as much significance as was once widely thought. One reason why it may not be particularly meaningful is that the stock may have been issued for property, the value of which is subject to a difference of opinion. Especially where this value is excessive, the par value gives no indication of a proper value. Moreover, the equity of the stockholders is affected by the accumulation of a surplus from earnings or a deficit from losses. More important is the fact that the market value of the stock is based chiefly on prospective earnings, whereas the par value is fixed and has nothing to do with the more important market value.

No Par Stock. Stock without par value was first permitted by the state of New York in 1912 and thereafter by other states. The stock certificate is marked "no par" and no money price is printed on it. Whereas in the case of par-value stock the capital stock account includes the original investment or book value of the par shares sold, when there is no par stock the account may show a different amount than the actual sale price of the stock, the difference being shown as capital surplus or paid-in surplus. In other words, a stated value is assigned to each share, and it is the stated value which is included in the capital stock account. When the corporation has an authorized number of shares greater than those already issued, subsequent shares can be issued at different prices.

Preferred Stock. What has so far been said may be considered as particularly pertinent to common stock. Most of the principles apply also, however, to preferred stock, a separate kind of stock which is preferred as to assets over common in the event of liquidation. It also bears a stated dividend rate which must be paid before common dividends are paid. However, dividends need not be paid if there are no earnings and the directors need not declare them even if there are earnings. But unless preferred stock is specifically stated not to be so, it is cumulative, which

means that unpaid dividends accumulate and must be paid before any payments are made to common.

Preferred stock may be issued in more than one class with equal or different claims to earnings and preference as to assets. Participating preferred stock is stock which, after it and the common receive stipulated amounts, participates with the common in all or part of the remaining earnings available for dividends. Preferred may be convertible into common in a certain ratio until a given date. Thus, a $100 par preferred issue may be convertible at the rate of three shares of common for one preferred share. Noncumulative preferred stock is stock on which the right to a dividend is lost by the stockholder if it is not declared in a particular year. In the absence of any specified limitation, preferred stock has the right to one vote per share. Although many issues do not have the voting privilege, quite a few have the right to vote under certain conditions, as when the dividend has not been paid for a specified time.

Although it is definitely stock and represents an equity in the business rather than a creditor's claim against it, preferred stock, standing between common and bonds, partakes of some features of stock and some of bonds.

A number of so-called classified common stocks labeled Class A and Class B have been issued. Some of them reflect nothing more than a different label for preferred and common, the A stock being what is in effect preferred. In some issues the B stock is simply the nonvoting stock, the vote being restricted to the A shares of which fewer are issued for the purpose of maintaining control with a relatively small capital investment. In every instance it is essential to look up the specific provisions before coming to any conclusions regarding the meaning of the letter.

Corporation Bonds. Bonds represent debts of the corporation. They are loan capital in contrast with equity capital raised by stock. The interest on bonds and the ultimate repayment of the debt are fixed obligations, whereas the dividends on stock are at the discretion of the directors and the claims of stock in liquidation are residual. The claims of bondholders to interest and principal constitute prior claims which must be met before anything is paid to stockholders. The interest must be paid regularly and is a fixed charge, while dividends may fluctuate in amount and are declared at the discretion of the board of directors when earnings warrant them. Bonds have a maturity date at which time the principal must be repaid, but stocks do not, although preferred stock or classified stock may be callable at a certain date like a bond.[5] Because bonds represent debt and not ownership, the bondholders have no voting power or voice in the management so long as the obligations are met.

Short-term borrowing from banks has traditionally been for periods of

[5] Willis J. Winn and Arleigh Hess, Jr., "The Value of the Call Privilege," *The Journal of Finance*, Vol. 14 (May, 1959), pp. 182–195.

less than a year. Longer-term credit is obtained from some banks or by the sale of securities to investors. Such securities may be either what are called notes which run for as long as ten years, but generally from one to five years, or bonds with maturities running anywhere from ten years after the date of issue. Since notes and bonds are similar, they may be treated alike.

There are several reasons why bonds are issued. They may be issued because at the time of issue the company's condition is such that stock cannot be readily sold. However, there must always be some financial justification which will appeal to investors; bonds cannot be sold merely because of a superior attractiveness attached to the concept of a bond. Another reason for issuing bonds is that existing stockholders may wish to retain control without making a larger investment. The sale of additional stock instead of bonds to outsiders would increase the number of votes, and existing holders would have a smaller percentage of the total unless they bought the additional shares themselves. Since the interest charge is a deductible expense in arriving at net income subject to income taxes, there is the advantage of reducing the taxable net. A final reason for financing by the sale of bonds is the lower cost to the corporation of acquiring the capital funds.

Trading on the Equity. Trading on the equity means using borrowed funds in the hope of getting them at a lower rate than the return which will be derived from their use in the business. This result may also be achieved by way of mercantile credit. The investment of the common stockholders who furnished the equity capital is a protection for the bondholders who furnish the loan capital. In using bonds the stockholders trade on their equity. They gain considerably when earnings are high, but if earnings decline they lose by paying more fixed interest charges than the added investment earns. Trading on the equity increases the degree of fluctuation in the rate of return on the common. The influence of such fluctuations in the earnings is called leverage and companies with a large proportion of bonds in their capital structure are said to have a high leverage factor. So long as the rate earned on the investment is greater than the rate paid for the borrowed money, the company is safe, but when earnings are deficient it must dip into equity capital in paying interest, and maintenance work may be neglected.

Trading on the equity is briefly illustrated as follows:

	Average year	Good year	Poor year
Capital stock	$100,000	$100,000	$100,000
Bonds	200,000	200,000	200,000
Interest at 5%	10,000	10,000	10,000
Earnings	15,000	20,000	10,000
Available for common	5,000	10,000	none
Per cent earned on common	5%	10%	0

Obviously, since it is dangerous to engage in long-term borrowing unless the corporation can count on reasonable stability of earnings, it is essential to curb any tendency toward overoptimism.[6] Another matter which will limit the use of bonds is the fact that the cost of borrowing becomes higher as more is borrowed. The reason for this is that, since the risk increases, investors can only be attracted by a higher rate. It is also important to note that in investment circles custom and usage dictate certain conventions.

General Form of Bonds. Although bonds are in reality long-term promissory notes, they are far more formal and complex than the ordinary notes met with in short-term financing. Bonds are issued in coupon or registered form, each of which is interchangeable for the other at the option of the holder. Coupon bonds are payable to bearer and have coupons attached for all subsequent interest dates at each of which a coupon is detached by the owner for payment. Registered bonds are registered with a trust company which acts as registrar of the issue. The name of the owner is typed on its face and interest is forwarded to him periodically by check.

Bonds are sold in round denominations, generally $1,000 and infrequently $500. By convention the interest rate is stated as a round number, say 3 per cent, or a round number and a fraction running as low as ⅛, say 3⅜ per cent, or in the other multiples of eighths, ¼, ⅜, ½, ⅝, ¾, or ⅞. If the bonds cannot be sold in the round-dollar denomination at a rate expressed as a round number and in eighths, they are priced at a discount or premium to reflect the going interest rate for that type of bond at the time of issue. Subsequently, they are bought and sold by investors on a similar basis.

Bond Indentures. There are three parties to a bond issue: the debtor corporation, the trustee (a trust company), and the bondholders. An indenture or trust agreement is drawn up between the corporation and the trustee in which the relationships of the debtor corporation, the trustee, and the bondholders are defined in considerable detail. The indenture, which explains the form of the bond and the attached coupons, also describes in detailed technical language the property being pledged and includes the authorized total of the issue, protecting clauses or covenants regarding the corporation's obligation to pay such items as insurance and taxes, sinking fund and retirement provisions, call or redemption features, an acceleration clause under which the principal is at once due in the event of default of interest, conversion privileges if any, and the status and duties of the trustee.

[6] Louis O. Foster, *Corporate Debt and the Stockholder*, The Amos Tuck School of Business Administration, Hanover, N. H., Bulletin No. 17, December, 1956, suggests that the incurring of debt may be necessary for expansion.

Under the Trust Indenture Act of 1939 trustees are not permitted to have interests which would conflict with those of investors. Under the Act, corporations must file trust indentures with the Securities and Exchange Commission as part of their registration statements. To meet the requirements of the law, indentures must contain provisions covering certain specified duties and responsibilities of trustees.

Use of the indenture makes possible the issue of a total amount of securities without making a separate contractual arrangement with each bondholder. The trustee's duty is to protect the bondholders and to represent them in the event that the corporation encounters financial difficulty.

The bonds themselves are issued under the indenture. The bond instrument is a promise to pay a stated portion of the debt covered by the indenture and gives a summary of the terms of borrowing, the details of which are in the indenture.

Security for Bonds. Bonds may be secured by property or they may be unsecured and therefore general credit obligations. A considerable portion of the fixed assets is real property, although some is personal property. Roughly speaking personal property is movable property, while real property is fixed, although it is always wise to check a particular state's legal interpretation of any given item. Any investments in securities are personal property. The real property in the form of land, buildings, and equipment may be used as the security for mortgage bonds. Personal property in the form of securities held as investment may be used as the security for collateral trust issues. Bonds secured by credit, such as debentures, have no specific security.

Types of Bonds. At the present time, a mortgage is generally considered a lien on property. Bonds secured by a lien on specifically named real property are called *mortgage bonds*. A mortgage bond is an evidence of a promise to pay a stipulated interest rate and to repay the principal at maturity. It is sometimes possible to have a second mortgage secured by the same property, but this claim is junior to the first mortgage.

If there is any default, foreclosure, which is the process of seizing the property and holding a sale, takes place. Although it is possible to have coequal first mortgages on different properties, where there is more than one mortgage on a single property the amount brought at the foreclosure sale is applied to the first mortgage with any remainder going to the second and any successive liens. If there is any surplus after paying all mortgage claims, it is available to the general creditors; anything still remaining at this point goes to the stockholders. On the other hand, if a foreclosure sale does not yield enough to pay the bonds, whatever amounts are not paid are added to the liabilities owed to the general creditors and the bondholders share any remaining liquidating values with the general creditors.

If interest is paid on a prior lien, such as a first mortage, but not on a lower-ranking issue against the same property, the foreclosure is only with respect to the secondary liens in default. The buyer of the property at a foreclosure sale would then buy it subject to the prior liens which are said to be undisturbed.

Collateral trust bonds are bonds secured by the deposit with a trustee of stocks or bonds owned by the borrowing corporation. If there is any default on a collateral trust issue, the collateral security can be sold to satisfy the bondholders. Because the default of some collateral trust issues during the great depression revealed relatively weak collateral, this type of bond is less popular than formerly.

Debenture bonds have no security other than the general assets and credit of the issuing corporation. Since they are not secured by the pledge of any specific property, any property not otherwise pledged acts as security. Occasionally companies with strong credit may be able to issue debentures on favorable terms without the necessity of pledging property. At the other extreme, debentures may be issued by companies having little security to offer since all of it may already have been pledged. By issuing debentures instead of secured bonds, a company can preserve its general unsecured credit for purposes of more favorable short-term borrowing because no property is pledged and the short-term creditors would have an equal claim to all the assets in the event of possible default.

A special type of debenture introduced in the period following World War II is the *subordinated debenture*, which is so named because in the event of insolvency its claims rank after those of other unsecured debt such as other debenture bonds and bank loans. The use of subordinated debentures increases borrowing power in the same way that the issue of preferred stock would, but the cost is less than for preferred stock because it is issued at a lower rate and the interest can be deducted in arriving at taxable net income.[7]

Assumed bonds are those assumed by a corporation which acquires the property of another corporation having bonds outstanding. When a corporation having bonds outstanding is purchased by another in a merger or combined with another new corporation in a consolidation, the successor corporation assumes the debt. Similarly, in the event of foreclosure and reorganization those issues which were undisturbed because they were not in default are assumed by the new corporation so that it can keep title to the property.

Convertible bonds are bonds which may be converted, usually at a certain time, into common stock at a certain ratio, such as par for par, or

[7] Robert W. Johnson, "Subordinated Debentures: Debt that Serves as Equity," *The Journal of Finance*, Vol. 10 (March, 1955), pp. 1–16.

at 50, 110, or some other figure. Since the corporation issuing them must have available a sufficient number of authorized but unissued shares to make the conversion, it may be necessary to amend the charter to increase the authorized shares. Convertible bonds may give salability to an issue when the market prospects for stocks seem good. On some convertible issues the conversion rate is increased to stipulated amounts after the passage of specified periods of time. On others, the right to convert is eliminated after the lapse of a specified period of time. Conversion is at the discretion of the bondholder who will convert only if the price and the expected earning power of the stock are more favorable than the price of and the fixed interest on the bond. But conversion can be encouraged and under certain circumstances in effect forced by calling the bonds in under a call price provision. It is desirable for companies with unstable earnings to issue convertible bonds with provisions which will insure the elimination of the debt.

Sinking fund and serial issues provide for systematic retirement. A sinking-fund provision in an indenture usually requires the regular setting aside of amounts which are paid to the trustee, who is obligated either to invest the funds so turned over in other securities or frequently, depending on the terms of issue, to use the cash at once to purchase and retire a corresponding amount of bonds of the issue for which the sinking fund was set aside. When a fixed annual sinking fund is required, the interest burden decreases over the years. Fixed annual amounts are, however, not provided in all indentures with sinking-fund provisions. It is possible to provide that the amount to be set aside increase each year; this is partly on the theory that the company's earnings from the capital borrowed will expand only gradually. On the other hand, in unusual cases, where the debt is admittedly excessive, provisions might be made for providing decreasing annual amounts, with the earlier years burdened more heavily. It is also possible to provide for the setting aside of a fixed percentage of earnings; since the earnings fluctuate, the sinking fund would obviously also fluctuate. This does not appear to be a particularly desirable provision for it defeats the objectives sought, especially if the earnings become negligible or if there is a deficit.

Serial bonds differ from sinking-fund bonds in that they are issued with the stipulation that a definite portion of them is to be retired each year. If the bonds are issued to the amount of ten million with one million to be retired at the end of each ten years, for example, investors can satisfy their portfolio requirements more readily by buying whatever series of the ten they may wish. The retirement of such serial bonds cannot affect the price as buying for a sinking fund might, since the maturity of each bond in any particular series is clearly designated.

Companies in industries attended by considerable risks associated with

business fluctuations should, if they borrow by issuing bonds when business conditions seem favorable, provide for as early retirement of such issues as possible. This group of industries includes the manufacturing and extractive industries, but some firms in other fields may also face greater risk than others. For instance, the revenues of an electric utility serving an important steel center will experience greater fluctuations in revenues than one serving a predominantly commercial and residential area. Because of past experience with excessive bond issues, railroads have in recent years been simplifying their capital structures by eliminating bonds.

Security Regulation. Under common law the promoter of a corporation may not make secret profits at the expense of a corporation. He must make disclosure to each original subscriber to the shares of the corporation of any secret profits made from the corporation. As a practical matter, however, the promoter dominates the organization and because his existence may not be readily apparent when dummy directors are used to incorporate the business, the common law afforded little protection especially to small investors, who were frequently exploited by fly-by-night promoters. Hence, the states passed blue-sky laws, which require publicity regarding the records of the promoters and the finances of the company, a limitation on the percentage paid to salesmen for selling stock, and the proper description of the securities as to their priority of claim. Because the state laws could not reach certain promotions and especially because of lack of provisions for enforcement of the laws, many of them were not particularly effective. New York state, in contrast, relies with general success on the fraud statutes to combat underhanded promoters. The Securities and Exchange Commission, a federal agency established in the 1930's, has been more effective in preventing misleading promotions. Under the law creating the Commission as well as under its regulations, full disclosure of material information is required. Of course, the S.E.C. does not approve issues but merely requires full disclosure, since if it were to approve issues, the arrangements would amount to government allocation of capital.

Short-Term Finance

Working Capital. In determining the amount of securities which must be sold, the normal working capital requirements must be added to the fixed capital required. The necessary amount of working capital is affected by the volume of production and sales, labor and material costs, taxes, insurance, and other costs. The seasonal character of a business and the liquidation of its inventories into accounts receivable and cash during the year are basic. After a successful seasonal selling period the working

capital must, of course, be in liquid accounts rather than in inventories.

In general, it is desirable to secure as great a regularity in the turnover of inventory as is possible because the more rapid the turnover, the lower the working capital requirements. This means that overstocking should be avoided so far as possible. As rapid a turnover as possible also avoids losses and gains from changes in inventory values, and is especially desirable for companies where the manufacturing period is long. Difficulties arise in periods of rising prices when attention must be directed to the problem of maintaining the working capital with the same purchasing power at the end of a financial period as at the beginning. In a period of falling prices, inventory acquired at earlier higher prices might have to be sold in the finished product at prices insufficient to recover the amount originally paid for the inventory. As has already been mentioned, the control of inventories is being facilitated by the use of electronic data-processing equipment.

Working-Capital Deficiencies. An inadequate working capital may result not only from losses arising from inventory price declines but also from a number of other possible factors including operating losses, excessive additions to fixed assets out of necessary working capital, the reduction of bonds or stocks outstanding, or the payment of interest and excessive dividends. While the payment of fixed charges cannot be avoided, there is always some choice in connection with dividends. It is fairly obvious that dividends should not be declared for the mere purpose of maintaining regular payments if the earnings do not warrant payments, or if the firm is at the same time using profits to acquire additional fixed assets. Dividends should be backed by a strong working-capital position.

Additional Working Capital. There may, however, be a more legitimate need for later acquisition of additional working capital because of the expansion of operations and the need for greater inventory. In prosperous times, both current assets and liabilities are frequently increased, the additions arising from greater sales volume and an increase in the permanent capital. There may also be temporary increases in working capital arising from increases in accounts payable, from the sale of commercial paper, or from advances against the accounts receivable by factors. For a discussion of the function of a factor, see page 382.

When an increased volume of business is expected to be relatively permanent, it is a general principle of finance that the permanent working capital should be increased either out of earnings or by the acquisition of additional working capital from outside sources.

A converse situation which arises when working capital in the form of cash is temporarily idle requires consideration of investment on a temporary basis. The importance of the rate of return on such short-term lending scarcely needs to be emphasized.

Bank Credit. Although we shall be referring in the immediately following discussion to bank loans, it should be kept in mind that most borrowing from banks is in the form of discounts rather than loans. Since discounting involves the deduction of interest in advance (that is, when the loan is made), the effective rate is higher than the nominal rate as in the case of a strict loan on which the interest is paid at the end of the loan period.

Borrowing from banks has traditionally been for short periods of time, such as for 30, 60, or 90 days, but sometimes the loans are extended. Although the theory was that there should be a cleanup of the loan at least once a year to show that it is liquid, this principle is not always followed. In order to borrow from a bank, the business must establish its credit. The bank may grant a line of credit, which means that the creditor can borrow in different amounts as requirements occur up to the amount of the total line of credit granted. Secured loans are made on the basis of notes secured by various forms of negotiable instruments. Term loans, which may or may not be secured by collateral, are now made with a maturity of 12 months or more and are sometimes repayable in installments.

Commodity loans are made on the security of warehouse receipts. A warehouse receipt is a written acknowledgment of the warehouseman that he has received in storage certain goods which will be delivered on demand, providing the terms of the receipt are complied with. The goods are kept separate from those of other depositors in the warehouse. If it is negotiable, the warehouse receipt may be endorsed by the manufacturer in favor of his bank and then given to the bank. At the same time, he signs a note for the amount of a loan on the goods, and the bank which holds the note until maturity makes the funds available to him. The negotiable receipt must be surrendered to the warehouse every time a partial delivery of the goods is made.

Nonnegotiable warehouse receipts issued in the name of the bank avoid the red tape of surrendering the negotiable warehouse receipt to the warehouse every time a partial delivery of the goods is to be made. The manufacturer arranges credit at the bank and stores the goods in the warehouse for the account of the bank. Partial delivery can then be made on the written order of the bank. The bank holds the warehouse receipt as long as the credit is outstanding.

In field warehousing, a branch of a public warehouse is established on the premises of the owner of goods. The goods remain stored there. One of the employees of the manufacturer is made a representative of the public warehouse and the goods are therefore legally under the custodianship of the public warehouseman. Negotiable or nonnegotiable warehouse receipts are issued to cover the products. Although field ware-

housing is mainly a credit device, it is also useful when a manufacturer owns a warehouse because there is no public warehouse nearby, or when the goods are necessary for production and more readily available in or near the plant without the need for outside transportation.

Accounts receivable are sometimes discounted at a bank or finance company. Under the nonnotification plan the customers of the borrower who discounted their accounts continue to pay the borrower, who receives the payments as an agent of the bank or finance company and turns the payments over to the latter. Under this arrangement the bank or finance company does not notify the borrower's customers. Under the notification plan, customers pay the bank or finance company directly.

Factors. Factors have long been customary in the textile industry. Factors buy the accounts receivable for a commission and assume the risk of collection. Where the custom of factoring is established, it makes no difference that the customers are notified, because they will not be likely to assume that their vendor is in financial difficulties. Factoring has been expanding to a number of industries other than textiles, including the lumber, clothing, shoe, glassware and china, electrical-appliances, and fuel-oil industries, among others.

Commercial Paper. Companies with the very highest credit standing may sell at discount what is called commercial paper to a commercial paper house which sells such paper to banks. Commercial paper is in round denominations such as $2,500, $5,000, and $10,000 with maturities as long as six months or more.

Credits and Collections

Credit Policy. The necessary working capital is dependent in some measure on the mercantile credit policy adopted. Most buying and selling by businesses is not on a strictly cash basis and at least on an open-book-account basis involving accounts receivable. When goods are sold on credit, capital is tied up, but at the same time purchases on credit are, in effect, loans which offset the capital tied up in accounts receivable. The anticipated amounts of purchases and sales on credit are therefore of significance. But these amounts depend on the terms of sale which include the period of credit, the cash discounts if any, dating, interest, and so on. Dating means deferring the due date by dating the bill with a fictitious date from which the credit terms begin. This may be done to accommodate dealers for seasonal purposes or it may be for competitive purposes. Regular terms are usually decided on and generally granted, but there may be special terms in given instances. When goods are sold on credit the entries of the amounts set up in the books as accounts receivable are made from the bills rendered. Although the term

Dun & Bradstreet Report

RATING UNCHANGED

CD 13 MAR 14 196- N

34 61 ARNOLD METAL PRODUCTS CO — METAL STAMPINGS — 1947 — F 3
ARNOLD, SAMUEL B., OWNER

53 MAIN STREET
SOUTH DAWSON MICH

TRADE PPT
SALES $148,250
WORTH $18,961
EMPLS 7

SUMMARY

SALES ARE INCREASING THROUGH SUB-CONTRACT WORK AND PROFITS ARE BEING EARNED AND RETAINED. A SATISFACTORY FINANCIAL CONDITION IS MAINTAINED.

TRADE

HC	OWE	P DUE	TERMS	Mar 1 196-	SOLD
3000	1500		2-10-30	Ppt	Over 3 yrs
2500	1000		2-10-30	Ppt	Over 3 yrs
2000	500		1-10-30	Ppt	Old account
1000			30	Ppt	Over 3 yrs to 2-6-
500	500		2-10-30	Ppt	Over 3 yrs
500	500		30	1st sale	

FINANCE

Statement Dec 31 196-

Cash	$ 4,870	Accts Pay	$ 5,621
Accts Rec	12,472	Notes Pay Curr	2,400
Mdse	8,619	Accruals	4,083
Total Current	25,961	Total Current	12,104
Fixed Assets	10,104	Notes Pay Def	5,000
		NET WORTH	18,961
Total Assets	$ 36,065	Total	$ 36,065

Net sales 196- $148,250; Gross profit $47,821; Net profit over and above drawings of the owner $3,204. Inventory valued at lower of cost or market. Reserve for doubtful accounts $1,508. Reserve for depreciation $3,912. Fire insurance merchandise $7,500; fixed assets $9,000. Lease expires January 1, 196-.
Signed Mar 14 196- ARNOLD METAL PRODUCTS CO by Samuel B. Arnold, Owner.
Johnson Singer, CPA, South Dawson.

-----O-----

Sales increased last year due to increased sub-contract work and this trend is reported continuing. Arnold bought new equipment in September at a cost of $8,000 financed by a bank loan secured by a lien on the equipment payable $200 per month. With increased capacity he has been able to handle a larger volume.

On March 14, 196- Arnold stated that for the first two months of this year volume was $32,075 and operations continue to be profitable. Collections are made promptly and operations are adequately financed.

Medium to high four figure balances are maintained at a local depository where an equipment loan is outstanding and being retired as agreed.

OPERATION

Manufactures light metal stampings for industrial concerns and also does some work on a sub-contract basis for aircraft manufacturers. Terms are 30 days net. Owner is active and has seven production and office employees. LOCATION: Rents a one story cinder block building with 10,000 square feet of floor space located in an industrial section. Premises are orderly.

HISTORY

The trade style was registered by the owner January 10, 1947 and is used for general business purposes.

Arnold, born 1908, married, was graduated with a B.S. degree in Mechanical Engineering from Lehigh University in 1931. Employed 1931-40 by Industrial Machine Corporation, Detroit and from 1940-46 as production engineer by Aerial Motors, Inc., Detroit. He started this business in 1947 with $7,500 derived from savings.
3-15-6 - (1803 PRA)

PLEASE NOTE WHETHER NAME, BUSINESS AND STREET ADDRESS CORRESPOND WITH YOUR INQUIRY.
The foregoing report is furnished, at your request, under your Subscription Contract, in STRICT CONFIDENCE, by DUN & BRADSTREET, Inc. as your agents and employees, for your exclusive use as an aid in determining the advisability of granting credit or insurance, and for no other purpose. BR2 2 (30452)

— Dun & Bradstreet, Inc.

Fig. 123. Sample of a Dun & Bradstreet Report.

"open book account" evidently originated when bills were not systematically rendered, the term is still used to describe the modern arrangements just described. Some sales may be made with short-term notes as security.

Credit Department. The credit and collection department should not be under the sales department because the sales objective is generally to sell as much as possible with little attention to risk. The credit manager, who must be familiar with the company's policies, status, and affairs, must know accounting, the legal phases of sales, credit matters, and collection techniques. He should also have an understanding of changing business conditions.

The department analyzes credit risk and sets up credit limits on the basis of the size of purchases, the paying record, the ability to repay, the length of the credit period, and credit ratings from rating agencies. The chief sources of credit information are the credit-rating agencies, financial-statement analysis, and the sales force. Credit-rating agencies include the general mercantile agencies like Dun & Bradstreet and also special rating agencies established by specific industries. There are also credit-interchange bureaus. Although some information may be available from banks and attorneys, it is often not adequate. Financial statement analysis will be briefly referred to later, in the chapter on "The Administration of Income." Credit information from the sales force must be used only with special care. Credit insurance may be arranged for; the policy covers extraordinary credit losses above the recorded loss experience.

Figure 123 is an example of a Dun & Bradstreet credit report. In addition to detailed reports, Dun & Bradstreet also publishes a reference book. Each listing in it is condensed from information in the credit reports of more than three million manufacturers, wholesalers, retailers, and other businesses buying on credit in the United States and Canada.

Collection techniques give rise to a number of considerations beyond the scope of this book.

Conclusion. This chapter has been mainly concerned with the acquisition of capital from outside sources. However, as was pointed out at the beginning, increases in capital may be achieved by reinvested earnings. In the next chapter further consideration of reinvested earnings will be undertaken in connection with the various matters relating to the administration of income.

QUESTIONS

1. What are the chief characteristics of stocks?
2. What is the difference between preferred and common stocks?
3. In which industries does the use of bonds appear to be desirable?
4. What are the chief characteristics of mortgage bonds?

5. How do collateral trust bonds differ from debenture bonds?
6. What is the difference between convertible bonds and sinking fund and serial issues?
7. Under what circumstances should a company consider bank borrowing more satisfactory than the issue of more securities for working-capital purposes?
8. Which forms of securities are appropriate for acquiring working capital?
9. What are the different kinds of security for bank credit?
10. Describe the important factors in a company's credit policy.

CASE: The Turner Company

The Turner Company was organized with an authorized 35,000 shares of common capital stock with a stated value of $10 per share and with 500 shares of $100 par value preferred stock. At different intervals 400 shares of preferred were sold at $105 per share, 10,000 shares of common were sold at prices averaging $19 per share, and the remaining preferred shares were sold at $96. The retained earnings from profitable operations are $97,000. Show in a statement (of stockholders' equity) how the capital was raised.

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Chapter XXV

The Administration of Income

THE purpose of preparing financial reports, which reflect the process involved in arriving at the net income of the business, is to provide management with information necessary to control the business and to show what is estimated as the net income. After they have been prepared, they can be analyzed to determine important relationships among different items which appear on the statements. After determining net income, it is necessary to make decisions regarding its use. These subjects will be considered in this chapter, the first part of which will deal with financial reporting, the second with the analysis of financial statements, and the third with retained earnings and dividends.[1]

Financial Reporting

Need for Financial Reports. In order to manage a business successfully, it is essential to have periodic information regarding its financial condition and the way in which operations have affected that condition. Such information is necessary in order to get a clear understanding of the status of the business and to interpret the influences at work, while it also makes possible capital budgeting and more satisfactory control.[2] Information of this sort is, however, needed not only for management purposes but is also made available to investors, creditors, and interested government agencies. Investors as owners are entitled to know the results of operations and the status of their business. Bondholders and other creditors extend credit on the basis of their interpretation of the condition of the business and its prospects insofar as they can be inferred from the results of past operations. Government requires the filing of financial

[1] Cf. Ronello B. Lewis, "The Role of Accounting in Decision Making," *The Accounting Review*, Vol. 35 (January, 1960), pp. 37–44.

[2] Cf. Diran Bodenhorn, "On the Problem of Capital Budgeting," *The Journal of Finance*, Vol. 14 (December, 1959), pp. 473–492.

— National Cash Register

Fig. 124. This split-second calculator may be used in conjunction with a data-processing system.

— National Cash Register

Fig. 125. An electronic data-processing system may be used to file data, analyze statistics, keep accounts, and perform many other services.

information in connection with taxes, the sale of new securities, and in some fields regulatory matters. Labor unions have also been becoming interested in such information as well as in the way it is prepared and presented.

Content of Financial Reports. The required information is presented in financial reports prepared by the accounting department, which is headed by the comptroller or controller. The work of the accounting department consists of properly recording all of the financial transactions of the business and of preparing various reports from the records of the transactions.

Bookkeeping and accounting machines make it possible to handle masses of relatively routine entries with considerable speed. However,

Fig. 126. An electronic data-processing system.

— National Cash Register

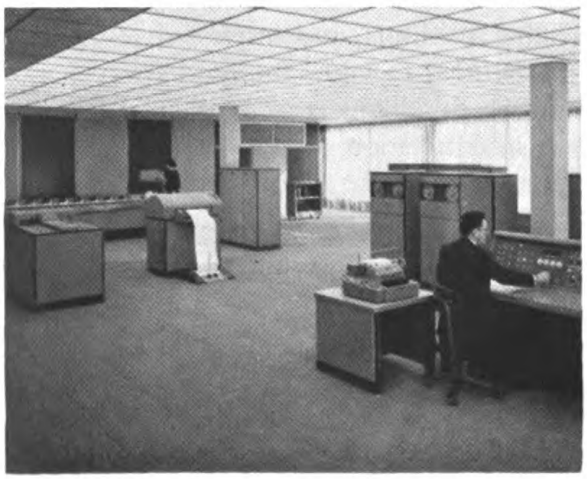
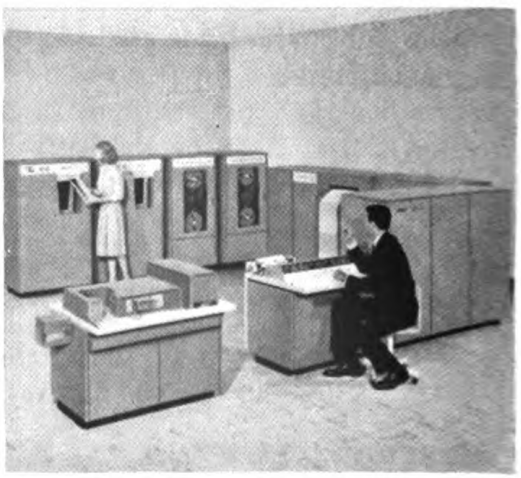


Fig. 127. Magnetic cards are placed in the Card Random Access Memory Unit of a data-processing system.

— National Cash Register



special, adjusting, and what may be called interpretative entries are exceptions which require special attention before being run through the machines.

Figure 124 is a machine which performs very rapid electronic calculations by simultaneously posting accounting data and at the same time permitting automatic capture of data either by means of a coupler that creates punched cards automatically as a by-product of the posting or by use of a paper tape recorder. The tape recorder can be linked with a data-processing machine (Fig. 125) to get rapid reports and analyses. Since the cards or tape can be easily sent to the manufacturer's data-processing center (Fig. 126) for rapid processing, it is not essential to acquire a data-processing system. However, a data-processing system such as that illustrated in Figure 127 may be purchased.

The reports which are prepared by the accounting department include those which summarize all of the transactions, as well as schedules which provide supporting details of some of the items shown on the summary reports. The summary reports are the balance sheet and the earnings statement, which is sometimes called a profit and loss statement, an income statement, a statement of income, or income account.

A basic function of accounting is to raise significant questions rather than to present the answers. Accounting methods analyze costs and revenues to separate the effects of different variables and to report to management those data which ought to be examined and acted upon according to the exception principle.[3]

The Controller. The controller's function thus includes the gathering, reporting, and interpretation of financial information. Figure 128 shows the line and staff functions in a controller's office.

The controller is also commonly given responsibility for insurance, he usually performs substantial parts of the treasury function, and he often takes over the function of corporate secretary. The scope of the controller's work extends beyond pure staff in other ways also. The interpretation of information may be tantamount to authority to act because, in arranging information to explain its meaning, the choices made will influence if not determine decision-making. Routine steps in credit granting and the sending of collection notices when handled by the accounts-receivable section, the timing of payments to take cash discounts when handled by the accounts-payable section, and the settling of minor disputes with employees by the payroll section are examples of the exercise of line authority within broader policy.[4]

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[3] Cf. William J. Vatter, "Contributions of Accounting to Measurement in Management," *Management Science*, Vol. 5 (1959), pp. 27–37.

[4] Cf. Leo A. Schmidt, "Controllership and the Semantics of Control," *Michigan Business Review*, Vol. 13 (May, 1961), pp. 22–24.

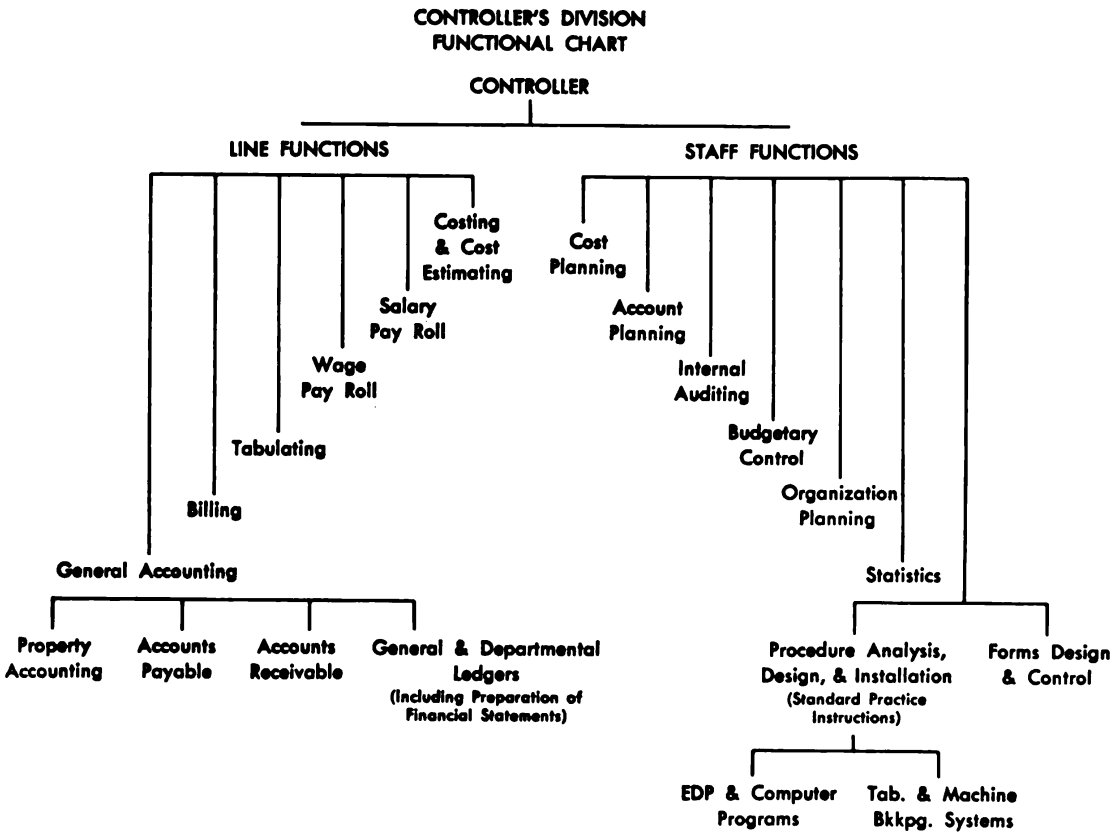

Fig. 128. Chart of functional relations in controller's division.

The function of controllership as conceived by the Controllers Institute of America was as follows:

1. To establish, coordinate and administer, as an integral part of management, an adequate plan for the control of operations. Such a plan would provide, to the extent required in the business, profit planning, programs for capital investing and for financing, sales forecasts, expense budgets and cost standards, together with the necessary procedures to effectuate the plan.
2. To compare performance with operating plans and standards, and to report and interpret the results of operations to all levels of management and to the owners of the business. This function includes the formulation and administration of accounting policy and the compilation of statistical records and special reports as required.
3. To consult with all segments of management responsible for policy or action concerning any phase of the operation of the business as it relates to the attainment of objectives and the effectiveness of policies, organization structure and procedures.
4. To administer tax policies and procedures.
5. To supervise or coordinate the preparation of reports to governmental agencies.
6. To assure fiscal protection for the assets of the business through adequate internal control and proper insurance coverage.
7. To continuously appraise economic and social forces, and governmental influences, and interpret their effect upon the business.[5]

[5] Controllers Institute of America (pamphlet), New York, 1961, p. 2 f.

In 1962, when the name of the Controllers Institute of America was changed to the Financial Executives Institute, an effort was made toward clarification of the treasury function as against the controller function. The following definitions of the scope of the functions of the treasurership and controllership were adopted.

Treasurership: provision of capital, investor relations, short-term financing, banking and custody, credits and collections, investments and insurance.

Controllership: planning for control, reporting and interpreting, evaluating and consulting, tax administration, government reporting, protection of assets, and economic appraisal.

Balance Sheet and Earnings Statement. The balance sheet shows the condition of the business at the particular date for which it is prepared, while the earnings statement shows what took place during the period between the date of the last balance sheet and the present one. The balance sheet has been called a summary of the resources devoted to the functions of the business, while the earnings statement has been called a summary of the effectiveness with which these resources have been used.

Balance sheets and earnings statements are prepared at the end of stated periods of time called accounting periods, such as a month, six months, or a year. For management purposes, statements are prepared monthly during the year, but detailed reports are usually published only at the end of the year, which may be the calendar year or a fiscal year selected on the basis of seasonal factors in the industry. A company whose production is normally half completed between October and December and fully completed by the end of the following March, and the bulk of whose sales are made by the following September, might, for example, choose as a fiscal year the period October 1 to September 30 of the following year.

The balance sheet shows what the business owns, what it owes, and what the stockholders' equity is. The things which a business owns are called assets; the amounts which it owes are called liabilities; and the difference between the assets and the liabilities is the stockholders' equity. Assets are shown on the left side of the balance sheet, while liabilities and the stockholders' equity are shown on the right side. By showing them in this manner, the total of the assets as shown on the left side equals the total of the liabilities and stockholders' equity as shown on the right side. This is so because Assets — Liabilities = Stockholders' Equity, and therefore Assets = Liabilities + Stockholders' Equity.

The earnings statement shows how the net income of the business was derived. The revenue from sales is the gross revenue while the net profit is found by deducting the total of the cost of sales plus other expenses from the sales revenue.

The balance sheet and the earnings statement tie in with each other arithmetically because net earnings not paid out to stockholders are added to the stockholders' equity. This increase in the stockholders' equity is at the same time also reflected either in an increase in assets or a decrease in liabilities or both.

Consolidated Statements. Consolidated statements include the amounts for subsidiary companies, the stock of which is owned by the parent corporation. The objective of preparing consolidated statements is to show the results which would exist if there were no separate corporate entities. Naturally, when a corporation has no subsidiary companies there is no occasion for consolidated statements.

The Balance Sheet: Assets. Assets include current assets, investments and advances, other assets, fixed assets, and deferred charges.

Current assets typically include cash, United States government securities,[6] accounts receivable, notes receivable, and inventories. In general, current assets are cash, government securities readily convertible into cash, and any other items which will be converted into cash within the normal operating cycle of the business. Allowances which have to be provided for possible losses from failure to collect all of the accounts receivable are based on past experience. In placing a value on the inventories of finished products on hand, raw materials, and supplies, the general principle followed is to value them at cost or market, whichever is lower.

Investments and advances include investments in other companies which are not consolidated and advances or loans made to such companies. Obviously not all companies have such an item.

Other assets include amounts set aside for special purposes, such as pension funds and sinking-fund cash deposited with a mortgage trustee to cover the retirement of bonds.

Fixed assets include properties, plant, and equipment set up at cost. Since all property except land is subject to wear and tear, an allowance must be provided to reduce its book value by an estimated amount of depreciation. In the case of mining property an amortization allowance must also be provided to reduce the book value by an estimated amount of depletion of the natural resource.

Deferred charges include certain supplies which it is expected will be used up within a short time and also certain services like insurance for which payment has been made in advance.

Liabilities. The liabilities of a company, which are claims against the assets, include current liabilities payable within a maximum time of a

[6] Cf. William J. Frazer, Jr., "Large Manufacturing Corporations as Suppliers of Funds to the United States Government Securities Market," *The Journal of Finance*, Vol. 13 (December, 1958), pp. 499–509.

year, long-term debts payable at some future time beyond a year, and certain reserves for contingencies.

Current liabilities include accounts payable, including wages due but not yet paid, taxes which it is estimated are due to date but which do not have to be paid until a short time after the date of the balance sheet, and interest and other obligations payable within a year. That part of any long-term debt which is payable within one year is also shown as a current liability. A company may also hold some short-term United States Treasury notes which are to be sold to pay part of the federal income taxes on the earnings made during the preceding year, in which case their value can be deducted from the federal income-tax liability, the first quarter of which is due early in the following year.

Long-term debt includes various forms of bonded indebtedness.

Reserves are provisions for possible costs or losses such as contingency reserves provided for possible obligations such as might arise from the loss of lawsuits but which it is not entirely certain will develop. Insurance reserves are sometimes set up by companies to provide for possible losses which could be insured against by taking out insurance policies with insurance companies but which the company decides instead to provide for by setting up reserves. Reserves are provisions made to reduce the stockholders' equity so that the equity will not prove later to have been misleadingly high.

Minority Interest. When a corporation undertakes to acquire all the shares of another corporation in order to operate that corporation as a subsidiary but does not succeed in acquiring a few of the shares, the owners of such shares have a minority interest. Such a minority interest constitutes a claim against the acquired company's assets included in the assets of the consolidated balance sheet.

Stockholders' Equity. The stockholders' equity or investment in the business includes the capital stock plus any earnings reinvested in the business as retained earnings, less treasury stock, which is stock of the corporation itself acquired by purchase or donation. In a sense, the total stockholders' equity may be viewed as a claim against the assets, although in theory and law it is far different from the liabilities.

Earnings Statement. The earnings statement shows how the net income (or loss) for the year was made. In practice the accountant prepares the statement to show gross sales less the cost of goods sold to get gross profit on sales. He then deducts the total of both selling expenses and general expenses from the gross profit on sales to get the net operating income. Finally, he adds the net of other revenue and other expenses to arrive at the net income before income tax.

In the case of industrial companies, the costs of the products sold include (1) materials, wages and salaries, property taxes, and other manu-

facturing expenses or overhead costs, and (2) the annual provision for depreciation and, in extractive industries, depletion.[7] Administrative and selling expenses include salaries, advertising, taxes other than income taxes and those not included in the cost of production, and the general expenses of running the business not properly included in cost of production. Other income may include dividends received from the investments in companies not consolidated, interest on United States government securities owned and on notes and advances to unconsolidated subsidiaries, and cash dividends earned by paying for purchases within the discount period. Interest expense is an example of other expenses. The major remaining item is for federal income taxes. The corporation income tax is levied on the earnings before the deduction for this tax is made; but after the calculation has been made, income taxes may be listed with the other expenses. However, many statements now show net earnings before federal income taxes, then the income-tax figure, and finally the net earnings after these taxes.

Statement of Surplus. The statement of earned surplus, or retained earnings as it is now increasingly called, shows changes during the year and indicates how the net income was used. The net income for the year is added to the retained earnings at the beginning of the year and from the resulting total the amount of cash dividends paid on stock is deducted, the remainder being the retained earnings at the end of the year as shown on the balance sheet.

Flow of Funds Statement. For management purposes it is highly desirable to understand clearly where funds came from (sources) and what they were used for (applications). Therefore statements of sources and applications of funds, or flow of funds statements, are widely prepared. In general, without becoming involved in too many details, we may say that the cash flow during the year depends upon the sources of funds including net earnings, depreciation allowances (since they do not represent a cash outlay), and borrowings *less* the application or disposition of funds for the purchase of property and investments, for dividends paid, and for increases in working capital other than cash. (Decreases in working capital other than cash would represent a source of funds.)

In the preceding paragraph, the flow of funds was described as though it is a cash flow. However, the way in which these statements are prepared depends upon the definition of the term "funds," which is not always considered only as cash.[8] The question is whether we are inter-

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[7] Cf. John Coughlan, "Industrial Accounting," *The Accounting Review*, Vol. 34 (July, 1959), pp. 415–428, who points out the limitations of mercantile accounting and the usefulness of industrial accounting.

[8] Cf. Donald A. Corbin, "Proposals for Improving Funds Statements," *The Accounting Review*, Vol. 36 (July, 1961), pp. 398–405. See also John A. Griswold, **Cash**

ested in the changes in net working capital during the year, in some intermediate concept of a flow of resources, or exclusively in the cash flow. Obviously, several statements could be prepared to show a company's flow of funds as defined in different ways but if this is done care must be exercised in the interpretation of the different ones. At the present time accountants are not agreed on any particular form as the most desirable.

Examination of Statements and Accounting Records. It is the common practice today to have an annual audit made by an independent firm of certified public accountants. Since a detailed check of every transaction in an enterprise of any size would be prohibitive in time and cost, the auditors make such tests of the accounting records as seem necessary in the light of the company's accounting system. The auditor's report, which is addressed to the board of directors, includes the statements already referred to, together with appropriate footnotes and other comments which are an integral part of the statements, various supporting schedules, comparative statements, analyses, comments, and historical information. An accompanying covering letter to the board of directors together with the statement of (consolidated) income, the (consolidated) balance sheet, the statement of (consolidated) retained earnings, and the statement of the flow of funds are published in the annual report to the stockholders (together with other material which does not concern us here).

Financial-Statement Analysis

Comparative Analysis of Financial Statements. For purposes of comparison and analysis the balance sheet and earnings statement figures for two or more successive years may be listed in parallel columns. In fact, such comparative statements are often published in the annual reports to stockholders. Since the amounts as such do not readily reveal any significant relationships or changes, the increases and decreases in the different items from one year to the next may be shown in a third column. It is also possible to show each asset as a percentage of the total assets and each liability and stockholders' equity item as a percentage of the total liabilities and stockholders' equity. Such percentages can be shown for the amounts in each year's balance sheet, while the percentages of increases and decreases in the various items from one year to another may also be shown. As far as the profit and loss statement is concerned, similar comparisons could be made, but of more significance is the calculation of the various cost and expense items as percentages of sales.

Ratio Analysis of Financial Statements. Various ratios are used in

Flow Through a Business, The Amos Tuck School of Business Administration, Hanover, N. H., Bulletin No. 5, March, 1955.

connection with the granting of credit, in making analyses of securities, and for interpretation by management. Such ratios should be used carefully, with due regard for such factors as economic and business conditions, competitive relations, and management policies. Some of the more important ratios will be considered here.

The current ratio is the ratio of current assets to current liabilities. The usual rule-of-thumb current ratio is 2 to 1 or 200 per cent, the assumption being that a 100 per cent fall in the value of the current assets would allow a sufficient margin of safety. It was at one time assumed that the 2 to 1 ratio could be applied to all industries, but it is now recognized that a satisfactory current ratio depends on the nature of the business and, in any event, on the quality of the current assets and not merely on their quantity.

The quick ratio or acid-test ratio is the ratio of quick assets to current liabilities. Cash, receivables, and temporary investments in securities which can be quickly converted into cash are considered quick assets. Inventories are likely to be considerably less liquid since it may take some time to manufacture raw materials and goods in process into finished goods and even the finished goods available for sale may not be readily sold at an early date; until they are sold they have not been turned into accounts receivable. The quick ratio generally considered safe is about 1 to 1, but this rule-of-thumb standard cannot be accepted as any more definitive than the 2 to 1 current ratio rule.

Inventory turnover is computed by dividing the cost of goods sold for the year by the average inventory at cost price. Generally, the more sales that are made with a given inventory, the more successful and efficient the business. A slow turnover may reflect too large an investment in inventory, slow-moving goods, or an unbalanced inventory.

The turnover of receivables is found by dividing the annual net sales on credit by the receivables on the balance-sheet date. This turnover indicates the rate at which receivables are on the average converted into cash and can be compared with the usual credit period to determine whether the receivables are being collected within that period.

The ratio of total assets to total debt supplements the current ratio, which measures only current debt coverage. This ratio places emphasis on the fact that debt has to be paid out of assets. The stockholders' equity to total debt ratio, a variation of the preceding ratio, emphasizes the extent of trading on the equity.

The operating ratio is found by dividing the total of the cost of goods sold plus operating expenses by the sales. When this ratio is subtracted from 100 per cent, it gives the net operating profit margin or percentage.

The ratio of net sales to fixed assets shows the turnover of the fixed

assets and indicates the productivity of the investment in fixed assets in terms of sales.

The ratio of net income to total investment (stockholders' equity plus bonds) shows the return on the total investment. The return on the stockholders' equity is the ratio of net income to stockholders' equity.

Retained Earnings and Dividends

In the first part of this chapter the essential factors in arriving at net income were considered. Although there is room for difference of opinion in connection with recording some of the items, the final earnings outcome would ordinarily not be substantially affected in well-managed companies which follow the generally accepted accounting principles and procedures. This is true, however, only if there is no substantially large item or items about which such difference of opinion may exist.

Net income is added to retained earnings. This amount then becomes available for (contingency) reserves, reinvestment in the business, and dividends. Some comments have already been made with reference to reserves. Reinvestment of earnings in the business and dividends are closely related so that we can discuss the remaining question under retained earnings and dividends.

Retained Earnings. Before turning to dividends, it is well to point out that retained earnings were formerly called surplus. This sometimes caused confusion because a clear distinction was not always made between earned surplus and capital surplus. Capital surplus may arise from a variety of sources and the specific descriptive name sometimes used is more closely indicative of its source than is the term "capital surplus." Among the various sources of capital surplus are the sale of stock at more than its par or stated value and the issue of stock to acquire the stock of another company which has a greater value than the stock given in payment. Because of the various sources of capital surplus and the diverse provisions of the different state corporation laws regarding it, generalization as to its possible uses is difficult. However, the important point is that it is ordinarily not possible to declare dividends out of capital surplus. Dividends are for the most part paid out of retained earnings (earned surplus).

Dividends. The declaring of dividends is a matter of law and management policy. Although the state corporation laws vary, it may be said that in general the board of directors in considering whether the payment of a dividend would be legal must concern itself with matters such as the following: (1) no dividend may be paid unless the value of the assets, after the payment, exceeds the par or stated value of the capital

stock plus the liabilities; stated otherwise, this rule provides that dividends must not impair the legal capital; (2) no dividend may be paid when the company is already unable to pay its debts or would be unable to do so after payment of the dividend; (3) no dividend may be paid except from retained earnings.

Apart from the legal requirements, the decision to declare a dividend is a matter of management policy. As a general rule, the directors will ordinarily consider it undesirable to pay dividends if there are no retained earnings even if it is lawful to do so. Also, since cash dividends reduce the cash and current assets, the effect on working capital of declaring a dividend is highly significant.

Regular dividends are widely considered desirable because they appeal to stockholders and add to the company's credit standing. Since the policy of paying regular dividends may be limited in the case of some companies with fluctuating earnings, the directors of such companies may establish a fairly low regular dividend rate which they believe can be maintained and declare extra dividends from time to time as seems to be warranted. If the extra dividend is paid so regularly, however, that stockholders come to expect it, difficulties in communicating any problems arising from inability to continue such a dividend may develop.

The directors may consider it expedient to avoid the declaration of dividends in order to put the company into better condition in the face of anticipated losses. For somewhat analogous reasons they may decide to reduce the company's indebtedness rather than declare dividends. In fact, contracts with creditors may definitely require restrictions on dividend payments.

An important criterion in the decision to declare dividends is the reinvestment of earnings to finance growth. This policy, which has been widely followed in this country, has been a major factor in the growth and expansion of many companies and industries. In some other countries, including Great Britain, it appears that a widespread policy of paying out most of the earnings as dividends not only did not encourage the expansion of industry and the replacement of equipment, but it also evidently contributed to the economic difficulties which finally came to light in the period after World War II.

The increasing federal income taxes have become a factor influencing financial policy. On the one hand, the high personal income taxes encourage the retention of earnings in the business which is closely held, but, on the other hand, high corporation income taxes make it difficult for companies to retain sufficient earnings to achieve real growth. The high corporation income taxes are one factor leading to the sale of medium-size businesses to large corporations; another factor leading to

the same result is high death taxes, which cannot be paid unless the company is sold to buyers which are most likely to be large corporations.

Kinds of Dividends. Cash dividends require no explanation. Stock dividends are paid by increasing the number of shares and decreasing the retained earnings by the amount of the book value of the additional shares issued. Stock dividends do not result in any change in the stockholders' equity, but merely result in an increase in the capital stock outstanding and a decrease in retained earnings by the same amount. Stock dividends are paid to give the stockholder some evidence of his increased equity and earning power resulting from reinvested earnings. They are usually issued only when the directors believe they will be able to declare the regular rate of return on the original number of shares plus the additionally issued ones. However, in the case of some very large stock dividends there is no expectation that it will be possible to pay the existing dividend but rather that a smaller dividend per share will be paid. Although stock split-ups have the same effect, they are different because one or more additional shares are exchanged for each existing share, and retained earnings are not affected.

Stockholders are occasionally given a choice of accepting either a stock dividend or a cash dividend. Scrip dividends, which are transferable promissory notes, have occasionally been declared when the earnings appeared to justify a dividend even though the cash position did not. Dividends in the stock of other corporations have also been paid; the corporation paying them is thereby distributing to its shareholders the stock which it owns in other corporations but which for one reason or another it does not wish to continue holding. Ordinarily, such stock does not constitute a large proportion of the corporation's assets.

Liquidating dividends represent the return of capital to the owners of the business. In most cases a liquidating dividend arises when the corporation is winding up its affairs and has some assets remaining for stockholders after paying all creditors.

Conclusion. The process of preparing financial reports involves decisions which affect the net income as finally determined. The analysis of these reports sheds some light on the financial development and status of the business. Decisions regarding retained earnings and dividends involve the final disposition of net income.

QUESTIONS

1. Why are financial reports needed?
2. How do the balance sheet and earnings statement tie in with each other?
3. Describe the principal items on the balance sheet.
4. How does the earnings statement arrive at the net income or loss for the year?

5. In connection with ratio analysis, (a) contrast the current and quick ratios and (b) describe the receivables turnover.
6. Are all the ratios of equal importance? If not, which are more important and why?
7. In the investment world, interest has in recent years centered on growth stocks of corporations which have grown over the years and may be expected to continue to grow as a result of successful plowing back of the earnings. Mention some fields in which you would expect to find growth stocks. Should every company in such a field of business attempt to plow back earnings?
8. What changes in tax policies would be desirable to encourage growth and development?
9. Describe the different kinds of dividends.
10. Why is a stock split different from a stock dividend?

CASE: Robbins Wood Products

The following are the major items, rounded off, on the balance sheet of the Robbins Wood Products Company:

Assets

Current Assets			
Cash		$28,000	
Accounts Receivable	$11,000		
Less: Allowance for Bad Debts	2,000	9,000	
Inventories		28,000	
			$65,000
Fixed Assets			
Machinery and Equipment		$27,000	
Less: Allowance for Depreciation		20,000	7,000
Total Assets			$72,000

Liabilities and Stockholders' Equity

Current Liabilities			
Accounts Payable		$32,000	
Taxes Payable		4,000	
			$36,000
Stockholders' Equity			
Common Capital Stock		$24,000	
Retained Earnings		12,000	
			36,000
Total Liabilities and Stockholders' Equity			$72,000

1. What are (a) the current ratio, (b) the quick ratio, and (c) total assets to current debt?
2. From the balance sheet and, on the basis of the ratios, is this company in a financially sound condition?
3. Is there anything which should be questioned before drawing a final conclusion on the second question?

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Chapter XXVI

Meeting Business Risks

ALTHOUGH there are specific costs, losses, and damages which can be definitely expected and charged off as costs, there are some costs, losses, and damages which because of their uncertainty present the problem of risk. A business takes a variety of risks in connection with property, production, labor, marketing, and general business conditions. Property is subject to the risk of destruction by fire, storms, floods, and so on. Production risks arise from flaws in materials, lack of necessary materials at the right time, limitations on the part of workers, and so on. Theft, strikes, war, and changes in laws are among the possibilities which must be faced. Innovations by other producers in products, production methods, or marketing methods are always possible and must be met in order to continue effective competition. Market risks arise from producing in advance of sales for an uncertain market in which adverse changes in demand, prices, and even possibly transportation might take place. Fluctuations in general business conditions affect costs, prices, labor-market conditions, financing, and, in fact, the status of the business as a whole.

Since the owners of a business by the investment of their capital subject the capital to considerable risk, it is to their interest to eliminate risk or to transfer it to others to the maximum extent it is possible to do so. The managers of a business, even if they do not own it, are also interested in the same objective not only because their careers are closely enmeshed with the fate of the enterprise but also because they have an increasingly professional point of view. Workers are likewise interested in the continued success of the business, to say nothing of such factors as their own safety, which is promoted by the effort to eliminate the risk of accidents.

The effort to eliminate accidents and to promote safety is typical of the elimination of risk by preventing it. To be sure, a safety program is

only one of the many aspects of modern management which are in effect directed in some measure to the elimination of risk. Proper location of the plant, research into new products, the setting of standards for the product, production and labor standards, and the control of production all help to eliminate uncertainty and therefore risk. The aim of market research is to limit the risks inherent in marketing. Financial policies involving provisions for more or less definitely expected declines in values as well as for contingencies have a similar objective of attempting to eliminate risk.

Despite efforts to eliminate or at least minimize risks, there are some which cannot be eliminated, although some of them can be transferred to specialists in risk-bearing, the best known of which are insurance companies. The cost of having the specialist handle risks is offset by a greater saving from the losses which might otherwise have to be borne directly by the business. Specialists in risk-bearing actually do not themselves assume as great a proportionate risk as would the business which purchases their services. Some of these specialists can provide their services at moderate fees because of expert knowledge of the situation. A good example of this is the title guarantee company which investigates real-estate titles and guarantees the title if it is satisfied that there is no real risk. Others of these specialists are able to perform their services because they conduct their operations on the basis of the theory of probability according to which a large number of individual items behave in a highly regular fashion in the large group even though they behave irregularly as individual items. It is on this basis that insurance companies, by combining a great many individual uncertainties and calculating on the basis of statistics of past experience the certain loss to be expected for the group, are able to insure the individual policyholder against possible loss arising from his being among those suffering loss by charging him a small proportion of the total expected loss for the group. The charge for this small portion of the total loss plus administrative costs constitutes the premium paid by the insured policyholder. Another way of transferring risk is by hedging in the attempt to shift the risk of price changes.

The risks involved in several kinds of changes in business conditions can be met in part by forecasting, which if reasonably correct provides against the possible adverse effects of such fluctuations.

Before turning to insurance, hedging, changing business conditions, and forecasting in the following sections of this chapter, it should first be noted that, whereas the unsuccessful businessman frequently attributes his failure to lack of capital or a downward swing in business conditions, the fact of the matter is that the most important deficiency is generally poor management. A number of studies have been made on the reasons

for business failure and all of them conclude that poor management is the principal reason.[1] And, of course, good management involves proper handling of matters taken up in the present chapter.

Insurance

As has already been pointed out, insurance distributes the cost of risk over a large group of individuals subject to the same risk in order to reimburse those in the group who actually suffer the losses. The insurance company agrees to meet certain stated risks to a large number of insured parties who pay a premium and are issued a contract called a policy in which the insurance company agrees to reimburse the insured for the specified loss up to a designated amount during the life of the policy and in consideration of the payment of the premium.

Life Insurance. The most widely used insurance is life insurance including term insurance, whole life insurance, limited-payment life insurance, and endowment insurance. Term insurance covers the insured party only during the definite term of years for which it is written. The whole-life policy provides protection to dependents during the life of the insured. A limited-payment life-insurance policy requires the payment of premiums for a stated number of years after which the insured pays no more premiums but continues to be covered. An endowment policy requires the payment of premiums for a definite number of years, during which the insured is covered for the face value of the policy, but at the end of this time the policy is paid up and may be exchanged for the cash amount or converted into some other form of life insurance.

Although life insurance is ordinarily used for the protection of dependents, it is sometimes used to protect a business against the loss of one or more valuable executives or other employees, or, in the case of companies the stock of which is closely held, against the death of one or more of the stockholders. The expense of replacing valuable employees lost by death may be considerable. Likewise, when there are few stockholders, life insurance provides a means by which their stock can be bought when they die.

Fire Insurance. Fire insurance covers damage to property by fire. The insurance company has to pay for any fire loss unless the fire hazard has increased since the policy became effective, but it does not agree to pay for losses due to all contingencies, such as those resulting from theft, war, riot, or civil commotion.

Fire-insurance policies contain what is called a coinsurance clause. The reason for this clause is that most fires do not result in complete

[1] Cf. *The Failure Record through 1961*, Dun & Bradstreet, Inc., New York, p. 12 f.

destruction of the property and therefore the buyers of such insurance tend not to seek full coverage to the total value of the property. In order to get full protection for partial losses it is necessary under the coinsurance clause to buy coverage up to a stipulated percentage of the total value of the property, usually 80 per cent. Without the coinsurance clause, a building valued at $20,000 but insured for $10,000 would be only partially covered in the event of partial damage by fire. If it were damaged to the extent of $4,000, for example, the insurance company would pay only $10,000/$16,000 or five-eighths of the loss. This would be $2,500 although the loss was $4,000.

Because of the need for diversifying its risks, one insurance company will sometimes not be willing to insure a property for the total amount the insured desires. When this is so the insured may obtain policies from several different companies, each of which agrees to pay for losses in proportion to the amount of insurance its policy called for.

Included with fire insurance are policies covering losses from water damage, sprinkler leakage, hail, rain, windstorm, tornado, earthquake, and explosion. Separate policies may be issued to cover these risks or they may be covered by a special agreement added to the fire-insurance policy as a rider or endorsement. Use and occupancy policies may be taken out to cover losses during the period after a fire and before operations can again be undertaken.

Casualty Insurance. Casualty insurance includes burglary, larceny, and theft insurance, workmen's compensation insurance, and automobile insurance. Burglary, larceny, and theft insurance is available for several purposes. The mercantile open-stock burglary policy provides protection against burglary when the business is closed, while robbery insurance protects the insured against robbery during the regular course of business. The three forms of robbery policies are: (1) the messenger robbery policy, which insures against loss caused by robbery from the person in charge of property while he is outside the premises of the insured, (2) the payroll robbery policy, which insures against loss resulting from robbery of the paymaster, and (3) the office or store robbery policy, which insures against loss resulting from robbery of a custodian while on duty within the premises.

Workmen's compensation insurance protects the employer against costs resulting from injuries to employees arising from and in the course of their employment. The insurance company agrees to pay the award made against the employer under the state compensation law.

Public liability insurance of various kinds is available to provide protection against hazards which may result in injuries to outsiders for which the business may be held responsible.

Automobile insurance is available to cover several hazards, including bodily injuries to others, property damage done to the property of others, damages to an owner's car resulting from collision, and fire and theft. Comprehensive coverage is now available to cover practically all damages except those resulting from collision.

Marine Insurance. Marine insurance provides coverage against loss to property being transported on boats. This form of insurance protects against a number of hazards instead of a single hazard as does the standard fire-insurance policy. It protects against loss from fire as well as all important hazards which may cause losses, and it may be issued to cover the loss of the hull as well as the loss of freight charges. Inland marine insurance provides against various risks which arise in the transportation of goods to various parts of the country. It offers coverage for goods in transit by rail, express, airplanes, and coastwide ships.

Fidelity and Surety Bonds. Fidelity bonds provide protection against defalcation of funds or goods by employees. Separate bonds can be issued for each employee to be bonded or a schedule bond listing all the bonded employees in a schedule attached to the bond can be obtained. Surety bonds cover losses due to negligence rather than dishonesty by employees and others. They are also issued to guarantee the performance of a contract. If a contractor submitting the lowest bid will not be awarded the contract unless he guarantees that he will complete the work, he can obtain a surety bond.

Insurance Manager's Duties. Because of the technicalities as well as the scope of coverage, some companies have their own insurance experts. An insurance manager is responsible for making surveys of risks, hazards, and probable losses. In practice, he reports to the treasurer in most instances, to the controller, or to a variety of other officers in different companies. Among other activities, the insurance manager also cooperates with safety activities, keeps abreast of developments in insurance as well as new types of policies, examines construction, repair, and alteration plans for possible hazards, and examines leases, contracts, and agency agreements for avoidable losses. Records of insurance, costs, premiums, claims, renewals, and so forth are kept under his jurisdiction.

Actually, only the largest multiplant companies or those that self-insure some of their major risks have more than five or six persons concerned with insurance. There may be no department but merely one or two persons devoting most of their time to insurance matters.

Although responsibility for the functions of an insurance manager may be somewhat scattered among a number of officials and departments in smaller companies, it is desirable so far as possible to fix the general responsibility even though the individual assigned the task cannot be expected to be particularly expert if, as is most likely, he has other

work. Moreover, regardless of who administers the insurance program, decisions on insurance matters should be initiated and made within the framework of an established company insurance policy.[2]

Hedging

A commodity exchange is an organization of dealers in certain commodities which provides a marketplace where the members meet at definite times and buy and sell on their own account or on customers' orders the commodities under the rules laid down by the organization. Among the commodities traded in on commodity exchanges are cotton, grains, hides, rubber, silk, tin, sugar, wool, and copper.

On the commodity exchanges buying and selling may be by cash contracts or futures contracts. A cash contract may be a spot transaction, in which case delivery is made at once, or a deferred delivery contract, in which case delivery is to be made on a specified future date. A futures contract is a contract for the purchase or sale of a stipulated amount of a specified grade of some commodity at a fixed price at a future date. Commodities adapted to futures trading must be susceptible of accurate classification into a fairly small number of grades, they must have sufficient interest among traders so that there will be a large enough number of buyers and sellers none of whom can materially affect the price, and they must be in sufficiently large physical supply so that sellers will not find the available supply bought up and held off the market when they try to obtain the goods to fulfill their contracts.

Protection against price changes may be achieved by buying deferred deliveries. For instance, a miller with a capacity of 100 barrels of flour each month may be asked by a baker to quote a price in advance on the delivery of 100 barrels each month for six months. If the miller wishes to buy wheat as he needs it, he may place orders for wheat to be delivered each month at prices quoted today for future delivery. He can quote the price of flour to the baker on the basis of the prices of the wheat.

Protection against price changes can also be sought by hedging. A hedging transaction involves a coincident purchase and sale in two markets which are expected to behave in such a way that any loss realized in one may be offset by an equivalent gain in the other. Hedging is used when a large part of the cost of a manufactured product consists of the cost of a raw material in which there is futures trading and when the price of the manufactured product fluctuates with the price of the raw material. For example, if a miller buys spot wheat to be sold

[2] National Industrial Conference Board, Inc., New York, *Company Insurance Administration*, Studies in Business Policy No. 81, 1956.

as flour at a later date, he can sell the same quantity of wheat futures as of the date he will have finished producing the flour. If when he sells the flour, the price of wheat and therefore of his flour is lower than when he bought the wheat, he takes a loss on the transaction. But he makes a profit on the futures transaction which offsets his loss. This is because he is now able to buy wheat futures to cover his earlier sale of futures at a lower price than that for which he sold them. If the price had gone up, there would have been a gain on the sale of the flour and a loss on the futures transaction.

If a miller contracts to sell flour for later delivery at a certain price based on present wheat prices, he can buy futures now in order to protect himself against an advance in the spot price at the time he must buy the spot. If the price goes up, he sells the futures at a profit, but he has to pay more for the spot wheat and will take a corresponding loss on the sale of the wheat.

By eliminating the risk of a changing price, hedging makes it possible for the manufacturer to concentrate his attention on the production program in which he is specialized. The assumption in making such transactions is that the spot price and the futures price will move together so that a loss realized on the one transaction will be offset by a gain in the other. However, it should be noted that hedging does not give full protection against price changes chiefly because the spot and futures prices do not always move together. The usefulness of hedging by manufacturers other than flour mills has been seriously questioned by some authorities.

Changes in Business Conditions

The activities of an individual business contribute to the changes in general business activity which are always going on, but at the same time these changes in business conditions influence in turn the problems of managing a business. The four types of changes which are ordinarily distinguished are seasonal, cyclical, secular, and accidental, fortuitous, or random fluctuations. Since accidental, fortuitous, or random fluctuations, which are the result of such phenomena as strikes, floods, and earthquakes, are least amenable to measurement, their effects are considered as residuals.

Unless the different types of changes are understood, one of them can be mistaken for another, and highly erroneous decisions might be made as a result. Seasonal variations within the year are related to the regularly recurring seasons resulting from such factors as weather changes and holidays. Cyclical fluctuations, which include the random or erratic movements, are recurring prosperities and depressions extending beyond

the calendar year. Secular movements reflect the long-term trend upward or downward.

Seasonal variations fluctuate around the cyclical movement and the cyclical movement fluctuates around the long-term trend. There is no complete agreement regarding the long-term trend. However, a fifty-year cycle called a long cycle has been distinguished. A nine-to-ten-year business cycle and a forty-month cycle have been distinguished. The typical business cycle is generally regarded as on the average a forty-month cycle although some writers have seen more significance in the intermediate or secondary trends which are equivalent to the nine-to-ten-year cycle.

Seasonal Variations. As has already been indicated, the seasonal changes which take place during the year are influenced by the regular weather changes and the customary holidays. The influence of weather changes requiring the production of certain goods at particular times is particularly seen in food and certain raw materials, the seasonal production of which also influences their seasonal transportation and use. On the other hand, seasonal weather changes also require the availability of different types of certain products, notably clothing. While the production of such articles might be spread out over the year, the usual practice has been to produce them seasonally, obviously in a period or season earlier than that in which they are sold to final consumers. The influence of custom and holidays is particularly reflected in the expansion of retail sales in the weeks before Christmas and Easter.

In some instances, notably food and construction, production is seasonal, while in others, including gasoline, toys, and automobiles, consumption is seasonal. In some cases production of the raw materials is on one seasonal basis while the production of the final product is on another.

An apparently obvious way of ironing out seasonal influences would be to produce at a constant rate throughout the year even though sales are concentrated in particular periods. This system, however, is impossible in some fields such as agriculture. In others it would raise serious problems because unless consumption were somehow regularized significant changes would have to be made in the volume of inventories held in periods when sales are few. Among the problems which would arise with differing seriousness in particular industries as a result of expansion and holding of inventories, there would be serious storage problems, financing problems, difficulties arising from perishable articles and those subject to deterioration, and the impossibility of producing steadily over the year by style industries.

Efforts to regularize consumption by inducing consumers to buy in other than customary periods have not been encouraging. Even if regularization of consumption succeeded, it would often result merely in shifting the holding of inventories from the manufacturer to some market-

ing agent. Canning and refrigeration, which permit regularized consumption throughout the year, for example, require the holding of inventories by various distributors.

Diversification of production by adding new lines which can be sold in what were customarily off-season periods offers some possibilities. Geographical diversification of sales is another alternative as suggested by the possibility of sales of agricultural implements or fertilizers to farmers in different parts of the country at different times.

Although seasonal variations cannot be expected to be eliminated to any considerable extent, particular businesses and industries which succeed in doing so will help to eliminate such variations in at least related businesses, as, for instance, their suppliers.

Secular Trend. The business cycle fluctuates around the secular or long-period trend of production which may be thought of as being composed of a primary long-run trend as well as shorter secondary trends. A secular trend of growth and decline exists also for individual businesses and industries as well as for total industry. To a considerable extent the secular trend under capitalism has been projected upward by excessive cyclical booms. While they were the source of economic progress in the sense that they resulted in the possibility of producing more products more efficiently, or at less cost in terms of economic resources, at the same time these booms required correction by means of subsequent depressions.

The Business Cycle. The business cycle, which consists of recurring periods of upswing and downswing, does not exhibit the precise periodicity in the sense of exact uniformity in the length of its phases as the meaning of the term cycle suggests. The cycle of a particular industry is called a specific cycle, which may or may not coincide with the general business cycle.

The general business cycle is influenced by originating causes and self-generating causes. Originating causes include war and the preparation for war, cyclical or rapid changes in important foreign countries, the weather, changes in demand, significant changes in legal rules, and government fiscal policy. Self-generating causes arise from within the business system itself.

Conditioning factors which affect the direction and extent of the processes set in motion by an originating cause are also at work in the cycle viewed as a self-generating movement. The important conditioning factors are the interrelationships within the business system, innovations, the role of investment in capital goods, credit expansion and contraction, and interest rates. The interrelationships within the business system are enmeshed to such an extent that a significant change in any one of the interdependent aspects is likely to have repercussions on a number of

others. Innovations as well as increasing sales and profit expectations suggest greater investment in capital goods. While the use of credit permits a greater volume of production than would otherwise be possible, excessive credit expansion, which contributes to higher prices, is undesirable. Changing interest rates influence the direction and amount of capital movements as well as business sentiment.

In the self-generating upward and downward movements, some forces tend in one direction upward or downward while at the same time others tend to pull in the opposite direction. Those tending to pull in the direction in which business activity is moving may be called reinforcing forces, while those tending to pull activity away from the direction in which it is moving may be called limiting forces. Reinforcing and limiting forces are always at work. When business activity is moving upward (or downward) the reinforcing forces are stronger than the limiting forces. But when a change takes place from an upward to a downward movement (or the opposite), the limiting forces have asserted greater strength than the reinforcing forces. The limiting forces become more important than the reinforcing forces toward the end of an upswing as well as toward the end of a downswing.

The Upswing. In reviewing the factors in the self-generating cycle, it is essential to break in at some point and it is just as well to begin with the upswing. Once the period of an upswing in business activity has begun, the reinforcing forces become cumulatively stronger and spread in various directions. As production increases, the employment and purchasing power to which it gives rise expand, with the result that demand spreads in still other directions where production then also expands. The increasing demand for raw materials, labor, and consumer goods results in rising prices. The prices of materials and the wages of labor used in production are costs and when, as has frequently happened, they lag behind the price which can be secured for the goods produced, the lag gives rise to favorable expectations because of the profit possibilities from this difference. Moreover, with rising output the unit cost of production is reduced because the overhead is applied to a greater quantity of goods. This reduction in unit costs, with rising profit margins, stimulates optimistic anticipations which lead to replacements of equipment and even to expansion. Favorable expectations arise also from innovations which lead to similar programs of replacement and expansion by other firms.

Whatever their cause, favorable anticipations leading to borrowing from banks for the purpose of further increasing production and sales result in increases in demand and further price increases. The expansion of credit finances increases in inventories which had been depleted in the preceding depression, but in addition favorable price anticipations stimu-

late the accumulation of inventories even beyond immediate needs.

Rising prices, expanding credit, and generally increasing optimism lead to the projection of excessive anticipations regarding the future, which are likely to be reflected in expanding programs of investment in capital goods designed to meet the anticipated output and sales possibilities. The construction of new equipment and plants also gives rise to increases in consumer demand for goods; and when this demand is observed, it may stimulate still further construction of plants.

As against the foregoing reinforcing forces in the upswing there are important limiting forces which sooner or later exert a check. For one thing, inventory accumulation slows down as rising prices seem to flatten out and further profit possibilities from this source appear less likely. Limitations of storage space and working capital also lead to less accumulation.

Rising prices also exert limitations because the costs of labor and raw materials may rise more rapidly than the price being charged for the finished product. The use of less efficient and more costly labor and sources of raw materials eventually becomes necessary. General attitudes lead also to a general drop in labor productivity. Management becomes less efficient as prosperity increases because profits are easily made. Overhead costs rise as less efficient plants are brought into operation. If the new plants built in the expansion programs become more costly because of the rising prices, the overhead per unit of output from such plants will also be higher as they come to be used in production. It is also possible that the entire additional capacity will not be used in production. The prospect of a lower profit margin or return on investment even while total profits are increasing checks optimistic attitudes somewhat.

High-cost firms find increasing competition difficult to meet. Many firms unable to find markets for their products ought to substitute other lines but cannot do so. Business failures increase. Credit losses from failures lead to a more prudent attitude toward further credit extension. Curtailment of credit may lead to the discovery that too much working capital was tied up in inventories, which must then be liquidated. The liquidation brought on by failures and credit curtailment tends to result in declining prices.

Capital-goods production meanwhile eventually reaches a peak after which it falls off somewhat. Less labor is needed as a result. Available productive capacity begins to appear somewhat excessive. As the peak of the upswing is reached, the use of more costly resources results in rising prices with no net addition to output. Capacity output is reached in some industries but not in others which depend on them for supplies.

The Downswing. All of the various maladjustments related to rising

costs and growing inefficiency, increases in failures, hesitancy in capital-goods expansion, strains against available credit with resulting increases in interest rates, and changing business sentiment may combine to exert a sufficient influence over the reinforcing forces to lead to a down turn. The maladjustments which take place in the upswing are ultimately corrected in the course of the downswing.

When the downswing gets under way because of a combination of the foregoing factors, with or without the added influence of an originating cause, a number of forces tend to reinforce the movement. Although construction programs already under way are generally continued, new ones are not undertaken. The falling off in durable goods is the basic reinforcing factor in the downswing. Although the output and consumption of consumer goods do not decline so much, there is less and less incentive to expand capacity in such industries, the effect being to intensify the decline in the output of capital goods.

In the period of liquidation, debts are repaid and prices continue to go lower because of the falling off in demand and the liquidation of inventories. At the same time, profit margins decline as a result of lags in wages and other costs which remain higher than the prices secured for finished products. Declining output, enforced liquidation, and deflation eventually lead to intensified pessimism. However, at the beginning of the downward movement the belief is widely held that liquidation will not be necessary. This attitude together with accompanying efforts to prevent liquidation prolong a period of liquidation. Such liquidation is necessary to correct the maladjustments which arise in the upswing and to restore efficiency. Although there is no other logical solution if the maladjustments of the upswing take place in the first instance, this view is no longer widespread as greater resort to government fiscal policy has become popular.

In the downswing there are nevertheless also limiting forces. Misdirected production is eventually absorbed. Excess inventories are depleted within a relatively short time. Inventories of manufactured goods ultimately reach a minimum below which they cannot go if current demand is to be met. As a result, replacements must be made regularly. Moreover, the declining costs decrease losses or widen the profit margin. Although the demand for consumer durable goods declines substantially, the fact that the demand for other consumer goods does not decline severely results in the eventual need for replacing productive facilities in this field. Nor can the replacement of consumer durable goods be postponed indefinitely. Finally, even though marriages may be deferred and doubling up may be widespread, population increases are likely to result eventually in cumulative demands for housing, furniture, and other articles.

All of these factors limiting the downswing may eventually combine in sufficient strength to cause an upturn. With reductions in costs, the restoration of efficiency, an increase in the demand for capital goods, an expansion of security flotations, an increase in the demand for credit, and a rising optimism regarding profit expectations, the upturn is reinforced into an upswing.

The foregoing outline of the more important factors at work in a typical cycle reflects the present status of efforts to describe the statistically determined average cycle of about 3½ years. Although the precise combination of forces is somewhat different in every cycle, most of the factors mentioned are present in varying degrees of importance. In all cycles the role of investment in inventories and capital goods is decisive.

The cycle is not necessarily smooth for several reasons. Spurts in different prices result in corresponding reactions in connection with inventories. Changes in optimism or pessimism are induced by price changes. Some capital-building programs are more rapidly completed than others. Finally, relatively minor originating causes often arise.

Forecasting

Experience and judgment are essential to the successful management of a business. As already indicated, studies made to determine the extent to which changes in business conditions have been the cause of failure in depression show that mismanagement in one form or another was the most frequent cause. Although the failures constitute in effect a good part of the content of the downward trend from prosperity, they largely cause this downward trend and are not caused by it.

It is nevertheless clear that changes in business conditions affect any business in some measure and therefore constitute a business risk. While general business fluctuations cannot be eliminated by the individual business, the risks caused by them can be reduced by successful forecasting.

The object of forecasting is to make analyses of future conditions based on statistical data, so that greater advantage may be taken of the expected conditions than would be possible without such knowledge. Forecasting depends on analyzing those past and present conditions which will indicate probable future conditions. While it is not possible to tell exactly what will happen, the objective is to make as accurate a general appraisal of the future as is possible.

Various procedures are followed in forecasting. Although some forecasters use only one method, many use a combination of methods. One method is to draw a trend line and project it into the future. Several past cycles are drawn about the trend; and on the assumption that future

cycles will be the same, they can be drawn for the future period. This method assumes that the trend of American business will continue to show the same kind of growth as in the past, and it lays most of the emphasis on the self-generating cycle. The difficulty with the procedure is that cycles are not entirely periodic.

Because of the fact that not all cycles are uniform, some forecasters select a specific previous situation which seems to have all the aspects of the present situation and then draw their conclusions as to what will happen in the present situation by determining what happened in the past situation.

Crosscut analysis is based on the theory that no two cycles are identical but that much similarity can be expected. All the factors in a given situation are assembled and the forecaster concludes, on the basis of his knowledge of economic conditions, whether the situation is favorable or unfavorable. An elementary form of crosscut analysis involves the separate listing of the favorable and unfavorable factors in the outlook.

The pattern of relationship method of forecasting establishes for the major measures of economic activity a standard relationship against which actual performance can be checked. The discrepancy between the standard and actual relationships provides the basis for the forecast.

Data on gross national product, which have been used for forecasting, do not tell very much about what will happen in the next period. Although theories have been developed for this purpose, their application has so far not been very reliable.

In the cyclical-sequence method, the effort is made to predict in advance when a particular business activity will expand or decline by picking out data for some business activity which precedes with some degree of regularity that activity which it is desired to predict. The assumption is that knowledge of the movements of the activity which lags with regularity behind that activity which it is desired to forecast will help in the forecast because of the regular recurrence of the phenomena in sequence.

Elaborate studies have recently been made of economic and financial indices over a long period of time to determine which of them typically lead and which typically lag behind significant changes in overall conditions. If changes in significant indicators can be shown to lead major changes in business conditions while others typically lag, forecasting may be facilitated. A very great deal of effort and statistical study has gone into this approach and it shows promise of expanding usefulness.[3]

Much forecasting involves the use of advanced statistical methods. But whether the forecaster uses simple or highly complicated procedures,

[3] Geoffrey H. Moore, ed., *Business Cycle Indicators*, 2 vols. Published for the National Bureau of Economic Research by Princeton University Press, Princeton, 1961.

he must have an understanding of the economic significance of the data he is working with. Such understanding depends on a knowledge of economics and grows with the experience and maturity of the person doing the forecasting. Regardless of the capability of the forecaster, however, there is always the danger that in a given situation he may overlook the presence of some factor which ordinarily might require little consideration but which turns out later to have been of key significance for the accuracy of the particular forecast.

All businessmen are necessarily engaged in forecasting, whether or not they use methods such as those described. In fact, forecasting of the sort described here is a specialized type of work and most businesses do not employ people to do such work.[4] However, a good deal of material is readily available and most businessmen use such information either by reading it directly or by noting summaries in newspapers or trade journals. Among the direct or basic sources of ideas are a number of bank letters available at no charge including the First National City Bank's *Monthly Letter: Business and Economic Conditions*, *The Cleveland Trust Company Business Bulletin*, and the reviews of other banks. A monthly review is also published by each of the twelve Federal Reserve Banks. These bulletins provide statistical data covering activities in the different Federal Reserve districts. The *Federal Reserve Bulletin* published by the Board of Governors of the Federal Reserve System provides a good deal of important data for the country as a whole. The *Survey of Current Business* published by the United States Department of Commerce also provides much useful data. Among the more important weekly financial publications are the *Commercial and Financial Chronicle* and *Barron's*. None of the publications mentioned in this paragraph endeavors to make specific, concrete forecasts but the statistical data as well as the careful discussions in the articles provide the reader with data which can serve as a basis for making his own forecasts.

Conclusion. It is evident that a business enterprise faces a wide range of risks. For the most part the effort to meet risks has been divided among various functions of the enterprise. The question thus arises whether the coordination of risk management would be desirable and whether this should be recognized as a major function.

QUESTIONS

1. Distinguish between insurable and noninsurable risk.
2. What is the basic theory underlying insurance?
3. What is coinsurance?
4. Describe the different kinds of casualty insurance.

[4] Cf. National Industrial Conference Board, Inc., New York, *Forecasting in Industry*, Studies in Business Policy No. 77, 1956.

5. What is the difference between fidelity and surety bonds?
6. Describe a hedging transaction. What problems arise in connection with hedging?
7. Define: (*a*) originating causes, (*b*) self-generating cycles, (*c*) innovation, (*d*) reinforcing forces.
8. Might the influence of the use of electronic data-processing machines on inventory control have any effect on business conditions? Assuming it had, would such an influence be an originating cause or a self-generating cause?
9. What is the lead and lag method of forecasting?
10. What are the principal difficulties in forecasting?

CASE: Pioneer Shopping Center

In 1958 the Pioneer Shopping Center was established in Passtown, a rapidly growing village in the outlying New York suburban area. The center was a relatively small one consisting of eight attached cement-block units. From east to west there were a tavern, a luncheonette, a dry-cleaning establishment, a drugstore, a post-office substation, a paint store, the branch of a bank in the next town (which had a long history going back to the period before the area was suburban), and a hardware store. The center was directly opposite the village's new and modern firehouse.

Early in 1961 a fire alarm turned in at 3:30 A.M. on a Monday morning brought a hundred volunteer firemen together with twelve pieces of equipment from the village and two neighboring towns, including the one where the main office of the bank branch was located. The fire had started in the tavern on the east end. The tavern roof had collapsed before the first piece of fire-fighting equipment arrived. Firemen were hampered in fighting the blaze because there were no hydrants nearby. Water was brought to the scene in tank trucks from a nearby pumping station. Firemen and police dragged six bags of mail from the post-office substation before the fire reached it. The manager of the branch bank supplied the vault combination and rescuers retrieved $30,000 in cash from the flames. The fire was brought under control by 6:30 A.M.

The fire had swept from the tavern westward across the entire strip of stores. All that was left of six of the eight units were side walls, the rear walls having been practically entirely demolished. If the remaining two units might be described as recognizable from the outside, this was largely because the signs "Bank" and "Hardware Store" were still in place. The damage was estimated at $500,000.

It was discovered that the wood beams framing the ceiling of the structure had been laid crosswise from east to west instead of from north to south along the length of the walls. There were no insulated partitions between the walls of the units and extending upward from the ceiling to the inflammable roof. The walls themselves were covered only with plywood. The flames had swept along the beams through and across the top of all the units and readily spread downward.

1. What features of the setup as it existed before the fire were questionable?

2. How might it have been possible for this property to have passed building-inspection requirements?

3. Could this property have been made fireproof?

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Chapter XXVII

Controlling Costs

THE importance of controlling costs needs no special emphasis. Although the various production standards and the production-control system discussed in earlier chapters are designed to achieve as efficient and low-cost production as possible, there is no way of knowing their effectiveness without a system of cost controls. This system makes it possible to determine what the various costs actually are and to check up on those which appear to be out of line. These objectives are achieved by the proper use of cost accounting. The present chapter attempts to explain in a general way the purpose of cost accounting, the problems in controlling costs, and how cost accounting deals with them.

Purposes of Cost Accounting. One purpose of cost accounting is to calculate the total cost of production and the unit cost of each product. Since the total cost must be less than the income derived from the sale of the products if there is to be a profit, cost of production must be known for estimating this result, if for no other reason. In addition, however, costs are used in setting the prices of the products, a subject which will be discussed at greater length later.

The control of costs is possible by means of various cost reports which summarize the data necessary for the interpretation of the cost of operations. The current costs shown on these statements may be compared with those of a previous period or with those considered attainable on the basis of careful analysis. Such comparisons will readily indicate any excessively high costs and questionable fluctuations in the cost of some items. Investigation can then be made to eliminate any difficulty and accompanying inefficiency.

Cost Elements. There are three elements of cost: direct labor, direct material, and overhead. Direct material consists of materials which go into the product and become part of it, direct labor consists of the wages of workers who work directly on the product, and overhead consists of

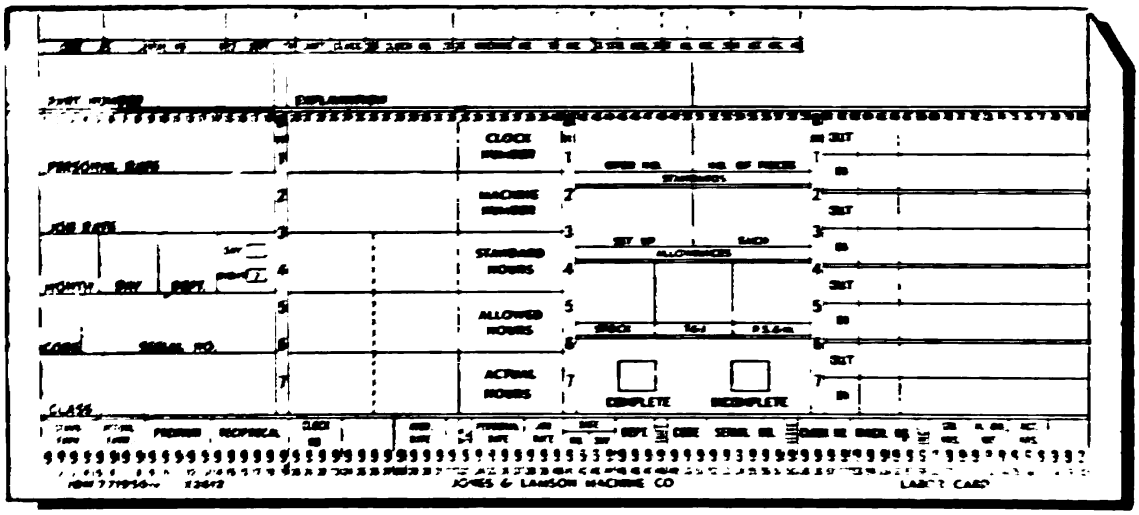

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Fig. 129. A labor cost card.

all other manufacturing costs which cannot be directly allocated to the product, including such costs as indirect labor and indirect materials, depreciation on buildings, machinery, and equipment, power, light, heat, insurance of various kinds, taxes other than income taxes, and so on. The total cost of production is the direct material cost plus the direct labor cost plus the overhead.

Material Costs. Whether or not material costs are direct or indirect, it is essential to take a periodic inventory of materials in order to make sure that the total agrees with the stores records. It is also necessary to place a value on them. The general rule in inventory valuation is to value them at cost or market, whichever is lower. It should be noted that the problem of valuing inventories is somewhat complicated when some of the material is in process of being worked on at the time the inventory is being taken. Partially done work, which is called goods in process, contains some direct labor and overhead costs. Finished goods include a still larger amount of direct labor and overhead.

Labor Cost. Labor costs may be entered on forms such as the one shown in Figure 129. The starting and finishing times for a job are punched on the card or they may be taken from the time-clock card to calculate the wage if the worker is on the day rate. The payroll department collects the time tickets for the different jobs from the workers or at the dispatcher's office and enters the rates and the total wage. The factory payroll is made up from the filled-in time cards. In the case of direct labor the cost department allocates the labor costs to the products on which the work was done, whereas in the case of indirect labor the allocation of the cost is either to the nonmanufacturing department where the worker works or to overhead.

Overhead. The significance of overhead is indicated by brief review of the words used in the past to describe the different kinds of costs.

Direct material and direct labor costs were originally called prime costs because they were the principal costs and there was little overhead cost. The relatively little overhead that existed was called supplementary cost or burden. These terms arose from the idea that direct labor and direct material could not be combined without being burdened by a certain amount of supplementary cost. Gradually the term burden came to be the descriptive word used and it is still widely used to describe overhead. With the development of large-scale production with heavy fixed-capital investment and large amounts of such costs as depreciation, the importance of overhead costs grew to the point where it became a distinguishing characteristic of modern industry. At the same time, the allocation of overhead became the central and fundamental problem of cost accounting. In fact, the rise in the importance of cost accounting parallels the development of large-scale industry with heavy sunk costs.

The cost of direct materials and direct labor can be controlled with comparatively little difficulty. Overhead, however, consists of a great variety of costs whose relationship to the final product is not clear. Not only are there so many different items, but their total cost is also very large. Since the total overhead is very large, it is evident that management is distinctly interested in controlling it. But this is difficult because there are so many different kinds of costs going into the overhead. The only way they can be controlled is by allocating them to the various manufacturing and other departments often called service departments. When the overhead is allocated to the manufacturing and service departments, the overhead cost for each department can be compared from one period to another. In periods when the plant is idle for part of the time because of lack of orders, the classification and segregation of overhead by departments make it possible to calculate the cost of plant idleness.

Depreciation, Taxes, and Insurance. While all overhead items present problems of allocation, it will be possible in this book to consider only depreciation, taxes, and insurance since these costs lend themselves to some generalizations without the necessity of extensive cost analysis.

Depreciation. The wear and tear of buildings, machinery, and equipment constitute a large part of the overhead. Allowances for depreciation are made periodically by any one of several methods.[1] The straight-line method under which the same cost is charged off each year over the estimated life of the property is the simplest and most widely used. Under the diminishing-charge method decreasing annual depreciation allowances are made on the theory that maintenance will increase as time passes and the two items together will tend to be a uniform annual

[1] Cf. Leonard A. Morrissey, *The Many Sides of Depreciation*, The Amos Tuck School of Business Administration, Hanover, N. H., Bulletin No. 23, February, 1960.

cost. Some methods of estimating depreciation cost are based on the rate of use of property, the cost varying directly with this rate of use. There are theoretical objections to all methods of estimating depreciation. The straight-line method, for example, not only implies that the depreciation is the same each year regardless of use but it also ignores the fact that the realizable sale value of property decreases most rapidly at the outset. Looking at the matter from an operating point of view, property does not depreciate so much in value in the first few years as the amount of the straight-line charge provides. Similar criticisms may be made of the diminishing-value method. So far as calculations based on the rate of use are concerned, it has been pointed out that some property is retained in better condition when it is used than when it is idle. It also seems clear that in a period of recession when production is curtailed this method would result in low depreciation charges at the same time that outlays for maintenance are likely to be curtailed. This method seems to ignore Professor Hatfield's widely quoted dictum to the effect that "all machinery is on an irresistible march to the junk heap, and its progress, while it may be delayed, cannot be prevented by repairs."

Taxes. *Property taxes* are levied by the state and local governments, including counties, towns and townships, municipalities, and school districts. Although the general property tax is levied on real and personal property of all kinds, some personal property is in some states no longer taxed. Although real property is taxed where it is located, the rules regarding the location of taxable personal property vary somewhat. Property is assessed by the local assessor, but changes in the assessed value may be made by review agencies before which the property owner is permitted to present his case for a lower value. Property taxes are often collected by one of the local units of government, say the county, which allocates the amount thus collected to the state, the county, and any cities, towns, and villages within the county.

Social-security taxes include levies for old age and unemployment benefits. Under experience rating provisions the required unemployment tax is reduced according to varying criteria of the employer's success in limiting labor turnover.

Insurance. Since provisions for insurance were considered in an earlier chapter, it is only essential to mention here that the costs of carrying fire insurance, workmen's compensation insurance covering injuries to employees in the course of their work, and other types of insurance are part of the overhead.

Allocation of Overhead. Overhead costs consisting of such items as indirect labor, indirect materials, depreciation, power, light, heating, insurance, and taxes other than income taxes must be allocated to the manufacturing and service departments. Although some of the overhead

can be allocated directly to the overhead costs of the manufacturing and service departments, some cannot be. Any overhead costs which cannot be assigned to manufacturing departments is assigned to the service departments together with the overhead directly assigned to those departments.

After the costs of the service departments have been determined, these costs are allocated to the manufacturing departments on the basis of the number of employees, the number of machine or man hours worked, the floor area, or some other method.

After all the overhead including the service department costs has been finally accumulated for the various manufacturing departments, it is apportioned to the products or jobs by one of several methods. Under the unit method which is useful when there is one or only a few products the unit of product is the basis for determining the apportionment rate. The rate of overhead assigned to the product is determined by dividing the overhead by the number of units of product. Expressed as an equation, the $\text{Rate} = \dfrac{\text{overhead}}{\text{number of units of product}}$.

Under the direct-labor method, which is more widely used, the basis of distributing the overhead is the cost of the direct labor charged to the product. This method is useful where handwork is mainly used and where a uniform hourly wage rate is paid. If R is the rate, $R = \dfrac{\text{overhead}}{\text{direct labor cost}}$.

When direct labor is of greater importance in the production process than machinery, the direct-labor-hour method may be used. In this case, $R = \dfrac{\text{overhead}}{\text{total direct labor hours}}$.

The machine hour rate is one of the best methods of apportioning overhead when machinery is an important factor in production. A predetermined estimated overhead cost rate per hour is computed for each machine and this rate is then applied in accordance with the number of hours the machine was used in production. The machine-hour overhead cost rate for each machine then equals

$$\frac{\text{total estimated annual overhead allocated to machine}}{\text{total estimated annual operating hours of machine}}.$$

If there is a difference between the overhead as accumulated on this basis and the actual cost, the difference has to be absorbed in cost of production at the end of the year. The machine-hour method affords a reasonably accurate method of allocating overhead. It is a good method for estimating the cost of a job on the specification and route sheets and makes possible the setting of more accurate selling prices to the extent that they are based on costs. Many management men consider this method practical, logical, and theoretically sound.

SYMBOL	PART NO.	STD. COST
NAME OF PART		

CLASS	LABOR RATE $	OVERHEAD RATE $	SALES PRICE	DATE PRICED	BY WHOM

ORDER NO.						
DATE ISSUED						
DATE FINISHED						
DATE						
S. U. / EACH						
L. & O.						
MAT.						
STD. COST						
NO. IN LOT						
TOTAL HOURS						
TOTAL L. & O.						
TOTAL MAT.						
POOR STOCK L. & O.						
POOR STOCK MAT.						
SCRAP L. & O.						
SCRAP MAT.						
PASSED L. & O.						
PASSED MAT.						
TOTAL COST						
NO. STARTED						
NO. PASSED						
COST EACH						
TOTAL STD. COST						
HRS. FOR 1						
MAT. FOR 1						
OSW. FOR 1						
Form X-3403						

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Fig. 130. Cost card covering a part.

SYMBOL	ASSEMBLY NO.	STD. COST
NAME OF ASSEMBLY		
LABOR RATE / OVERHEAD RATE	SALES PRICE	DATE PRICED / BY WHOM

ORDER NO.			
DATE ISSUED			
DATE FINISHED			
DATE			
FINISHED PARTS			
ASSEMBLY TIME HRS.			
TRANSFERS — SYMBOL / COST			
STANDARD HOURS			
TOTAL HOURS			
TOTAL LABOR & OV'D			
TOTAL F.P.			
PASSED LABOR & OV'D			
PASSED F.P.			
TOTAL COST			
NO. STARTED			
NO. FINISHED			
COST EACH			
HOURS FOR 1			
FORM E-2422			

— Jones & Lamson Machine Company

Fig. 131. Assembly cost card.

The cost-center rate method is somewhat similar to the machine-hour rate method except that the rate is apportioned on the basis of cost centers which are generally the same as production centers rather than machines. This method is useful when the work involves more labor than machines.

The normal burden rate method is based on an estimated normal plant output with a monthly normal overhead. The latter is divided by the normal number of machine hours per machine per month to get the normal hourly overhead. The standard burden method involves the determination of a standard rate in connection with a standard cost system which will be briefly described in the section following the immediately succeeding one.

Cost Systems. Although there are several kinds of cost systems, the two most common ones are the job-order cost system and the process cost system. A job-order cost system is used when a varied line of products is made, especially if they are made to customers' orders. The process cost system is used when the products are standard and production is continuous and routine. The total cost of operating each process or department is determined and the unit cost is found by dividing this total by the number of units produced. The total average unit cost is arrived at by adding the average unit costs incurred in all the processes.

Figure 130, which is a cost card used by a machine-tool producer, covers the cost of making a part. The assembly cost card (Fig. 131) covers the cost of making an assembly of various parts.

Standard Costs. The best method for controlling costs is by the use of a standard cost system in which predetermined standards are calculated for all the items included in each of the cost elements. The assumption is that all of the various factors discussed in preceding chapters have been standardized so that a standard volume of production can be carried on in the most efficient way. Once the standards have been determined and the standard costs estimated, the actual costs should be about the same as the standard costs. If there is a difference between the two, investigation into the reasons can be undertaken at once. Such differences are called variances. The emphasis in a standard cost system is on the analysis of the variances and not on calculating the costs, which were predetermined.

In determining standard costs, the degree of tightness of the standards which must be decided on may be the theoretical ideal or maximum efficiency, attainable good performance, or average past performance. The argument in favor of setting standards of attainable good performance is that maximum efficiency is so hard to achieve that it may be ignored while average past performance is likely not to be efficient enough.

As a general principle, standard costs should be revised when there is

a decided increase or decrease in the purchase prices of raw materials and supplies, when there is an important change in labor rates, when there is a change in the design of the product, when considerable changes are made in production procedures on the basis of new operation and time studies, when new and different equipment is introduced, or when there is a considerable rise or fall in general business activity or in the company's volume of business.

Flexible Budget. A standard cost system makes possible the use of flexible or variable budgets. In a standard cost system, standard production costs are calculated for a standard or normal volume of output, but when the volume of output is different from this output the standard costs must be changed. A flexible budget shows the standard costs calculated in advance for various levels of output from the lowest to the highest. The flexible cost of production budget for the different levels of output needs to be changed only under the same conditions which give rise to changes in the standard costs.

Inasmuch as direct material and direct labor costs can be fairly readily adjusted to reflect changes in costs resulting from a change in the volume of production, the use of the flexible budget is of the greatest importance in connection with overhead. It is particularly desirable to prepare a flexible overhead budget for the various departments in advance because the various overhead costs do not vary with production in the same proportions. Although few items are entirely variable and few are entirely nonvariable, it may be stated as a general rule that overhead costs are variable, semivariable, and nonvariable. Flexible overhead budgets show for each department the amounts of each overhead item applicable at different percentage levels of output above and below the standard production output. The flexible budget for a department is prepared on a monthly basis and can be applied for any volume. The departmental flexible overhead budgets may be combined into a flexible overhead budget for the entire plant.

Conclusion. In a question at the end of a previous chapter, reference was made to Parkinson's Second Law, which is that expenditures rise to meet or exceed income. It is obvious that, although business firms may exhibit a tendency toward extravagance in some directions during prosperous times, they cannot afford to spend more than their income for any length of time since they do not have the power to impose compulsory levies in the form of taxes which are available to government.

QUESTIONS

1. What are the purposes of cost accounting?
2. Mention and describe the cost elements.

3. Why is overhead significant? How did the changing terminology regarding overhead reflect changing conditions?
4. Why are income taxes not an overhead charge?
5. What methods are used to calculate depreciation?
6. Describe the significant items other than depreciation which constitute overhead.
7. Should the salaries and wages of some employees be considered overhead? Which ones? Is it possible that only part of some salaries and wages should be considered overhead?
8. Distinguish between the several kinds of cost systems.
9. What are the distinctive characteristics of standard costing?
10. What is a flexible budget? How can it be utilized?

CASE: Linton Company

John Stanton, production manager for the Linton Company, was in charge of a large integrated product line, which meant that he was responsible for the cost of operating the line. Reports showed his line was losing money and top management was pressing him to reduce costs. The breakdown of unit costs supplied by the accounting department was as follows:

Direct labor	$ .22
Direct materials	.55
Burden	.53
	$1.30

The product had to be made at $1.10 in order to be competitive. On looking into the labor and materials figures, Stanton found that, although labor could not be reduced, the materials figure could be reduced 5 cents per unit, but this still left a difference of 15 cents. The real problem therefore seemed to be with the overhead. However, a breakdown of this figure was unavailable and it seemed to be company policy not to make detailed cost breakdowns available. Stanton therefore decided to get some figures on his own by having his engineers make calculations. In the process, he learned that his operations were being charged with the costs of certain machines used throughout the plant even though his use was about 15 per cent and 25 per cent respectively. There seemed also to be other possible similar miscalculations. When the matter was discussed in detail with the controller, it was concluded on the basis of the analysis made in his office that the line was actually making a substantial profit.

1. How can such an error in the burden figure be accounted for?

2. Is it proper to hold someone responsible for the cost of operating a line if he does not have all the details of cost?

3. What suggestions might be made so that this sort of problem can be avoided?

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Chapter XXVIII

Budgets and Break-Even Charts

Budgets

Budget Systems. Profit planning is the predetermination of the financial objectives of the business and the preparation of plans to attain them.[1] A budget is a financial plan in which the estimated future income and costs of a business are projected for a definite budget period. The purpose of a budget is to control the operations in the future period. A complete budget system covering all the operations of the business involves a forecast of the profits for the budget period, the cash receipts and disbursements, and the financial condition at the end of the period. The forecast of profits is prepared in the form of an estimated earnings statement with the estimated revenues, costs, and expenses shown in detail on supporting schedules. The forecast of cash receipts and disbursements is prepared to show the receipts and disbursements by months. The financial condition at the end of the budget period is shown in the balance sheet expected at the end of the period. The budget should reflect a goal which can be attained and which the management has decided on as its objective.

A detailed budget may be prepared for a year by quarters, with the first quarter prepared by months. If this procedure is followed, the budget for a year is revised at the end of each quarter by dropping the quarter completed and showing the new first quarter estimated by months; an additional quarter may be added at the end if the necessary figures are available.

The details of the budget systems of different companies vary somewhat, some of them being more elaborate and complex than others. Although the development and use of budget systems has been expanding considerably, they are not universally used, at least in as conscious a way as the material in this chapter might imply. Moreover, many budget

[1] Cf. Leon E. Hay, "Planning for Profits — How Some Executives Are Doing It," *The Accounting Review*, Vol. 35 (April, 1960), pp. 233–237.

systems actually found in practice are incomplete in the sense that some expenses are not budgeted. The growing use of budgets suggests, however, that such omissions in practice are not desirable. In the following discussion the elements of a complete budget system are considered.

Organization and Responsibility for the Budget. In large companies a director of the budget may be assigned the responsibility for the coordination of the budget. In some companies the comptroller, the treasurer, or possibly even the president may be in charge. The problem of defining and placing responsibility for the budget is complicated by the fact that full responsibility cannot be entirely centralized in the same way that other tasks can be. If a budget system is to be effective, responsibility must be shared by those who submit preliminary estimates and who are in turn later responsible for executing their portion of the finally approved budget. It is partly for this reason that budget committees, which may include officials responsible for the major functions of the business, are sometimes appointed. The committee approves the budget and shares in the responsibility for executing it as a whole.

Budget Procedures. The period covered by a budget is conventionally the calendar or fiscal year, with a breakdown by quarterly periods and then months. The budget director or official in charge begins the initiation of the budget about three or four months before it is to go into operation. The procedures to be followed are worked out in conferences with various interested officials. A time schedule is worked out for the submitting by department heads of preliminary estimates by months. These estimates are reviewed by the budget director, who must assemble the figures by compiling a preliminary budget which will disclose whether it is in balance. Since many of the estimates will tend to be higher than acceptable figures, estimated costs and expenses are usually revised downward before the final budget is prepared. However, realistic budgets contain some flexibility and play. After study of the final budget, top management either approves or disapproves it. If it disapproves, revisions must be made in the operations contemplated and the budget has to be revised accordingly. When the budget has been finally approved, it reflects the officially adopted program and copies are sent to responsible officials.

Budgetary Control. The very preparation and existence of the budget develops a consciousness on the part of officials of the need to conform to it. Although this is in itself a form of control, real control is achieved by carrying out the budget. The budget director is responsible for the preparation of periodic reports, usually monthly and quarterly, showing in parallel columns the actual and budgeted figures for the month and the year to date. Copies of these periodic reports are sent to the chief executive officers and the officials immediately responsible. The differences

between the actual and estimate figures readily disclose the need for any corrective measures. Conferences and discussions between the responsible officials and the budget director may be the basis for further discussion with top management. The budget system thus acts as a check on officials and discloses which ones are meeting the requirements. It is possible that changes in the budget estimates may be required from time to time because of changes in conditions or the discovery that some factors were not taken into account when the budget was prepared.

Long-Term Capital Budget. Before a new business is undertaken estimates of revenues must be compared with estimates of costs in order to determine the anticipated profitability of the enterprise. However, aggregate dollar profits are of little consequence apart from the percentage return on the capital investment. For this and other reasons, including the feasibility of actually raising the necessary capital, the capital requirements must be determined in advance. The required capital outlay includes provisions for current, fixed, and intangible assets. A projection of this sort is frequently called a financial plan for the capital structure.

A financial plan of this kind may be prepared to cover not only the original capital requirements but also such additional capital as it is estimated will become necessary in future years. Estimates of future capital requirements are, of course, influenced by the long-term objectives of the business as well as by its current and more immediate prospects. Projection of the sources of additional capital from retained earnings and the sale of additional securities is an important and difficult feature of this aspect of long-range planning. A long-term capital budget may be regarded as somewhat like a master plan for the business or at least as reflecting a significant part of such a plan. As annual revisions are made and the immediately past year is dropped, estimates for another year are added. The requirements for the current and immediately following year are broken down by months.

Operating Budgets. Greater stress is ordinarily laid on the current budgets than on a long-term capital budget which is in any case dependent to a large extent on current developments from year to year. The element of control plays a more direct part in current budgets which may be divided into two groups, operating and financial.

The operating budget begins with an estimate of sales for the future period, usually a year.[2] The sales budget is prepared by analyzing past results, market analysis to determine whether the sales can be increased, and product analysis to decide whether the sale of some products should

[2] John Parkany, "A New Approach to Sales Forecasting and Production Scheduling," *The Journal of Marketing*, Vol. 25 (January, 1961), pp. 14–21, discusses the potential contributions of short-term sales forecasts to production economies which are often overlooked.

BUDGET REPORT OF THE COST OF PRODUCTION

Cost Center 15
Productive Output 106%
Month of _____ 19_____

	Direct Materials	Direct Labor	Factory Burden	Total Budget	Total Actual	Increase over Budget	Decrease under Budget
Budget	$2,756.18			$2,756.18			
Actual	2,765.23				$2,765.23		
	$ 9.05					$ 9.05	
Budget		$3,506.09		3,506.09			
Actual		3,497.88			3,497.88		
		$ 8.21					$8.21
Budget Direct			$1,879.00	1,879.00			
Actual Direct			1,888.00		1,888.00		
			$ 9.00			9.00	
Budget Indirect			$1,936.78	1,936.78			
Actual Indirect			1,985.52		1,985.52		
			$ 48.74			48.74	
						$66.79	$8.21
				$10,078.05	$10,136.63	$58.58	

Fig. 132. Summary cost budget report for a cost center.

be eliminated or at least discouraged. The production budget is prepared in relation to sales estimates and the capacity of plant operations to show the estimated volume of production which must be achieved in the different parts of the budget period in order to meet sales and inventory requirements.

The budgeting of cost of production requires the use of a cost-accounting system. A summary budget report of the cost of production for a cost center is shown in Figure 132. The direct-materials budget includes estimates of the cost and quantity of materials to be used directly in production. The labor budget includes estimated direct-labor costs which will be necessary to attain the budget output.

The overhead budget includes indirect material, indirect labor, repairs and maintenance, power, heat, light, rent, depreciation, insurance, factory-office expense, and similar costs. A detailed overhead budget showing controllable and uncontrollable costs is prepared for each of the service departments and each of the manufacturing departments. Foremen's bonuses are frequently based on the extent to which they succeed in controlling the controllable overhead. Figure 133 illustrates an overhead-expense budget.

Overhead Expense Budget Report

Department 38 For the Month of November 19_____.

Overhead Expense		Budget Allowance	Actual Expense	Increase	Decrease
Code	Account				
	Controllable Budget Items				
7301	Fuel	$ 700	$ 685		$ 15
7302	Spoilage	50	58	$ 8	
7304	Light	39	47	8	
7305	Power	123	118		5
7310	Indirect Factory Supplies	1,800	1,750		50
7313	Maintenance Material, Equipment	50	35		15
7315	Maintenance Labor, Equipment	230	270	40	
7319	Other Indirect Labor	1,128	1,097		31
	Total Controllable Overhead Expense	$4,120	$4,060	$56	$116
	Direct Uncontrollable Budget Items				
7303	Heat	$ 25	$ 25		
7307	Compensation Insurance	47	52	$5	
7314	Maintenance Material, Building	15	13		$2
7316	Maintenance Labor, Building	47	44		3
7321	Foremen	390	390		
7332	Patents Amortization	90	90		
7340	Depreciation, Building	50	50		
7341	Depreciation, Machinery	600	600		
7350	Insurance, Building	33	33		
7351	Insurance, Machinery	75	75		
7360	Taxes, Building	48	48		
7361	Taxes, Machinery	150	150		
	Total Direct Uncontrollable Overhead Expense	$1,570	$1,570	$5	$5
	Indirect Uncontrollable Budget Items				
	Supervision and General Expense	$ 430	$ 437	$ 7	
	Cost of Payroll Expense	187	192	5	
	Engineering Expense	840	837		$ 3
	Toolroom Expense	400	395		5
	Storeroom Expense	1,125	1,130	5	
	Total Indirect Uncontrollable Overhead Expense	$2,982	$2,991	$17	$ 8
	Grand Total	$8,672	$8,621	$78	$129
	Net Decrease of Actual Expense under Budgeted Expense				$51

Fig. 133. Overhead expense budget report.

The cost-of-goods-sold budget shows the total estimated materials, labor, and overhead costs, to the total of which the finished-goods inventory at the beginning of the budget period is added before the expected inventory at the end of the period is deducted.

Budgets must also be prepared for various other outlays and expenses. A purchase budget based on the materials budget and covering both direct and indirect materials is necessary since materials must be purchased in advance of deliveries and use. The marketing expense budget includes all costs resulting from selling and delivering the products. The general-and-administrative-expense budget covers salaries of executives and office workers, office expenses, credit and collection expenses, legal fees, and taxes not charged to production costs.

In preparing a budget, the potential of the firm should be considered as setting outside limits. Although the potential indicates maximum profits, a budget should not be based on such a maximum since it will not be achieved and would deprive the management and others of a desired sense of achievement. A good budget embodying the fiscal and operating plans of the enterprise should reflect experience and not be too tight or too loose.

The Financial or Cash Budget. Although the financial or cash budget rests basically on the expected sales and outlays, it involves the setting up by months of estimated cash receipts and outlays. The importance of a cash budget separate from the operating budget can be understood when it is recalled that the sales made in any particular month may not be paid for until later, the exact time depending on the terms of sale. Moreover, a number of cash outlays for production costs and other expenses may be made in months other than those to which the actual charge applies. Some payments will be made before the items paid for are used while others will be paid for after they are used. Actual cash outlays for materials, supplies, and even some wages may be made at some time after the production has been performed. Some outlays for capital equipment will also be anticipated. The payment of dividends should also be provided for in the cash budget.

Master Budget. When the various estimates for the different items have been assembled, a master budget based on the detailed budgets for the various aspects of operations should be prepared to summarize all the operations. The summary will show totals from the sales budget, the production budget, the capital budget, and the financial budget.

Break-Even Charts

Preparation of Break-Even Charts. The break-even point is the point where the business just breaks even without a profit or loss, or more

precisely the point where the sales revenue equals the cost of production and other expenses. A break-even chart permits ready visualization of the relationship between revenues and costs. As indicated in Figure 134, the *OX* axis measures the output as a percentage of capacity, while the *OY* axis measures the dollars of revenues and costs. The total fixed plus variable costs at the different levels of output are plotted on one line, *AC*, and the revenues from sales on another, *OS*. By inspection, the point *B* where these two curves cross at about 63½ per cent of capacity is the break-even point.

The estimated relationships shown on the chart are those expected for the ensuing period. Since the preparation of the chart is based on a budget and cost-accounting system, it is often called a budgeting break-even chart. This term also serves to differentiate such a chart from a historical break-even chart which may be prepared from past earnings statements. The nature and use of the budgeting break-even chart as a top-management device in connection with the formulation of current policy and strategy explain why they are not currently published.[3]

The break-even chart is useful when there is a heavy capital investment and overhead costs constitute a considerable amount of total costs. There would be little point to preparing such a chart if all costs varied directly with sales or output, assuming all the output will be sold. It is the fact that some costs are fixed regardless of sales which makes the effort to calculate the break-even point significant. In practice, serious difficulties in making the necessary estimates arise from the fact that overhead may vary over the range of output, with some costs fixed, some variable, and some semivariable. Some costs may be fixed up to a certain point and then increase up to another point after which they may again remain fixed. In such cases neither *AA'* nor *AC* and *AC'* would plot as a straight line. Such complications, which must be taken into account in the preparation of actual break-even charts, are not reflected in the accompanying figure.

Uses of Break-Even Charts. Break-even charts are used for various purposes. They provide ways of visualizing the effects on profits of contemplated changes in costs. If the costs rise to *AC'* as on Figure 134 on which the increase is in variable costs, the new break-even point *B'* is at about 77½ per cent. If the acquisition of additional fixed capital is under consideration, for example, the increase in the fixed costs can be compared with the decrease expected in the variable costs and if the decrease in the variable costs more than offsets the increase in the fixed

[3] For an analysis and suggested exercise of care in the use of break-even charts, see A. W. Patrick, "Some Observations on the Break-Even Chart," *The Accounting Review*, Vol. 33 (October, 1958), pp. 573–580. Douglas Vickers, "On the Economics of Break Even," *ibid.*, Vol. 35 (July, 1960), pp. 405–412, is also pertinent.

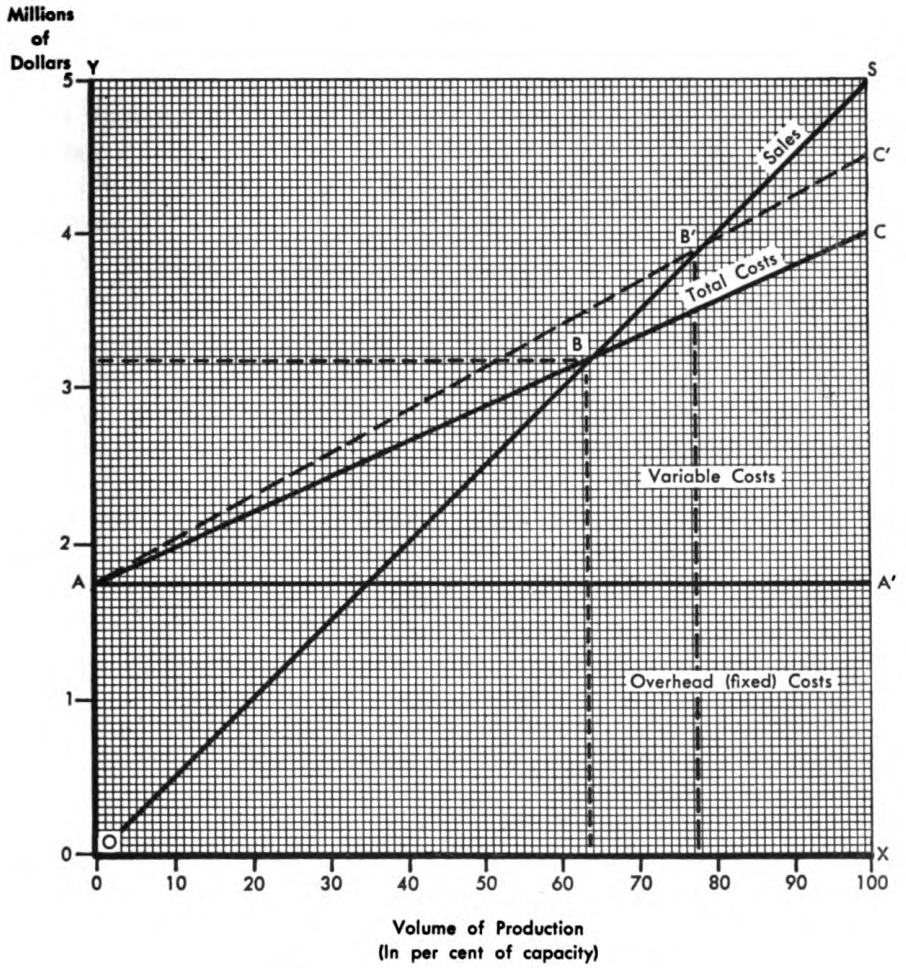

Fig. 134. A break-even chart.

costs, the break-even point is lower. Similarly, when the effects of possible wage increases are being studied, or when material prices are expected to rise, the cost curve can be adjusted accordingly in order to estimate the new break-even point. Conversely, if a rise in the prices of the firm's products is being considered, the sales curve can be changed to take the expected effects into account. The break-even chart is, of course, also useful when contemplating expansion of existing facilities when the existing plant is operating at full capacity. In this case, the problem is whether the sales necessary to reach current net income can be realized.

Conclusion. During recent years rising costs and break-even points have been of considerable concern to management. If break-even points are generally high, only a small reduction in sales and output would put large segments of industry into financial difficulty. While it is possible to raise the prices of products, and they have been raised, there are limits to which this can be done to bring the break-even point down because beyond certain prices sales will fall off. Even though demand is at high

levels, a given firm must consider what competitors will do with regard to prices. This suggests that attention must also be given to reducing costs. However, many material costs remained high and labor costs were continually rising as a result of successful labor demands. If break-even points were to be reduced, it was necessary to improve production methods, to acquire more efficient machinery and equipment, to eliminate unnecessary labor, and to manage more effectively. The elimination of unnecessary labor became an important aspect of collective bargaining as management sought to control the break-even point by favorable consideration of automation.

QUESTIONS

1. How should an organization for budgeting be developed?
2. What procedures are followed in maintaining a budget system?
3. In what ways does a budget system provide controls?
4. What difficulties would you expect to encounter in preparing a long-term capital budget?
5. Do you use any kind of budget for personal purposes? How formal is it? If you do not have a budget, why do you prefer not to have one? How are budgets used in households?
6. Why is a separate cash budget necessary?
7. What does the break-even chart show? Why is the discussion of this chart included in the present chapter?
8. What uses can be made of the break-even chart?
9. Would it have been better to include the discussion of the flexible budget, which was considered in connection with the control of costs, in the present chapter instead? Why or why not?
10. In what directions has management been turning attention in recent years to control the break-even point?

CASE: The Laurel Company

The Laurel Company, which has been in the hardware-manufacturing business for 25 years, has added a considerable variety of products to the original limited line. During its earlier years, production for stock seemed to mesh rather well with sales and inventory requirements. As additional products were added, however, this plan seemed to encounter difficulties. Various items were in short supply or else there seemed to be excess inventory. The company's controller believes the time is overdue for developing a budget system based on sales estimates, while at the same time taking into account inventory policies relating to the need for possible quick deliveries and keeping production costs down by limiting the number of changes in products, on the one hand, and on the other hand by keeping inventory low enough to improve liquidity, to reduce interest charges on the capital tied up, and to lessen the risk of obsolescence. In making this proposal, he added that the operating-expense budgets should be prepared by the manufacturing departments. These budgets should be consolidated and combined with the sales

budget to produce the budgeted profit. He proposes a target element but one that should be well within the possibility of attainment. He also believes some kind of contingency provision should be included for the possible non-attainment of budgets by individual units and to take account of the tendency to optimism on the part of sales. Once the budget is accepted, control is to be effected by focusing attention on variances.

The controller suggests that a budget committee be established to evaluate the proposals. The president is very much interested in the idea of setting up a budget system, but has raised the questions: (*a*) whether a committee is necessary at this stage or whether the controller should not instead work out the details, (*b*) whether a committee should then approve the system or make suggested changes, (*c*) whether when the system is adopted (which it already seems certain will happen) a committee should be in charge of the budget, or the controller's (or some other) department should be in charge, and (*d*) whether it is possible to work out means of assuring responsibility for the budget down the line?

1. What suggestions would you offer the president?
2. Should a capital budget also be provided? If so, what additions should be made to the tentative plan?

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UNIT 9
THE PRODUCT

PRICING AND MARKETING

Chapter XXIX

Setting Prices

Administered Prices. On highly organized commodity exchanges there are so many producers, buyers, and traders buying and selling so large a total quantity of a given commodity through brokers that no one of them acting alone can influence the price which is impersonally arrived at so that a farmer, for example, in selling his output does not himself have to determine a price for it. The prices of industrial goods, on the other hand, must be set by the producers themselves and are called administered prices.[1] However, the basic factors which they must take into account are the same as those which determine prices on the organized commodity exchanges. In deciding on his prices the producer must exercise his judgment in appraising supply, demand, and the competitive situation in the industry. The "competitive situation in the industry" is really a complex of consumer demand, total supply, price strategy undertaken to obtain a larger share of the market from competitors, and the actions or possible actions of competitors.

Costs and Prices. The two basic factors in competitive prices are supply and demand. Although producers give more attention to supply or costs than to demand in determining prices, they must have some regard for demand. While firms whose costs are the same as or lower than those of competitors may base their prices on costs, it is obvious that high-cost producers will be undersold by lower-cost producers. Even though a monopolist could theoretically base his prices on cost if there were no substitutes and the demand for the product were perfectly inelastic (meaning the buyer cannot turn to any substitute), such a monopoly position does not exist in actuality. Those producing articles which have distinct superiority in the minds of buyers because of especially valuable brand names or for other reasons might base their prices to a considerable

[1] The present discussion does not deal with prices in the regulated public-utility and transportation industries.

extent on cost of production. But the ever present possibility that consumers will substitute competing products must be taken into account.

Calculating Costs. Although costs receive considerable stress in actual practice, the methods of calculating or really estimating costs differ widely. Costs used in pricing may be based on past experience, average cost, or standard cost. Companies which do not attempt to forecast costs but keep their cost records current may base their prices on most recent operating experience. Average cost includes what is regarded as a normal profit, or the rate expected to be earned on the total capital investment. The standard cost of a unit of output may be used by firms with a standard cost system. The unit cost may be based on estimated expected sales volume or on the volume of output regarded as standard, normal, or near capacity. Costs must be estimated in advance when raw materials and labor costs are changing and firm price commitments based on costs must be made in advance of production. Companies which prepare catalogs encounter difficulties which must be resolved by meeting competitors' prices especially when prices change downward. When raw materials constitute the principal or a large part of the cost of production, the price may be based almost entirely on fluctuations in the commodity markets.

Adding the Markup. The price may be set on the basis of full cost, cost plus, or the addition of a markup, each of which amounts to a similar method of adding a percentage to the particular cost estimates used. If the cost figures used do not include an allowance for an estimated profit, this has to be included.

The percentage markup may be one which has been considered satisfactory in the immediate past or it may be the markup which competitors are known to be using. In any case, some comparison must be made with prices set by other firms.

In pricing goods made to order, a margin of profit or markup is added to cost. When this markup is called overhead, it is estimated to include overhead plus profit.

Demand and Prices. It is commonly said that in setting prices businessmen lay too much stress on cost and not enough on demand. Although demand is by implication taken into account when consideration is given to the actual and possible actions of competitors, the data on these matters are not particularly precise. Economists say that demand should be analyzed into the quantities which could be sold at different alternative possible prices since such an analysis might show that it would pay to produce more of an article at a lower unit cost and to sell it at a lower price or that it might seem desirable to produce fewer articles for sale at somewhat higher prices, depending on various competitive and longer-run influences. When it is recalled that lowering the price will

invite retaliation by competitors, however, it becomes clear that greater sales will not be achieved by the firm initiating the lower price.

Because of the tendency to emphasize cost, estimates of market demand are in practice frequently made on the assumption that the price is already fixed. Many manufacturers believe that the elasticity of demand for most manufactured goods is not very great and that a greater volume of production with lower unit costs and prices would not result in increased sales. Clare E. Griffin supports this view in stating that the price elasticities of demand are not as great as is often believed.[2] On this assumption manufacturers conclude that fixed prices based on costs are justified for their products since these goods can be supplied at the fixed prices in times of great business activity without expansion of production facilities, whereas in times of reduced activity prices may also be maintained since any additional sales which might result from lower prices would leave the producer with a smaller net profit in the long run. A policy of fixed prices requires careful cost calculation and the reduction of prices when costs are reduced or when substantial additional demand develops.

Competition and Prices. The competitive drive for profits is reflected in efforts to lower costs by introducing changes and improvements in the methods, materials, machinery, and equipment used by a company in production. There is a good deal of competition among different groups within a company as managers, engineers, purchasing men, and marketing officials make and defend conflicting proposals from among which decisions are ultimately made. From internal competition of this sort competition is extended to the outside in the relationships of the different companies to each other when they sell their products.

Theoretically, if the different firms utilize the best combination of equipment, labor, and management, standard costs might be the basis of price policy. If all firms producing similar goods produced at maximum efficiency, the standard costs would be similar and lead to similar prices. In practice standard costs are not universally used; and even if they were, they would probably be estimated differently. Moreover, it is obvious that regardless of how costs are calculated some of the firms are not as highly efficient as others and some are actually marginal or high-cost firms.

When a company makes more than one product, some of them are likely to be more costly than others; and if they do not have a preferred market position which permits passing the costs on in the price, the higher-cost items must be sold at prices to meet those of more efficient

[2] "When Is Price Reduction Profitable?" *Harvard Business Review*, Vol. 38 (September–October, 1960), pp. 125–132.

competitors. The company will, however, be producing other articles in the manufacture of which it is more efficient or for which it has achieved a preferred market position. Such articles can be sold at prices which offset the proportionately smaller revenue derived from the less profitable lines. Since higher-cost competitors will have to fall in line, prices are often similar for similar products made by different producers.

Competition is an important factor in prices in industries where differences in the product are of minor importance. In such instances large companies have an advantage and smaller companies may have to give careful consideration to the policies of the larger companies when their product is not much different and they cannot produce at lower costs. The problem of meeting the prices of larger competitors may often be difficult.

Long- and Short-Run Prices. A common approach to price policy is the basic proposition that over a fairly long period a firm's prices must at least cover over-all costs to make and sell the products if the company is to survive and that they must yield an excess if the firm is to be regarded as successful. The difficulty with the idea that prices must cover costs over time is that it depends on the assumptions that the value of money is stable and that costs can be objectively calculated. In the short-run with the existing plant given, prices may be set in order to secure additional business and utilize excess capacity in periods of poor business or seasonal decline. In such cases, prices may be based on variable or out-of-pocket costs in the expectation that at least such costs will be recovered and that some of the fixed costs might be. It should be noted that many businessmen fail to appreciate this type of possible action.

Company and Industry Price Policy. Although most companies arrive at prices by adding what they regard as a fair profit to the estimated unit costs and then modifying the results to meet competitive conditions, it has already been indicated that there is considerable difference of opinion as to how costs should be calculated for this purpose. In practice, competitive prices, the availability of substitutes, the possible reaction of competitors to a given price, and estimates of demand must be taken into account. The competition of aluminum, stainless steel, and plastics, for example, exerts an influence on fabricated copper prices. Patented, brand-name, and otherwise successfully differentiated products may command higher prices than other products which meet more competition. The extent of different kinds of services provided is also a factor in determining the prices of articles. The same company may sell products in more than one of these groups.

Although patented, brand-name, and serviced articles command higher

prices than others, they are priced on a long-run basis in which such factors as the estimated longer-run effects of different possible prices on sales volume and possible future changes in costs are taken into account. In periods of rising prices, especially when there are shortages such as those which existed in the immediate post-World War II period, unbranded articles may therefore sell at higher prices than successfully branded items. In that same period, the prices of steel, automobiles, and many other items were fixed by the manufacturers on the basis of longer-run considerations taking into account costs and the longer-run reactions of buyers even though the articles could have been priced higher and were, in fact, frequently sold by distributors other than the manufacturers themselves at much higher prices than those placed on them by the producers.

Some businesses may be more favorably disposed to aggressive price competition in prosperous periods than in periods of recession, when they oppose such competition and call it cutthroat. Large firms may avoid aggressive price competition if the possibility of driving out too many competitors may be expected to arouse public hostility or if it is thought that the possibility of antitrust action may arise.

Although prices are generally formulated to provide for the recovery of development and tooling costs within a short time, in some industries the perishable nature of the product has an influence on price policy. In meat packing, for example, the prices of perishable products are to some extent determined by immediate market conditions since such products must be sold at some price within a given time regardless of prior decisions.

Established trade practices also influence pricing. In some industries traditional consumer price levels within which the prices must be set may be determining considerations. In others, prices are set on a pattern which allows a certain percentage for the retailer and a certain percentage for the jobber with the manufacturer getting what is left.

Under price leadership, which exists in a number of industries, one or more of the leading firms in the industry may set and announce prices, which are then announced by the other companies in the industry. Firms in the steel industry generally follow the prices posted by the United States Steel Corporation. It should be noted, however, that the published prices may be shaded or increased if business conditions and competition suggest such a course. Moreover, these are base prices for steel products made according to standard specifications, so that variations in products specified by buyers result in a great many different costs and prices. Similar practices are found in other industries. However, all of the companies in an industry in which there is price leadership do not necessarily follow the leader in this manner.

Trade associations may influence prices. Not only do they collect and report data on such matters as production capacity, production, stocks on hand, orders received, shipments, and unfilled orders, but they also report prices and make efforts to bring about uniform cost-accounting procedures. Smaller firms, which sometimes quote prices suggested by trade associations, may lose business which could be acquired by quoting lower prices to cover out-of-pocket or variable costs plus at least some overhead if the work could be done in periods when the particular plant would otherwise be idle.

Price policy is sometimes influenced by the size and financial power of buying firms which might themselves undertake production if they do not consider prices satisfactory. This possibility is especially present when there are few buyers, as in the market for automobile tires which is divided into two large areas, one of which is for tires for new automobiles in which there are few buyers and the other of which is for replacements in which there are many buyers.

Price policy is frequently influenced by the stage of development of an industry. An important characteristic of the economic history of the United States is the original production of new articles at high unit costs and selling prices after which improvements in techniques and means of producton made possible by the utilization of heavy capital investments in mass-production facilities resulted in much lower unit costs and prices. Mass production at low unit costs becomes profitable when the articles can be sold at correspondingly low prices to mass markets which are stimulated by highly developed means of communication and advertising. As such markets are developed, the articles are regularly purchased and become part of the standard of living of increasing segments of the population. In the automobile industry a policy of lower prices in successive years was possible for some time because of increasing efficiency and an expansion of sales, both of which resulted in lower unit costs. When the expansion of the market was no longer so fruitful a source of additional volume and therefore of lower unit costs and prices, the policy of introducing new models almost every year became the more important factor in marketing. In the period after World War II, higher money costs of production were accompanied by improvements in quality and changing designs, some of which were in part introduced to justify the higher money prices.

Target Pricing. Some large companies set up target returns on capital investment as a pricing objective. The percentage goals adopted by different companies vary considerably. Because of changing business conditions, it is not expected that the same return will be achieved each year. In addition to the objective of pricing to achieve a target return on investment, these companies place varying emphasis on such matters

as the desire to stabilize the price and the margin, to realize a target market share, and to meet or prevent competition. Since the enterprise itself is the unit of decision-making in these multiproduct companies, the pricing may be done for product groups in relation to the total profit planned for. The consequence may seem to be that costing becomes the result of price policy instead of the reverse.[3]

Terms of Sale and Prices. Quoted or list prices are subject to a variety of terms. Cash discounts, quantity and volume discounts, trade discounts, and delivery acceptance discounts may be provided. Freight allowances, seasonal allowances, advertising allowances, promotional allowances, and trade-in allowances may be made. Quality guarantees and guarantees against price rises or price declines are sometimes given. Credit terms, provisions for dates of delivery, guarantees of performance, legal and other services, and agreements to repurchase also influence price.

Under the uniform mill net or f.o.b. factory price method, the price is for the product at the manufacturer's place of delivery and the freight cost is paid by the buyer. In delivered pricing, the cost of the freight is included in the price. Uniform delivered prices are prices which are the same for large market areas. Freight costs are likely to be absorbed by a seller from a more distant plant to meet the competitive prices of one or more sellers located nearer to a buyer.

Variety of Products to Be Priced. The fact that many businesses, especially large ones, must price a variety of products makes their problem somewhat complicated. There are often hundreds and even thousands of stock or shelf items for which there is continuing demand and which must be kept in large inventory supply. In addition, many bids are requested on thousands of special items on which prices must be estimated. In the course of adapting its basic products to the specifications of buyers a large steel producer may, for example, find that it makes as many as 50,000 different products; an agricultural-equipment producer as many as 250,000 separate parts for servicing agricultural implements; and an electrical equipment producer as many as 200,000 different products each of which must be separately priced. It is evident that there is considerable room for differences of opinion in setting these prices.

Mercantile Prices. In merchandising, conventional margins of profit are added as percentages of the selling price or as percentages of cost. In applying a margin or markup to a product selling for $7.50, for example, 33⅓ per cent of the selling price or $2.50 is added to the cost of $5. In adding the markup to the cost of $5, 50 per cent is added to the cost to arrive at the selling price of $7.50. The markup is designed to cover overhead, including expected profits. Pricing may, however, be influ-

[3] Cf. Robert F. Lanzillotti, "Pricing Objectives in Large Companies," *The American Economic Review*, Vol. 48 (December, 1958), pp. 921–940.

enced by other factors. For example since some lines such as refrigerated products require greater costs than others sold by the same firm, a higher markup may be applied to the former. In some cases, conventional price lines influence pricing. The prices charged by competitors may be considered and sometimes most pricing may be based on that set by others. Some prices are set by manufacturers who consider retail margins in the suggested prices.

Responsibility for Company Price Policy. Price policy is considered a matter for top-executive consideration in all types of companies. In only a few companies, however, are price decisions made by one person. The general practice of having the sales and production departments arrive at suggested prices through consultation amounts to giving consideration to the demand and the supply factors. The recommendations made by these departments are then reviewed by the president or the executive committee and, in some cases involving important changes, by the board of directors. In large decentralized companies basic price policy is frequently established in this way, with divisional managers permitted to make discretionary changes within established limits.

In companies which manufacture to specifications, cost estimates are requested of the engineering department which may then also take an active part in the discussion leading to the determination of the final price.

Some companies have pricing committees, which are responsible for studying various matters such as manufacturing costs, profits, competitors' activities, and market conditions. An industrial machinery company, for example, has a pricing committee composed of representatives from the production, sales, finance, and contract and order departments, the chairman being the representative from the finance department. The committee makes recommendations to the president, who is responsible for final approval.

The following description of the process involved in the formulation of price policy is of interest:

> . . . The internal politics of business organizations requires much more attention in a study of the process of price determination than is usually devoted to it. In conferences on pricing policy, the sales representatives may stress the importance of lower prices and attractive products, the sales credit department the desirability of favorable discounts and terms of credit to customers, the legal department the dangers of larger discounts to different types of customers and the general importance of relationships to the public and to governmental agencies and departments in particular, the manufacturing department the technical difficulties of producing the quantity and quality specified for the desired dates of delivery, the accounting department the need for larger profit margins, and the research department the danger, attributable to technical imperfections, of introducing such innovations as the sales representatives may request. Similarly, decisions as to the volume of production and employment may involve compromises between

the desire of the production and the industrial relations departments to maintain the working force, the treasurer's concern over cash position, the accounting department's view of the probable fluctuation in inventory values, and the sales department's concern over style or technical obsolescence.

The compromise adopted between such divergent interests is apt to be materially influenced by the personalities involved, the accidents of the moment, and the "bargaining" strength and abilities of the various departments. To be sure, the individual entrepreneur must make decisions which amount to compromises between different interests, but in a large corporation these interests have "organized representatives." . . . one must be familiar with those rules of thumb, accounting practices, and special interests that impinge on decision-making within individual companies.[4]

Conclusion. It is difficult to draw any precise conclusions on price policy since the particular action taken by a producer at any time must necessarily be based on an appraisal of estimates in relation to thought processes which reflect the taking into account and weighing of a variety of influences based on experience, judgment, and expediency.

QUESTIONS

1. How does the setting of administered prices differ from price-making on commodity markets? What are the common elements in both forms of pricing?
2. Why are costs related to the supply side? How are costs estimated for purposes of price decision-making?
3. To what extent and in what ways is it difficult to take demand into account when setting prices?
4. How does competition affect industrial pricing?
5. Distinguish between longer-run and short-run factors affecting pricing. Is it worthwhile to make this distinction?
6. In what ways may it be said that company price policy is affected by that of the industry or that industry price policy is affected by that of companies in the industry?
7. The text states that price policy is frequently influenced by the stage of development of an industry. Can you cite any consumer product or products now on the mass market horizon which might serve as an illustration for the discussion of this topic? If so, explain what developments you would expect and when?
8. What do you understand by target pricing? Is this really pricing?
9. How should one go about determining where the responsibility for price decision-making should be placed within a firm?
10. Why is it difficult to determine the difference between competitive price-making and collusive price-fixing?

[4] *Cost Behavior and Price Policy*, a study prepared by the Committee on Price Determination for the Conference on Price Research, National Bureau of Economic Research, New York, 1943, p. 43 f.

CASE: Alpha Company

The Alpha Company, in considering whether to continue to make a part, estimates the cost of making it as follows:

Direct materials	$2.75
Direct labor	3.50
Variable overhead	1.70
Total variable cost	7.95
Fixed overhead	1.80
Total cost	$9.75

This part can be bought from reliable producers for $8.20.

Should the company continue to make the part? Explain.

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Chapter XXX

Marketing the Product

It is frequently pointed out that the extraordinary productivity of the American business and economic system required the development of a correspondingly productive marketing system to distribute the goods and services produced. Marketing involves activities ranging from product planning through all the steps involved in the flow of goods and services from producers to consumers, including responsibility for the product after it is sold and until it is entirely consumed. In other words, it may be said to extend from consumer needs and desires to consumer satisfaction.

Those who work in the field of marketing have a role of considerable importance in product planning, research, pricing, and the way in which goods are sold. Marketing officials not only participate to some extent with other executives in determining specifications of products but they may also originate some proposals regarding products. T. V. Houser suggests that the marketing executive cannot be limited to marketing methods alone but that his marketing knowledge must play a major part in other areas such as research, development, and production.[1]

In the formulation of marketing policies, decisions must be made on the market channels to be used and on policies regarding the servicing of goods sold. The sales force must be built up, advertising policies must be determined, and market research of various kinds is essential. Price policies, which have already been considered, are obviously of considerable importance in marketing.

Marketing Program. A marketing program, which is essential for integrating and coordinating marketing activities, is a written plan for guiding a company's marketing activities toward specific objectives. It tells what is to be done, when it is to be done, and who is to do it. The pro-

[1] T. V. Houser, "The True Role of the Marketing Executive," *The Journal of Marketing*, Vol. 23 (April, 1959), pp. 363–369.

Fig. 135. Storing merchandise in a grocery warehouse.

— Clark Equipment Co.

gram should represent as nearly as possible what has been called the "mix" of all marketing components. A program shows where the company desires to be at the end of the program period and how it intends to get there.[2]

Kinds of Products Sold. Manufacturers produce and sell both consumer goods made for use by ultimate consumers without further processing, and industrial goods made for use by other businesses in making other goods, in rendering services, and in running their business.

Consumer goods (Fig. 135) may be classified as convenience goods, shopping goods, and specialty goods. Convenience goods, which include such things as cigarettes, bread, and chewing gum, are those which consumers want at once and buy frequently with little effort spent in their selection. In order to make these goods as widely available as possible they must be sold through many retailers. Although the distribution to retailers is accomplished by the use of wholesalers, the manufacturer has to advertise his own products.

Shopping goods which include such items as women's hats and men's neckties are those which are bought only after comparing the quality, price, and style in a number of stores. Shopping goods are sold directly to retailers located in central shopping districts and are advertised by the retailer. Specialty goods which include such things as fancy groceries, high-grade watches, and more expensive cameras are those in which the consumer has a special interest and which he insists on getting even if he has to go out of his way to get them. Specialty goods are often sold directly by the manufacturer to the retailer, who is frequently an exclusive agency for the product in his community.

Industrial goods include installations of major equipment, auxiliary equipment, parts and materials, and operating supplies. Installations in-

[2] Albert W. Frey, *The Effective Marketing Mix*, The Amos Tuck School of Business Administration, Hanover, N. H., Bulletin No. 15, May, 1956.

clude such equipment as blast furnaces and turbines. Some major equipment is standard, some is special purpose. Installations and major equipment are generally sold directly by the manufacturer to the company buying them. Salesmen must have technical training, engineering service has to be supplied, and repair and maintenance service must be rendered.

Auxiliary equipment includes such equipment as small lathes, small motors, hand trucks, and other similar equipment which is used supplementary to the major equipment. Much of this equipment is sold through distributors called industrial supply houses, hardware wholesalers, and manufacturers' agents. Although the industrial supply house and the hardware wholesaler usually buy these goods and resell them, the manufacturers' agent sells on a commission basis. Salesmen selling auxiliary equipment do not need as much technical training as those selling installations.

Parts and materials which go into the buyer's final product include such parts as storage batteries and spark plugs and such materials as sheet steel, copper wire, and lumber. Salesmen selling parts and materials should know the details of the manufacturing process of prospective customers in order to be able to discuss the use which the customers may make of the products. Some parts and materials are sold by brand name. Operating supplies which include such things as oil and grease, soap, brooms, and stationery are materials used in operating a business but which do not enter into or become part of the final product. Operating supplies' salesmen usually do not need the technical training essential for selling other types of industrial equipment. Since speedy delivery is necessary and the purchases are frequent and in small quantities, it is essential to sell such supplies through distributors.

Marketing Institutions. The institutional arrangements by means of which goods and services are distributed or marketed are retailing and retailers, wholesaling middlemen of various types, and facilitating institutions such as commercial auctions, commodity trading exchanges (Fig. 136), and the marketing services of trade and market operating associations. These marketing intermediaries, which are utilized in varying ways to form a firm's market channels, are called marketing institutions. They are businesses which are available to perform the functions needed by the firm in the process of moving its product through a marketing channel to ultimate buyers.

Selecting Marketing Channels. A channel of distribution or marketing channel is the combination of market intermediaries used by the seller of a particular product. It is the course taken by a product as it moves from the producer to the consumer. In selecting the marketing channel for a product, the volume of sales which can be obtained for as low a cost as possible is a fundamental consideration. Among the various fac-

— The Chicago Board of Trade

Fig. 136. The Chicago Board of Trade is the world's largest grain market. At the right are the grain tables where samples of each car lot of grain for sale are displayed.

tors which must be considered are the nature and extent of the market, including the buying motives of purchasers and ways of reaching them, determining which of the existing trade channels may be most desirable, the kind of assistance which the manufacturer expects to give to the channel, and the extent of cooperation expected from the channel to be selected.

Marketing Channels for Consumer Goods. A manufacturer of consumer goods can sell them directly to an agent middleman who sells them to large-scale retailers or to wholesalers for sale to retailers and consumers, to the wholesaler who sells them to the retailer or other wholesalers, directly to the retailer who sells them to the consumer, directly to the consumer, or to some combination of these.

The sale of consumer goods may be directly through agent middlemen who include brokers, selling agents, and manufacturers' agents who do not take title to the goods in which they deal. Brokers who deal in dry goods, canned goods, and sugar find buyers and sellers whom they bring together to carry out the transaction. Selling agents or commission houses, which are important in textiles, ordinarily represent one manufacturer and assume the responsibility for selling his entire output in accordance with their own preferences regarding prices and terms of sale as well as the territory in which to sell. Manufacturers' agents, who

are found in the grocery and hardware trades, represent several manufacturers and take only part of the output of each although they do not handle competitive lines. They operate in the territory specified in the contract with the manufacturer and sell at the prices specified by the manufacturer.

Many consumer goods are sold directly or from agent middlemen through wholesalers, who are of varying degrees of importance in different industries. Wholesaling is principally a field of relatively small business with unincorporated enterprises predominating, although there are several thousand with sales over five million and a few very large enterprises. Wholesalers are regular or full-service wholesalers and limited-service wholesalers. Full-service wholesalers buy the goods, store them, and assume the risks of selling and delivering them. Limited-service wholesalers provide only some of the services provided by regular or full-service wholesalers. Some are cash-and-carry wholesalers, whom retailers call on to get merchandise for a cash payment and then take it to their stores. These wholesalers handle fast-moving staple lines in such fields as groceries and tobacco products. Wagon distributors or truck wholesalers, who call on retailers and sell from their trucks, handle such things as bakery goods, fruits and vegetables, groceries, and dairy products. Desk jobbers or drop shippers, who handle such things as lumber, coal, and coke, accumulate retailers' orders into large quantities which can be bought at a discount. They send the quantity order to the manufacturer, who sends the goods to the different retailers in the quantities they specified. Mail-order wholesalers, who sell some electrical goods, sporting goods, and jewelry, sell through catalogs.

The direct sale of goods to retailers, including department stores, chain stores, supermarkets, discount houses, and mail-order houses, may be done directly or through agent middlemen and wholesalers. Direct selling to retailers may be illustrated by the decision taken by Procter & Gamble many years ago. The company originally undertook the policy of selling to retailers in addition to wholesalers because spasmodic buying on the part of wholesalers made for irregular sales and production even though soap consumption was regular throughout the year. It was discovered that the wholesalers bought while prices were rising but left the market when prices fell. In order to insure a more even flow of production and sales, the company began to sell to retailers directly as well as to wholesalers.

Another example in more recent years is that of a well-known carpet company, which on the basis of an analysis of its distribution methods decided to drop a number of wholesale distributors and ship directly to retailers from its mills and warehouses. The company decided to distribute carpets for which it is selling agent in the same way. Several advantages were claimed for direct selling to retailers. Closer contacts could be maintained with the retailers and better knowledge of their

needs would make for greater manufacturing efficiency. Improved service in deliveries from warehouses would also be possible. Single control would eliminate any duplication, overlapping, or competition in distribution. Finally, the effectiveness of advertising would be greater because of the direct contact between the manufacturer's representatives and the retailers. There were, however, various financial and management considerations which had to be decided on since the new policy required an expanded sales force, branch offices, and more warehouses. The problems and the outlays involved were considered of less importance than the advantages expected from the new system.

Some consumer goods are sold only to dealers with whom a sales-agency agreement has been made. Such an agreement specifies the locality within which the dealer is given the franchise to sell the article without competition from other dealers. Dealer organizations have been built up by a number of manufacturers notably in the electrical-appliance and automobile fields. Dealer distribution facilitates sales by stressing the servicing of the product. When the dealer organization is considered not entirely adequate, some manufacturers supplement it with some retail stores which they own and operate themselves.

Direct selling to consumers may be done by door-to-door selling, mail orders, or manufacturer-owned stores. House-to-house selling is illustrated by the policies of the Fuller Brush Company. Mail-order selling by catalogs is illustrated by the familiar example of the mail-order houses like Sears, Roebuck and Montgomery Ward, which manufacture only some of the products they sell. Manufacturer-owned retail stores may be illustrated by the Dennison Manufacturing Company's stores and by the Rival and Thom McAn shoe stores operated by the Melville Shoe Corporation.

Agricultural Marketing. In view of the location of processing plants in relation to agricultural markets, it is desirable to have some understanding of agricultural marketing. Although this subject might have been discussed in connection with the general topic of locating the plant, we had at that point not become familiar with the marketing institutions which we have now been taking up. In agricultural marketing, there are local assembly markets, district concentration markets, and central wholesale markets. In local assembly markets there are merchant dealers and farmers' cooperatives. Processing firms may be located in the vicinity. At these markets central market dealers and processors in cattle and other lines buy directly through agent buyers or salaried representatives. District concentration markets are intermediate between the local and the central wholesale markets. The central wholesale markets are those such as for wheat in cities like Chicago, Minneapolis, Kansas City, and so on. Here are found merchant dealers, warehouses, public elevators,

and other facilitating marketing institutions performing the various marketing functions.

Marketing Channels for Industrial Goods. Industrial goods are sold directly to users or through middlemen. Installations, special equipment, materials like copper, rubber, and petroleum, and supplies bought in large quantities are sold directly to users. Industrial distributors, who distribute standardized small equipment and machines, tools, and repair parts, are middlemen who buy and store goods and sell them to other manufacturers. They are the same as full-service wholesalers except that they sell to industrial users. Industrial goods are also sold through brokers, selling agents, and manufacturers' agents who do not take title to the goods. Brokers are found in marketing steel, cotton gray cloth, and hides and leather. Selling agents are found in lumber or millwork, chemicals, and the coal-and-coke industry. Exclusive dealer agencies are found in the distribution of machine tools. Manufacturers' agents are used in iron and steel, naval stores, and industrial chemicals.

Cooperation With Distributors and Buyers. Cooperation with marketing channels takes various forms. It is ordinarily not desirable to compete against outside distribution channels by selling directly. In connection with the sale of consumer goods, dealer helps for wholesalers and retailers are provided in the form of advertising and sales-promotion aids as well as in assistance in improving merchandising methods and salesmanship. Under cooperative advertising arrangements manufacturers share local advertising costs and thereby get the advantage of lower rates, which they would not get by placing the advertising themselves. Possible disadvantages in such advertising are that, since the manufacturer does not know the rates, he cannot control the costs, and he may also not be able to control the kind of advertising.

In the marketing of both consumer and industrial goods, manufacturers may employ missionary salesmen to train and assist the distributors' salesmen. In selling industrial goods various forms of industrial advertising are undertaken and paid for by manufacturers. Some manufacturers also conduct training programs for distributors of industrial goods, whose interest and cooperation is thereby stimulated.

Servicing merchandise after its sale is important and takes various forms depending on the article. Manufacturers assist distributors and dealers by providing various kinds of services to buyers of the goods. They provide information for the guidance of mechanics employed by dealers; they advertise servicing information in trade journals; they sometimes provide directories indicating where repairs can be made; and some manufacturers maintain regional repair offices to which dealers can send customers' goods for repair. Correspondence courses are made available by some manufacturers to help distributors' and dealers' service-

men. Dealers are also trained by sound motion pictures, slides, charts, demonstrations, and classes in repair work.

In the field of industrial goods, installation and demonstration services are essential in addition to repair services. Repair and replacement parts must be made available. Group meetings are often provided to make sure industrial customers and their employees use the equipment properly. Manuals and booklets are also provided. Instruction sheets and charts giving detailed explanations and directions for cleaning, lubricating, inspecting, and overhauling equipment are frequently provided. Advertisements in trade journals also explain the proper use and maintenance of products.

Containers, packaging, and labeling help to promote the sale of products. Packaging has been receiving more stress than ever before and many innovations are being developed and introduced.

Brand names are an important factor in sales. Manufacturers' brands often become so widely known as to become national brands. Although distributors' or private brands, which are owned by wholesalers and integrated retailers, such as chain stores, large department stores, and mail-order houses, are not so likely to become national brands, some of them do because of the large-scale organization through which they are distributed.

Manufacturers of basic materials and parts which become hidden in the final product often identify their products at the consumer level. Examples of successfully identified hidden products are new-departure brakes, nylon, and lastex. Such identification results in a more stable and stronger market so that buying resistance and therefore advertising and selling costs are decreased. Since the success of a policy of seeking goodwill for hidden products depends on associating the name and label with good quality products, the final product must be well made and highly regarded by consumers. For this reason manufacturers select the producers of the final products carefully and often arrange for licensing, quality agreements, or the use of testing laboratories. When retailers and manufacturers are anxious to feature the name of a basic product, no program is necessary to encourage the use of the label; but when there are good substitutes, strong consumer advertising campaigns or advertising allowances may be necessary in order to induce manufacturers to use the particular hidden product and retailers to stock the final product. Such problems do not arise in the case of patented articles since any failure to use the label can be met by withdrawing supplies. Although some companies manage to bring nearly all their products into an identification plan, others are only moderately successful and some are able to do so for only a small percentage of their total output.

The Marketing Division. The marketing division is a major func-

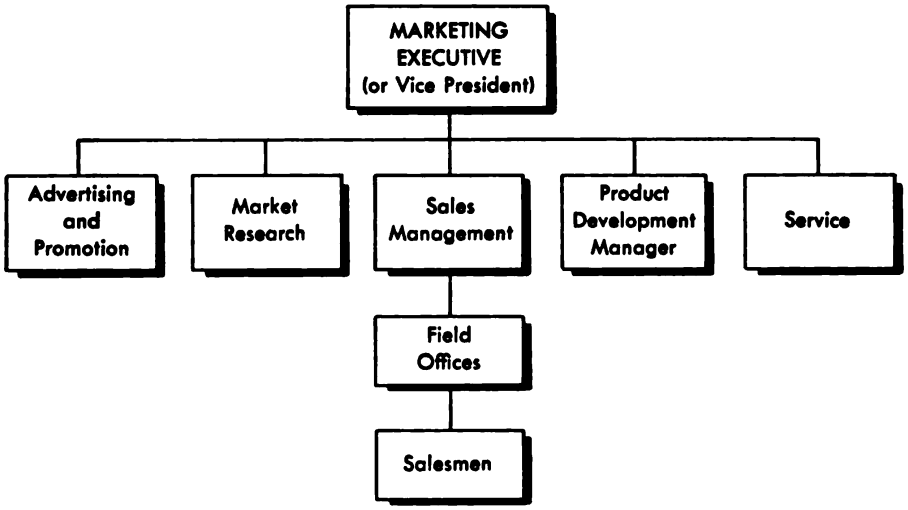

Fig. 137. Marketing department organization.

tional department. In a small company the department is organized exclusively as a line organization, but in large organizations staff work is added to do market planning and research. The department is headed by the chief sales executive, who is a major functional officer and may be vice-president in charge of marketing. The department may have assistant sales managers and functional managers in charge of particular fields, such as market research and advertising. There may also be branch managers for different geographical areas.

Figure 137 illustrates one of a variety of possible organizational arrangements for the marketing department. There may be sales managers for each of a company's several different products or product lines. Also, geographically divided sales organizations may be under the sales manager. Note that although product development is placed under marketing in this chart such an arrangement would not always be feasible or desirable.

Promotion. Although the practice of sales forecasting suggests that the firm adapts to demand, it should be kept in mind that it also attempts to manipulate demand by promotion activities of various sorts. Basically, promotion involves telling people about a firm's products by communicating a favorable presentation of their attributes through as many means of communication as the management decides to use.

Promotional effort is devoted to personal selling, advertising, publicity (including news releases, public appearances of company officers, and company participation in industry-wide publicity efforts), and product displays such as those in retailing and at exhibits or trade shows (some of which are restricted to trade buyers, some of which are open to the public generally, and some of which are open to both groups).

Sales Force. Since the sales force is of vital importance, the personnel program for salesmen should involve the same general principles of job

analysis, recruiting, selection, training, supervision, and incentives as in other departments. There should also be some methods of measuring their performance.[3]

The type of salesmen required depends upon the particular products and the kind of buyers. Salesmen may be classified in six groups according to the kind of selling involved. The first is the direct-selling, prospect-finding, customer-getting type who sells articles in the early stages of new products. A second type is the customer-reselling customer-service salesman who keeps the business coming in. A third type is the direct dealer-jobber-getting, distribution salesman who performs a function analogous to that of the first type except that he sells to dealers and jobbers. A fourth type is the dealer-reselling, dealer-servicing salesman who performs a service analogous to that of the second type. A fifth type is the technical man who sells to industry and is sometimes called an engineering salesman. He not only sells but he also analyzes the needs of customers and tries to make sure that once the product has been sold it is utilized in the most efficient way. A sixth type is the dealer-merchandising counselor who does not attempt to sell but advises wholesalers and retailers on their problems.

The first step in the selection of the sales force is job analysis. The details of the duties of salesmen in finding buyers, soliciting, and selling depend upon the company's product-and-sales program. Technical service duties are necessary with some products. Although the incidental routine and clerical tasks required will also be included in the job analysis, they are not so important in deciding on the qualifications. Once the required qualifications have been determined, recruiting can be undertaken. The sources of salesmen are men doing other types of work, those in educational institutions without experience in selling, those with experience other than selling, those with sales experience in other companies selling different products, and those with sales experience in companies selling similar products. After prospective salesmen have been located from among these sources, the next step is selection. Although selection programs differ, interviews in which certain definite information is gotten are always essential. The application blank must be filled out and tests are frequently administered.

Various forms of training programs are used in training both new and experienced salesmen. The objectives of a training program are: (1) to train salesmen in familiarity with the product and its uses, the processes of its manufacture, and the company for which they are selling, (2) to train them to study the market and to find and select potential buyers, and (3) to train them to sell. Training to sell is of course very important

[3] National Industrial Conference Board, Inc., New York, *Measuring Salesmen's Performance*, Studies in Business Policy No. 79, 1956.

and takes several forms, including training in the product and its market with little training in selling as such, field trips with experienced salesmen, the providing of one or more standardized sales presentations, and formal courses. Provision should also be made for training salesmen how to make the most efficient use of their time.

Sales Management. The sales manager must plan the tasks of the sales force by working out quotas to be assigned the salesmen. Sales territories are decided for salesmen on a geographical basis or by classes of customers.[4] In routing salesmen, the factors which must be taken into account include the territory which must be covered, economy in time and travel expenses, and the necessity for some return trips to headquarters.

The extent of supervision which is necessary depends upon the size of the organization and the size of the sales force, the scope of the territory assigned to salesmen, and the type of salesman. In small companies salesmen report to the sales manager in the home office. But the sales manager alone cannot properly supervise too many salesmen. When there are sales branches, salesmen report to branch managers.

Whenever possible, personal supervision is desirable. The salesmen themselves often prefer it because it provides the opportunity for getting advice, reporting on customers, and talking matters over generally. Personal supervision is difficult, however, when there is a large field force dispersed over a wide territory. In such cases, correspondence, telephone calls, and other means must be used. Periodic reports are prepared by salesmen. Although meetings, conferences, and conventions may be held, their productive usefulness in stimulating greater sales is questioned by some observers. Sales contests are also held but their desirability has also been called into question.

Sales Promotion. Sales-promotion effort is directed to company salesmen and middlemen in an attempt to increase their enthusiasm and therefore sales. Sales promotion creates and provides visual aids for salesmen to sharpen their enthusiasm. It also involves providing skillfully prepared material for distributors which it is expected will stimulate their interest and enthusiasm. Similar material is prepared for dealers to help them sell. Sales promoton may be defined as ". . . that component of the marketing mix that continually creates and applies materials and techniques that, reinforcing and supplementing the materials and techniques provided by the other components, *increase* the capacity and desire of salesmen, distributors and dealers to sell a company's product and make consumers *eager* to buy it."[5]

[4] Cf. Walter J. Talley, Jr., "How to Design Sales Territories," *The Journal of Marketing*, Vol. 25 (January, 1961), pp. 7–13.

[5] Albert W. Frey, *The Role of Sales Promotion*, The Amos Tuck School of Business Administration, Hanover, N. H., Bulletin No. 19, September, 1957, p. 9.

Although we have not as yet discussed advertising, it may be appropriate to point out here that a company may have as an important goal in its advertising the objective of creating a feeling of confidence and pride among members of the sales force as well as of encouraging them to use the advertising to help them sell. Other objectives will, of course, be along the lines of gaining the widest public interest, of informing customers and prospects of services, and of creating a corporate image of quality and leadership. One company's advertisements, which had the foregoing objectives and were not designed to create inquiries, nevertheless unexpectedly had the latter effect also.

Market Research. Market research, which has been in use during most of the twentieth century, involves the application of scientific methods to the study of problems involved in marketing goods and services. Market research is necessary to forecast sales, analyze sales statistics, determine sales potentials in given markets for specific products, set up sales quotas for different areas, make customer surveys to get the point of view of customers, and forecast future trends.[6]

Market research includes not only studies of markets and market conditions, but also studies relating to products and services, such as the development of new products, whether a new product should be introduced into a sales territory, the improvement of packaging, and the analysis of consumer preferences. Studies are also made of the company's price structure, salesmen's compensation, and dealer relations. Studies of sales methods help to reveal the effectiveness of the efforts of the sales force as well as of the advertising and the distribution channels being used. Market research is also essential when considering the acquisition of another company. The suggestion has been made that market research must become broader gauge by devising long-range goals defined by marketing management.[7]

Although a separate market-research department is not especially feasible in small- and medium-size companies, in larger companies market research is a staff function of considerable importance. The director of market research may have a staff of clerical and stenographic help, statisticians, market analysts, field investigators, and possibly a librarian. Reports are prepared as called for and presented to those who require them as well as to superior officers. Sometimes the market-research director is authorized to choose subjects for study as they occur to him. The reports based on such studies are also sent to superior officers as well as to others who might be interested.

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[6] National Industrial Conference Board, Inc., New York, *Marketing Research in Action*, Studies in Business Policy No. 84, 1957.

[7] Lee Adler, "Phasing Research into the Marketing Plan," *Harvard Business Review*, Vol. 38 (May–June, 1960), pp. 113–121.

If there is a vice-president in charge of marketing, the director of market research is under his direction. The director of research should be responsible to a senior officer and on a par with the heads of departments serviced by market research, because if his department is not of the same level of importance as the departments serviced it cannot make critical analyses of their work. Although some companies confine the work of the market-research department to the study of problems related to sales activities, others use it to provide analyses of a wider range of company problems, in which case the director may come into contact with so many phases of the business that he becomes a policy advisor. The influence of a director of market research may range from a more or less passive interest exerted by such reports as are prepared and distributed to an active and direct participation on management committees.

The services of market research firms are sometimes used. Outside views may be desirable; but if these firms are to be able to give the best advice, they must be given all necessary information, and some companies are reluctant to do this. Since not all market-research firms are necessarily reliable, care must be exercised in making the selection. Advertising agencies also do research on marketing problems.

Sales Forecasting. Sales forecasts, which are undertaken and prepared by the market-research department, involve an analysis of future demand for the firm's products. These forecasts are based on the analysis of two sources of data: (1) data from outside the firm, that is, on general economic conditions and (2) data gathered from within the firm. The first are based on estimates of future general business conditions, the effects of expected changes in business conditions on the total market demand and sales volume of the products in the firm's industry, and finally the firm's relation to the industry which determines the proportion of the total expected sales the company may anticipate.[8] The data gathered from within the firm include past sales and estimates by sales managers and salesmen of the volume of sales expected within their territories for the future period. The sales forecast may be made for individual products, groups of products in the company's line, or the total line of the company's products.

Sales forecasts are generally made at regular quarterly, semiannual, or annual intervals. However, an increasing interest has developed in longer-range forecasts extending to as many as five or even ten years. Such long-range forecasts are used as the basis for planning the firm's markets as well as for production and financial planning.

Demand studies may be made not only to forecast general demand

[8] Cf. Alfred R. Oxenfeldt, "How to Use Market-Share Measurement," *Harvard Business Review*, Vol. 37 (January–February, 1959), pp. 59–68.

for the firm's products but also to determine shifts in demand resulting from changes in industries and population. On the basis of such studies rearrangements of sales territories and relocations of warehouses can be made. Studies of sales possibilities in different areas may reveal that it would be more profitable not only to concentrate on particular areas but sometimes also to eliminate less fruitful areas.

Thus, sales forecasting makes possible the setting of sales quotas for salesmen and distributors.[9] Sales quotas can be worked out more readily for products which are used up, such as materials, lubricants, tools, and so on, than for capital goods which are much more difficult to prepare.

As we have already noted, the firm does not exclusively adapt itself to demand, and the data forthcoming from demand studies include the results of attempts to increase the demand.

Motivation Research. Motivation research, which has attracted attention in recent years, goes beyond market research in attempting to understand and forecast consumer buying motives and buying decisions.[10] Market-research attempts to predict how people will react in a given marketing situation when it asks how a new product design will be received and which advertising message or illustration will prove most appealing and produce the most sales. By studying the past actions of people, by conducting tests under controlled conditions, and by eliciting people's reactions in advance of the launching of a program, marketing research has been able to give valuable guidance to management, and at times has been able to predict with considerable accuracy what would happen in the market.

However, although market-research men attempt to study and predict the motives and actions of various types of groups of buyers by asking the reasons for their actions, they frequently do not get satisfactory answers, partly because people sometimes do not know their reasons, or because they rationalize their behavior, or because they prefer not to reveal their real reasons.

Motivation research attempts to discover these reasons by applying the techniques of the behavioral sciences. It involves the application of psychological, psychiatric, sociological, and anthropological research techniques and knowledge in the effort to understand what induces people to react favorably or unfavorably to various products and sales appeals, especially in those instances where the consumer himself may

[9] Cf. Donald R. Hertzog, "Setting Sales Quotas," *California Management Review*, Vol. 3 (Winter, 1961), pp. 47–52; George Risley, "A Basic Guide for Setting Quotas," *Industrial Marketing*, Vol. 46 (July, 1961), pp. 88–93.

[10] National Industrial Conference Board, Inc., New York, *Use of Motivation Research in Marketing*, Studies in Business Policy No. 97, 1960; James F. Engel, "Motivation Research — Magic or Menace," *Michigan Business Review*, Vol. 13 (March, 1961), pp. 28–32; *ibid.*, Part II, May, 1961, p. 25 ff.

not know or may be unwilling to give an accurate answer. Thus, it attempts to comprehend and forecast consumer-buying motives and buying decisions by the use of techniques that attempt to penetrate below the level of the conscious mind and uncover motives of which consumers are not themselves aware or tend to conceal.

The techniques borrowed from clinical psychology and psychiatry may be supplemented with the tools of sociology and cultural anthropology. This latter approach involves the construction of a cultural matrix, or a selected group of people whose racial and social backgrounds are carefully screened. Hypotheses are then formed as to how this group will react in given marketing situations. Their actual performance is checked to see whether it agrees with the hypotheses. Sociological and anthropological methods are so far mainly useful for the study of questions of general social trends such as the trend toward two-car families. These methods are less likely to be appropriate to such questions as brand preference, magazine-reading or television-watching habits, and so on.

With reference to the clinical psychological and psychiatric approach to motivation research, there are two questions which raise some doubt as to the extent of its validity and usefulness. The basic problem is that it is impossible to conduct reproducible experiments, which are the essence of validation in the physical sciences; and thus it is almost impossible to prove or disprove the findings obtained by these techniques. Second, since the interviews which form the basis for a questionnaire for a full-scale field survey are of small samples because the intensive study involved is costly, the question arises whether they may be too small. Moreover, there are relatively few professionally skilled individuals in this field and apparently most of them have not been concerned with marketing.

Advertising. The advertising of products and services is designed to provide potential buyers with information on the availability and uses of a product or service, as well as to stimulate demand for the product by attracting buyers from alternative expenditures on similar or different products or services. Effective advertising of this kind must be based on facts provided by market research concerning consumer wants, product characteristics, and market location.

When these facts have been determined the advertising message to the consumer can be prepared. The effectiveness of advertising depends on the general idea or theme of the advertisement, the proper phrasing of the message so that it will appeal to the self-interest of the reader, the simplicity and sincerity of the advertisement, and so on. The proper use of headlines, illustrations, white space, and the layout of the advertisement is important.

The advertising medium, which is the carrier of the advertisement, must be selected on the basis of the company's product or service and its price, the marketing channels being used, promotion methods, the type of consumer, the availability of the product in the area reached by the medium, and the circulation of the medium. The principal media are car cards, dealer displays, direct mail, local and network radio and television, newspapers, magazines, motion pictures, novelties, outdoor signs, and packages and inserts.

Monthly publications of the Standard Rate & Data Service, Inc., provide advertisers with valuable current information on rates and a variety of related data in the following areas:

Business publications
Consumer magazines and farm publications
Networks
Daily newspapers and weekly newspapers
Spot radio
Spot television
Transportation advertising

Similar publications cover Canadian and Mexican media. The company also issues a publication which provides information for the TV-film buyer and another to provide ideas and methods for wise spending of advertising money.

Advertising may be of an institutional type, which has as its principal objective maintaining an awareness of the firm's name without mention of specific products; it may be case histories of different uses of the product provided for the information of salesmen, distributors, and possible buyers; or it may be in some other form for the same purpose.

Advertising Budget. The control of advertising involves its proper coordination among the different media used, the testing of its effectiveness, and the use of an advertising budget. Although the advertising budget is often determined as a percentage of sales of past periods, it may be possible to decide on the amount by determining first what the particular objective in terms of sales volume is and then how that objective can be best accomplished and at what cost. Advertising appropriations may also be based on the amounts being spent by competitors. Although this method can be thought of as taking advantage of wider judgment, it might also be considered necessary for competitive survival. However appropriations are made, they must then be allocated to sales territories, media, and products.

Advertising Department. Company advertising departments are usually relatively small, with most of them having less than ten employees. The advertising department determines advertising objectives; it develops the advertising program to meet these objectives; it recommends the size

of the advertising appropriation which, when approved, is then budgeted and supervised; it evaluates the performance of the firm's advertising agency; it directs advertising research; and it coordinates the advertising program with other promotional efforts, including those made with the firm's marketing channels. Not only must the department decide on such matters as expenditures, coverage, layout, and frequency of insertions, but it must also plan and have produced the promotional material used by salesmen or sent directly to the company's distributors and dealers. This material includes the catalogs, pamphlets, displays, special racks, and pictorial material previously mentioned. Planning for sampling campaigns, free samples, advertising allowances, and cooperative advertising with dealers are included under this function.

Many of these functions, as well as maintaining liaison between the firm's advertising agency and those executives who make final decisions on promotional matters, are carried on jointly with the advertising agency.

Advertising Agencies. Advertising agencies perform a variety of services. Some give most attention to preparing and placing advertisements, whereas at the other extreme there are some which are actually marketing and advertising counselors. Although the former are sometimes fairly small, the latter may employ as many as 2000 individuals operating out of a number of branch offices. While the number and type of departments naturally vary with the size and scope of the agency's work, the typical agency has specialists in planning advertising campaigns, copywriting, layout and typography, art, production of advertising for all media, media selection, market research, and so on.[11]

The account executive is the contact man between the agency and its client. He assumes the major responsibility for the effectiveness of the advertising. He must interpret the advertiser's needs and draw on the agency's skills to meet these needs.

The advertising agency prepares the company's advertisements, buys space and time, and performs those activities which are essential to placing the finished advertisement in the hands of the respective media. It may also perform market-research and public-relations services for the company. It frequently provides counsel for the advertiser not only on advertising but also on overall marketing strategy.

The principal source of advertising-agency income is the commission granted them by advertising media. Most major media allow agencies a commission of 15 per cent of the published advertising rate. The adver-

[11] A. W. Frey and K. R. Davis, *The Advertising Industry*, Association of National Advertisers, New York, 1958. See also Frederic R. Gamble, "*What Advertising Agenices Are — What They Do And How They Do It*" (pamphlet), American Association of Advertising Agencies, New York, 3 ed., 1961.

tiser pays the agency the full amount of the advertising cost but the publisher charges the agency the net amount. The remaining income of the agency comes from fees charged advertisers for certain services such as cost of materials and services bought for the advertiser, including artwork, photography, and so forth. The agency buys these services for the advertiser and bills them to him with a markup.

Needless to say, the effectiveness of advertising agency performance depends not only on the competence of the agency but also on the effectiveness with which the advertiser cooperates with the agency. Such cooperation requires the furnishing of records, quality features of the product, and other necessary information. The firm's advertising department may do some of the necessary market research, check the work of the agency, and approve the advertisements before they are actually placed. With respect to the competence or at least the effectiveness of an agency, there may be differences of opinion as is shown by the fact that companies sometimes change their agency and give their account to another even after many years of dealing with an agency. By the same token, agencies have been known to resign an account because the advertiser would not accept their recommendations.

Marketing Costs. Increasing attention is being given to the control of marketing costs, which may be divided into two classes, one of which is selling costs including salesmen's salaries and commissions and the second of which arises from the physical distribution of the product. The careful analysis and control of production costs is frequently not matched by comparable controls over marketing costs. When a marketing budget is set up, however, certain significant questions regarding sales volume in relation to marketing costs suggest themselves at once.

Conclusion. Marketing is a very important function not only from the point of view of the individual firm, but also from the point of view of the American economic system. The myriad marketing channels are matched by a vast number of devices and methods used to promote and sell goods and services. When the scope of these activities is comprehended it is easy to see why the specialized knowledge of so many different people is essential to the successful marketing of the products of the business and economic system.

QUESTIONS

1. Classify and describe the kinds of products sold.
2. What should be considered in making decisions on distributing consumer goods?
3. How should decisions be made in selecting channels of distribution for industrial goods?

4. What arrangements should be made for cooperation with distributors and buyers?
5. How is the marketing division organized?
6. Describe the functions of the different types of salesmen. How should salesmen be selected?
7. What is involved in good sales management?
8. What is the difference between promotion and sales promotion? Is advertising sales promotion?
9. What should be included in marketing research? Should a company have a separate economics department or should such research be under market research?
10. What should be considered in developing an advertising program? Should the company have its own advertising department if it uses an advertising agency?

CASE: Brown Paint Company

After many years of profitable operations, the Brown Paint Company ran into competition threatening its dominant position in the southern states. This was reflected in the fact that the annual net profit was about $20,000 on sales of $75,000,000. Study of all aspects of the situation suggested that it was costing too much to sell. The company's 100 salesmen were really concentrating on servicing customers rather than selling them. Analysis showed that discussion of the technicalities of the product with dealers was taking about 25 to 30 minutes. The company's district managers are not aware of the problem and of a necessary solution.

The sales manager has concluded that it is necessary for salesmen to be merchandisers and that they should help their customers to become merchandisers. The dealers, he believes, are ordering in too small quantities. The total situation seemed to call for a good deal of training or retraining.

1. How would you organize training to meet this problem?
2. If salesmen were successfully indoctrinated with a merchandising point of view, how could the management know they were carrying it out in practice?
3. What should be done about the dealers?

CASE: Doria, Inc.

Doria, Inc., a manufacturer of a branded line of household appliances ranging from toys selling at less than $1 to air conditioners and other major appliances selling for over $200, also owns a chain of 12 discount stores in several eastern states and one southern state. It maintains a 400,000-square-foot central warehouse from which it services the discount stores.

The management is considering a plan for expansion which would involve establishing additional discount stores in the states in which it now operates as well as in at least two others. Since additional warehousing space to make a total of 600,000 square feet would be needed, the plan calls for construction of a new warehouse.

An integral part of the expansion plan would be the entry of the firm into the mail-order business. As an initial step 2,500,000 catalogs would be sent to potential customers in the areas in which future stores would be located. The mail-order business would be handled from the new central warehouse.

The catalogs, which would run to about 80 pages, would list about 60 pages of general merchandise and 20 pages of various drug items, all representative of thousands of items sold in the discount stores. About 125 branded household items would be included. Prices would be the same as those in the discount stores.

This would be the first time that a major manufacturer of household appliances combined its activities with a discount operation to enter the mail-order business.

1. **What advantages could Doria derive from this plan?**
2. **What risks should be considered?**
3. **Should Doria undertake this proposed expansion?**

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