

Management and the Engineer

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MANAGEMENT has been tersely defined as getting things done through the efforts of other people; but before we proceed further, let us distinguish between administration, management, and organization. Oliver Sheldon in his book, "The Philosophy of Management," offers the following definitions:

Administration is the function in industry concerned in the determination of the corporate policy, the co-ordination of finance, production, and distribution, the settlement of the compass of the organization, and the ultimate control of the executive.

Management proper is the function in industry concerned in the execution of policy, within the limits set up by administration, and the employment of the organization for the particular objects set before it.

Organization is the process of so combining the work which individuals or groups have to perform with the faculties necessary for its execution that the duties so formed provide the best channels for the efficient, systematic, positive, and co-ordinated application of the available effort.

Organization is the formation of an effective machine; management, of an effective executive; administration, of an effective direction. Administration determines the organization; management uses it. Administration defines the goal; management strives toward it. Organization is the machine of management in its achievement of the ends determined by administration.

Philosophy demands that we conduct our practice according to principles or laws. Have we linked all our new developments in management technique to some fundamental connection and reviewed them in the light of some ultimate purpose, or are we mere opportunists of a day?

Management, broadly, is the development and co-ordination of people and not the direction of things. It involves two major responsibilities.

(1) Planning what we want people to do and how we want them to do it. This, of course, involves also planning the facilities to be used.

Slightly condensed from an address at the semiannual meeting, Los Angeles, June 14-17, 1943, of The American Society of Mechanical Engineers and printed in the July issue of *Mechanical Engineering* under the title "Education for Management."

(2) Operation control, that is, means for the control of the various functions so as to require people to work according to the plan and its prescribed methods and means for ascertaining that this is being done. This means:

- (a) A philosophy of management.
- (b) A sound organization structure.
- (c) Good supervision.

What constitutes sound organization structure? In my opinion the following basic principles include about all there is to it:

(1) Separation of the functions of the business, such as sales and distribution, production, purchasing and procurement, financial and accounting, engineering, research and development, and industrial relations.

(2) Setting these line functions up with their logical subdivisions so there is no overlapping or conflict and so that no individual receives direct orders from more than one individual—his immediate superior. He may, however, receive aid and advice from staff officers or assistants.

(3) Clean-cut distinction between line and staff functions and functional control.

(4) Clean-cut specification of each management job in the entire management sequence at the several management levels, to avoid divided responsibility.

(5) Suitable and adequate delegation of authority and responsibility for each member in the management sequence varied in accordance with the management level.

(6) Selection for each position in the management sequence for each management level of the most suitable and competent individual, without fear, favor, or political influence.

Those who have had experience in organized sports will recognize that the foregoing principles generally apply throughout—to football, for example. There are various positions on the team. There are several management levels—coach, captain, quarterback—with varying degrees of responsibility. There are clear-cut functions to perform. The players do not expect to receive signals from the coach or a tackle. Each one knows what his job is and what he is supposed to do when the signal, or

Mr. Coes, who has had wide experience in industrial management and is vice-president of Ford, Bacon & Davis, Inc., of New York City, outlines the two major responsibilities of management, gives six basic principles of a sound organization structure, mentions eight reasons for management failure, and enumerates fourteen qualifications for a competent top executive. Too many engineers don't know enough about these things, he says; an engineer "may be an expert in his own field but he frequently makes grievous mistakes when he assumes that he is an expert in another field with which he is not thoroughly familiar, such as management." If you are an engineer-executive, here is an opportunity for self-appraisal.

command is given. The strategy is varied to suit conditions, as it must also be varied in business. The objective is clear—to win the game. The selection of members of the team is usually made on the basis of fitness, skill, competence, and ability to co-operate and obey orders. We do not confuse positions. We do not spoil a good quarterback by trying to make him center or fullback. A player does not reach for the ball when the signals call for someone else to receive it. We all know what happens when a limelight player proceeds on his own to do what he wants to do, regardless of whether it fits into the previously conceived play. We all know what happens when some incompetent and unskilled player is placed on the team through influence or politics.

A management group in business is in essence a team. When it is trained as a team, with competent individuals at each post, and when it is properly and expertly captained, we generally have a successful, aggressive, hard-hitting business organization.

Management frequently violates some of the foregoing principles and then wonders why it is in trouble. In fact, a substantial portion of the problems that are brought to the consulting management engineer actually emanate from violation of the cardinal principles of organization such as the following:

(1) Confusion between line and staff duties (staff officers giving orders to subordinates of line officers).

(2) Overlapping authority (two or more executives having control of sections of the same business function).

(3) Responsibility without adequate delegation of authority (failure to recognize that adequate authority must go along with responsibility if responsibility is to be discharged).

(4) No clear definition of duties. This usually results in overlapping authority, confusion, and conflict.

(5) Executives cut across organization lines of flow of authority in issuing orders. The result is confusion and lowered morale. A clean-cut definite organization is the means for orderly transmission of orders from the top to the bottom and for a reverse flow of information to the top. Hence it is a communication system.

(6) Executives do not know how to delegate authority or what authority to delegate, but they will delegate responsibility, because they fear some one will become more important than they are.

(7) Responsibility and authority are frequently assigned to an individual by executives because they like him, regardless of whether he is competent, through training, skill, experience, and character, to fill the position; probably the wrong man is chosen for the job.

(8) No clear-cut philosophy of management.

What's Wrong at Washington

VIOLETIONS of these same principles cause confusion and waste in government administration. The various administrative functions and agencies are not properly distributed or co-ordinated and there is too much overlapping of authority and responsibility for, too often no one function in its entirety is completely under the control of a single head. Only recently the Truman Committee significantly pointed out that there are too many czars assigned to attain specific objectives in the production field. Lines of authority are confused even on paper. As a practical matter they breed disputes. This is all too true. The Administration does not understand the fundamental principles of organization, such as the delegation of authority and responsibility. The President has shown all along a passion for divided authority among his subordinates. However, he can no more violate these fundamental principles with impunity and avoid confusion that can any top business executive, but the Administration's violations cause much more widespread devastating confusion and economic waste.

What are the important qualifications of a competent top executive? May I suggest the following:

(1) Character, that is, honesty, integrity, loyalty, truthfulness, fairness, tolerance, firmness.

(2) Orderliness in mind and in action.

(3) Poise and control of temper, not desk pounding.

(4) Respect for time, its value, and its use.

(5) Ability to assume responsibility.

(6) Ability to co-operate.

(7) Ability to take and to give constructive criticism.

(8) Ability to compromise when necessary.

(9) A sense of humor.

(10) Broadmindedness.

(11) Action without procrastination.



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(12) Wisdom to understand that it is no sign of weakness to seek help from competent sources.

(13) Clarity of thought—the ability to reason from the facts, draw sound conclusions, and then act.

(14) Good judgment, acting intuitively at times, without the aid of logical reasoning. In fact, with only the facts at hand at the time the decision must be made, logical reasoning from the facts will frequently produce a conclusion at direct variance with what judgment dictates.

I can hear someone say, "That is an impressive list of qualifications. I don't believe executives possess all of them." Being human beings, they don't. The problem is to select the individual who, other things being equal, such as training, experience, background, skill, and character, possesses the greatest number of the requisite qualifications and then to develop in him to the greatest extent possible those qualifications in which he is deficient. That is the best that can be done.

After we have set up management and have organized it, what are we going to do with it? What is it supposed to do? The administrative function should define this and the policies.

Top management has the job of co-ordinating the forces generated from the three basic economic elements — Men, Markets, and Money—which comprise practically all business enterprises, and of maintaining equilibrium between them. Competent management must have a good workable understanding of these elements and the forces released and must know how to guide the business so as to maintain equilibrium. It must consider the fact that in modern industry today, at least in this country, the workers in the plant, through their purchase of goods, their savings, life insurance, and ownership of securities, are components of both the goods and services markets and the capital supply market.

Sometimes satisfaction of the demands emanating from these three basic elements — Men, Markets, and Money—appears irreconcilable. In a country such as ours, free enterprise supports us all and the government functions as the referee of the rules prescribed for the conduct of the game of business.

What does the man factor (labor) want? Labor in general wants a fair share of the results of its productivity.

What does money (capital stockholders) want? It wants a fair return on the investment, commensurate with the risk taken, and it wants the ability to set aside surpluses to enable the enterprise to weather economic storms.

What does the market want? It wants goods suitably priced commensurate with the quality or grade offered.

Do these claims seem inordinate? No. They are at times made so through avarice or through ignorance of the respective parties, including government, of the basic economic laws that govern in our free-enterprise economy.

Carl Snyder in his fascinating book, "Capitalism the Creator," has demonstrated that a close correlation has existed over a long period of time in this country between wages and new capital investment; that wages went up in proportion to the increasing investment of new capital in facilities to produce goods at lower costs.

What has all this to do with "Management and the Engineer?" It has this bearing. It means that to be a good manager and a competent executive one has to understand the principles and laws involved, their application, and how they work. It is not enough to be just a good engineering technician, for example, to qualify for an important managerial position. One must know more about management and economic laws and principles and their application, more about what constitutes sound industrial relations, more about what

the markets want and why, more about how to get along with government.

Engineers can not avoid relations with management; nor can they avoid obtaining a good working knowledge of the basic principles of modern management, of sound organization, or of equitable labor relations if they expect to get ahead in their profession and advance in their business. Yet too many engineers do not know enough about management. One may be an expert in his own field but he frequently makes grievous mistakes when he assumes that he is an expert in another field with which he is not thoroughly familiar, such as management.

It is not enough for an engineer to be right, he must be persuasive as well and he must be able to sell his ideas to others.

My experience has taught me that a substantial portion of the problems that come to me in my professional capacity arise from violations of organization principles.

Must Study Labor's Problems

THE engineer should take an interest in industrial relations and contribute sound thinking on the subject. He should become familiar with the problems of the day's work from labor's point of view. There is more to this than just applying the techniques of time and motion study and job analysis, subjects in which many engineers have been greatly immersed and to which they have made real contributions. There are human values and human aspirations which must be considered, and it is with these that the engineer must be constructively concerned.

Here is the way capitalism and profit can be made to benefit labor and produce better living, according to James H. McGraw, Jr., president of the McGraw-Hill Publishing Co.:

(1) Constantly improve the equipment available for the worker.

(2) Use the lowered costs thus produced to

- (a) Lower prices to consumers
- (b) Raise wages
- (c) Provide incentives for invention, leadership, and investment
- (d) Lay aside "seed money" that can be used to start over again at Item 1.

An art in guiding management by means of statistical control is evolving. Determination of what is the range or belt of probabilities and how this technique can be applied to assist management in effective regulation and control of a business is important.

One authority has stated: "Our management battle is a hard one. Opposition (our enemies) is grim and desperate. A new and quicker production idea, a faster employee-training meth-

od, a few months of life gotten out of an old machine, a department's bettering of last month's record, a subcontractor educated to better management policies; this is the stuff of which management victories are made.

Do not engineers have responsible relations to management with respect to many of the foregoing items in furtherance of the war effort?

We have successfully solved many of the problems of mass production, but in many respects our technique of mass distribution is way behind our technique of mass production. After the war the engineer could well direct some of his talents to the problems of mass distribution.

After all, management consists in directing, guiding, training, and co-ordinating people. You can shout at a full-automatic lathe until you are blue in the face and nothing will happen except a rise in your blood pressure. But you can direct a skilled workman to operate the machine along predetermined lines and the required results will be forthcoming.

I like to think of management as the catalytic agent between ownership, consumers, employees, industry, and society (government) on the one hand, and the various functions of the business, such as production, sales, finance, accounting, on the other. A true catalyst is not transformed. Neither should management be transformed. It must not be transformed by labor, by ownership, or by government, to reflect, to the exclusion of the others, any one of the factors mentioned. If it is, then the results of management will be just as faulty as the results of chemistry when the catalyzer fails. This fact is all too often disregarded.

Columbia Offers Evening Course in Metallurgy

TRAINING in physical metallurgy for men and women employed in metal and associated industries necessary for the war effort will be given at Columbia University beginning Sept. 13 in co-operation with the U. S. Office of Education. The course has been planned to give fundamental instruction in physical metallurgy to personnel now engaged in metallurgical work who have had no previous training in this field, according to George L. Kehl, who will direct the studies.

The shortage of qualified people trained in metallurgy is so acute that the metal industries are now employing men and women with no experience in metallurgy, but who have an educational background that makes them adaptable for this kind of work, according to Professor Kehl.

Prerequisites for admission include

high school graduation, preferably supplemented by college training in chemistry and physics or industrial experience. Instruction will cover states of aggregation, detailed study of binary and ternary alloy systems, plastic deformation of single crystals and polycrystalline metal; recrystallization and grain growth; metallography of important aluminum, copper, and other non-ferrous alloys; the constitution of plain carbon steels, alloyed steels, and cast iron; and the principles of heat-treating steel.

One section will meet on Mondays and Wednesdays, and the second on Tuesdays and Thursdays, from 7 to 10:30 p.m. Interviews will be held on Sept. 7, 8, and 9, from 6:30 to 9 p.m. in the School of Mines building, 117th St. and Broadway.

Calendar of Coming Meetings

SEPTEMBER

- 2-4 American Institute of Electrical Engineers, Salt Lake City.
- 3 Columbia Section, A.I.M.E.
- 6-10 Fall Meeting, American Chemical Society, Pittsburgh.
- 7 Gulf Coast Section, A.I.M.E.
- 8 San Francisco Section, A.I.M.E.
- 8 El Paso Metals Section, A.I.M.E.
- 14 East Texas Section, A.I.M.E.
- 16 Board of Directors' meeting, A.I.M.E., New York.
- 17 Utah Section, A.I.M.E.
- 21 North Pacific Section, A.I.M.E.
- 30-Oct. 1 Joint meeting, A.S.M.E. and Engineering Institute of Canada, Toronto.

OCTOBER

- 1 Columbia Section, A.I.M.E.
- 1-2 First Annual Conference, Electric Furnace Steel Committee, Iron and Steel Division, A.I.M.E. Hotel William Penn, Pittsburgh.
- 1 Boston Section, A.I.M.E.
- 1 Gulf Coast Section, A.I.M.E.
- 5-7 National Safety Congress and Exposition, Hotel Sherman, Chicago.
- 5-12 First South American Conference on Liquid Fuels, Buenos Aires, S. A. Object of the conference is to intensify production of liquid fuels, to obtain economy and rational utilization of them, and to examine the possibilities of increasing exchange of them among South American countries. Chicago Section, A.I.M.E.
- 6 East Texas Section, A.I.M.E.
- 12 San Francisco Section, A.I.M.E.
- 13 El Paso Metals Section, A.I.M.E.
- 16-19 Regional Meeting, A.I.M.E.; Iron and Steel and Institute of Metals Divisions, A.I.M.E. Hotel Sherman, Chicago.
- 18 Board of Directors' meeting, A.I.M.E., Chicago.
- 18-22 American Society for Metals, Annual Convention, Palmer House, Chicago.
- 21-22 Petroleum Division, A.I.M.E., Fall Meeting, Ambassador Hotel, Los Angeles.
- 21-23 Industrial Minerals Division, A.I.M.E., Fall Meeting, Du Pont Hotel, Wilmington, Del.
- 22-23 Ohio Section of National Open Hearth Committee and Ohio Valley Section, A.I.M.E. Annual joint conference, Columbus, Ohio.
- 23 Engineers' Council for Professional Development, 11th Annual Meeting, New York, N. Y.
- 28-29 Joint Fuels Conference, A.I.M.E.-A.S.M.E. William Penn Hotel, Pittsburgh.

NOVEMBER

- 17-19 Annual Western meeting, Canadian Institute of Mining and Metallurgy, Hotel Vancouver, Vancouver, B. C.
- 29-Dec. 3 Annual meeting, A.S.M.E., Hotel Pennsylvania, New York.

DECEMBER

- 6-11 19th Exposition of Chemical Industries, Madison Square Garden, New York, Charles F. Roth, manager.

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- 20-24 Annual Meeting, A.I.M.E., Waldorf-Astoria Hotel, N. Y.