Bulletin of
The Society to Promote the Science of Management

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MAY MEETING

The May meeting in Boston was marked by an earnestness and keen interest unsurpassed in the history of the Society. It emphasized to many members the fruitfulness of intensive discussion, and the unique influence our Society, even though small, can exert if quality, rather than quantity continues to determine its future growth. The arrangements made by the local committee, of which Mr. A. E. Barter was the active chairman, produced almost ideal conditions, and everything went without a hitch. A feature of the meeting was the visit to the Watertown Arsenal, where Col. Wheeler's courteous preparation was appreciated by all. To him and to Mr. Barter the Society owes a large part of the success of the occasion.

NEXT MEETING

Friday, October 22, and Saturday, October 23
Philadelphia, Pa.

Friday, October 22

EVENING SESSION, MEMORIAL TO FREDERICK W. TAYLOR. 8.15 P. M., Houston Hall, University of Pennsylvania. The program, as arranged by the governing board, includes four principal speakers who will treat of important periods in Mr. Taylor's career and important phases of his work. Distinguished leaders in the movement in foreign countries are preparing appreciations to be read at this session. Among these are Professor A. Wallichs, Royal Polytechnical School, Aix-le-Chapelle; M. Henri Le Chatelier and M. Charles de Freminville, Paris; M. Charpy, Director of the St. Jacques Steel Works; Professor J. J. Sederholm, University of Helsingfors, Finland.

Saturday, October 23

MORNING SESSION. Leave headquarters (to be announced) 9 A. M. in automobiles arranged for by the committee, drive through Fairmount Park to "Boxly", Mr. Taylor's home at Chestnut Hill, where the party will be the guests of Mrs. Taylor.

LUNCHEON, at "Boxly".

AFTERNOON SESSION, at headquarters. Paper by Richard A. Feiss, of the "Clothcraft Shops" in Cleveland, O., giving details of the social service work in his concern. Illustrated.

DINNER, at headquarters.

EVENING SESSION, at headquarters. Discussion of Mr. Feiss' paper.

ADDITIONAL MEETINGS, 1915-16

December, 1915. New York City.
Annual business meeting and election of officers. Topic for papers and discussion: "Time Study".

February, 1916. Boston.
Topics for papers and discussion: "Fatigue" and "Profit Sharing".

May, 1916. Detroit and Ann Arbor.
Conference and round table discussions on the present state of Scientific Management in various industries.

COMMENT AND NEWS

Members who expect, even though they cannot be sure, to attend the October meeting in Philadelphia are requested to advise the Secretary at once, indicating at the same time the probable number of guests. This information is important to help those making the plans. Early in October a notice, with return post card, will be sent each member for final statement of intention. Please help by making the preliminary statement now.

The report of the Committee on Revision of the Constitution submitted in Boston opened up a discussion showing such diversity of opinion that it was referred back to the committee for further report at the October meeting. The committee was instructed to prepare a digest of proposed amendments and send copies to the members for an expression of their views. Members will probably receive this digest within a short time and are urged to send their comments promptly to the chairman of the committee.

President Person has appointed Mr. John H. Williams as a representative of the Society to confer with the Joint Committee on Classification of Technical Literature. The

work this committee undertakes in connection with engineering and general indexing was described at the Boston meeting by Mr. I. Winthrop Ames, librarian of the Stone & Webster, Inc.

The first solid stone in the foundation of one of our air-castles was laid at the May meeting by Mr. George D. Babcock. He presented to the Society for its archives a complete Miscellaneous Stores Classification, as compiled for the H. H. Franklin Manufacturing Co.,Syracuse, N. Y., in consultation with Mr. Carl G. Barth. As President Person remarked, this is an example which it is hoped many members will follow. One of the important services the Society can render is the accumulation and care of such documents of value proven in practical use. The only way such a service can become real is by the active coöperation of members. Will you not help to make this "service the Society *can* render" become a "service the Society *does* render"? The thanks of the Society go to Mr. Babcock and the officers of the Franklin Company for this first gift.

Owing to considerations of health, Mr. Robert Thurston Kent, the first secretary of the Society, resigned his duties last month. Mr. Kent was one of the first editors of a technical periodical to champion the cause of Scientific Management. From the beginning, in addition to his other interests, he has devoted a large amount of work to the interests of the Society. By his resignation the Society loses one to whose official connection it is indebted for an important part in the promotion of its welfare during its establishment and early growth. Mr. Henry Wood Shelton has been elected to fill the unexpired term of Mr. Kent.

INDIVIDUALITY IN INDUSTRY[1]

A paper emphasizing the necessity of giving individuality to the industrial unit itself, and how it can be accomplished.

By Robert B. Wolf[2]

About three years ago I was asked by the "Committee on Economic Administration of Industrial Establishments" of the American Society of Mechanical Engineers what I considered to be the "new element in the art of management." At that time, while the general principles of what I wish to present for your consideration today were in my mind, they were more or less indefinitely formulated and I hesitated to give them expression. Since then, however, I have had ample opportunity to verify my earlier conclusions and have put many of them into actual practice.

In presenting for your consideration my conception of progressive industrial organization, I do not wish to have it understood that I am attempting to elaborate on the methods of Mr. Taylor and others, nor do I wish to detract in any way from the splendid work done by these men. I hope that this paper, however, will show that there is a relationship between the various methods and will point out how they are all forward steps in the great movement which increases man's productiveness and his creative powers.

(1) A paper presented at the Boston Meeting of the Society to Promote the Science of Management, May 21, 1915.

(2) Manager of Manufacturing, Burgess Sulphite Fibre Co., Berlin, N. H.

In order to give you my ideas more clearly, a general review of present conditions in the industrial world seems to me necessary.

Many of you have undoubtedly had more or less opportunity to observe the deplorable inefficiency of most of our large industrial concerns, especially those commonly known as trusts, where a number of formerly independent plants have been united under one common management. The plants are usually scattered over a considerable area and the central offices located in some commercial center.

The first step in the organization of these corporations has usually been the removal of the resident owners and managers from the various localities to the central offices and the subsequent attempt to carry on the functions of management by the superintendent and heads of departments. These men, in most instances, not having had any real knowledge of manufacturing costs and profits, are, of course, incapable of conducting the business intelligently. It, therefore, becomes necessary for the central office to perform much of this work for the various plants.

As a rule, no final manufacturing costs are made at the plant and as a consequence those who are held directly responsible for the cost of producing and who have the most intimate knowledge of operating conditions have not a very intelligent basis upon which to work. They can receive very little help from the former managers; in the first place, because these managers are so far removed from the actual conditions that their judgment is affected; and in the second place, their interest is divided among so many different plants that, in the very nature of things, they cannot give the various problems the time required for intelligent consideration.

A realization of the impossibility of keeping close watch on details at a distant plant is perhaps responsible for the removal of some of the vital functions of the individual plants to the central offices, such as Purchasing, Selling, Construction and Maintenance, Cost-keeping, etc.

A central purchasing department has undoubtedly many advantages, but as ordinarily conducted in large corporations these advantages are almost entirely offset by the obstacles placed in the way of free choice on the part of the mill organizations and the consequent discouragement of individuality in making selections. The impossibility of handling all of the purchases by one capable man necessitates delegating a lot of minor purchases to subordinates, who have no real knowledge of actual mill requirements. Even though they know what is required in one mill, they cannot know in others where conditions are not the same.

The purchasing agent should have full power to build up an efficient organization for keeping informed of the market conditions, so that requisitions from the mills can be handled with promptness and dispatch. The department should be able to furnish full, complete information to the individual plants whenever they need it in order to properly purchase supplies. It should encourage the mills to furnish specifications and welcome attempts on their part to keep comparative records for the purpose of determining the best materials to use. It should always conduct itself toward each separate organization as if it were an outside firm, employed to give advice and assistance in every way possible to enable purchases to be made economically. Each plant should receive frequent reports from the purchasing department, giving complete information about materials found to be giving good results in other places. This one feature alone would make it immensely valuable to the parent corporation.

I have dwelt upon these details merely to show how greatly a central purchasing department can aid if put in its proper relationship to the various plants, namely, that of servant rather than the equal of the manufacturing department. Certainly nothing can be more important to manufacturing than the proper purchasing of materials which are to be converted into the finished product or which are needed to affect this conversion.

Let us take accounting next. Why are accounts kept and what is their purpose? In the last analysis, accounts are records of the progress of accomplishment and are used to enable those in charge of the corporation's affairs to decide upon the future policy to pursue.

Why, then, should any attempt be made by the central office to keep accounts that are of strictly local interest to the individual plants? And why even attempt to dictate how and when these accounts should be kept? In so far as comparisons between individual plants are concerned, this is justified, but no further, and even in this case it should not be pushed to a point where comparisons which local conditions at the plants demand are not allowed.

The foregoing should not be misconstrued to mean that I believe a central accounting system for corporations is not necessary or desirable, for it most certainly is. The accounting department should confine itself, however, to such accounting as is of inter-plant nature, and not attempt to dip into local conditions, except in an advisory capacity.

One serious mistake often made is allowing the accounting department to practically control the mill offices. These, for reasons to be pointed out later, should be entirely under the control of the local management, subject, of course, to frequent auditing by the accounting department.

The central office of the corporation needs only resultant figures giving a true record of the progress of each plant, and made in such a way that comparisons can be easily made, the local plants being required to furnish any figures called for at all times.

The selling, in most cases, can be handled by the central office much better than any other function; indeed, the main purpose in forming large corporations was primarily to stop ruinous competition between plants, especially in periods of slight demand. There should, however, be much closer touch between the selling department and the mills and a much more intimate knowledge of operating conditions by the salesmen. The degree of this intimacy is, of course, one of the important things to be decided by the chief executive.

"Maintenance and construction" is another thing which should be touched upon. There is usually much damage done to the individual plants by decisions of "absentee" engineers, whose knowledge of the plant conditions cannot be of such an intimate nature that they can make intelligent decisions. This very often actually retards progress in the organization and serves to discourage individual effort upon the part of the local mill management.

A high-grade consulting engineer employed to devote his entire time to the corporation's affairs would be a very valuable asset. He should conduct himself toward each individual plant exactly as he would if they were all independent establishments and his own clients. There would be this very important difference, however, which would mean much greater freedom of action, *i. e.*, he would be entirely free to give each plant the benefit of his experience in others, and in this way would be a constant, highly intelligent means of exchanging ideas of mutual interest and benefit.

Of course, I realize that most of this is a review of things already known to many of you, but this review seems to me to be necessary in order to properly present what, I hope, will be more constructive in nature.

I am now going to make a plea for the development of plant individuality. This is not merely a return to old conditions existing prior to amalgamation, but a regaining of all the advantages of the old order of things with the additional advantages of the new.

To begin with, we must have managers in our plants who have real executive ability and who are not selected because of their particular skill in certain manufacturing lines. These managers should have power to select and form their own organizations, and for this reason must be men who have a broad realization of their unity with the parent corporation. They should be the kind of men who are ready to receive suggestions and receive them gladly and at the same time have individuality enough to reject those things, which from their knowledge of conditions, seem unwise to incorporate.

Having selected this type of manager, the work of developing the organization's individuality can begin.

A good organization must have the following elements:

1st. A certain definite function to perform.

2d. A definite central organization of control.

3d. A thorough system of recording all events which take place in the performance of the work.

4th. Means for vitalizing certain subconscious functions of control so as to produce prompt, intelligent action without direction from the conscious mind.

5th. Means for making newly acquired accomplishments automatic.

In other words the question resolves itself into developing in the plant as a unit all of the functions so wonderfully exemplified in the human body.

Recognizing the principle that any organization to be progressive must have individuality, let us see how this individuality can best be built up. To do this we must have some knowledge of what constitutes individuality, and I know of no better way to illustrate this than by showing how unity of action is maintained in the organized activities of the physical body.

The mechanism which enables the human body to act as a unit is the nervous system, which controls, either consciously or subconsciously, every bodily function. We have thousands of afferent (or in-going) nerve paths leading from every portion of the body into the central nervous system, where every external impression is finally recorded in the cortex of the brain.

The end organs, which enable us to see, hear, smell and taste, all have their nerve paths leading to the brain, and we find upon analysis that what we once called the sense of touch is wonderfully differentiated into various senses, as, for instance, the thermal sense (of hot and cold), the pressure sense and the sense of pain, each conducted inwardly by a special set of nerves, which respond only to its particular kind of stimulation.

We find that all of the nerve paths lead to the brain through various relay stations, or nerve centers, for an intelligent kind of sorting or grouping of the impulses that take place, so that the final presentation to the brain is in proper form for recording.

We find also that while all impressions are in some way recorded in the cortex of the cerebrum, that many of the

nerve impulses producing them (in nerve centers through which they pass) act directly upon certain efferent (or out-going) nerves, whose function it is to produce musculo-motor action in the body; this resultant action taking place before the conscious mind has had time to direct it.

A study of the cortex of the brain, which is the seat of all consciousness including memory, self-consciousness, and volition, reveals a wonderful mechanism for co-ordinating and relating our sense impressions and musculo-motor action; for instance, the sense of violin playing has its seat in close proximity to the musculo-motor center which controls the motion of the arms; in other words, the place where the final recording of an external impulse takes place is close to and always associated with impulse terminals of a similar nature and at the same time with those nerve cells which can enable the individual to further the action required for the proper development of an accomplishment.

In addition to the foregoing, which has to do principally with the conscious action of the mind, we find a wonderful control of the bodily functions by the brain, which keeps the various organs in harmonious relationship with each other. When, for instance, the environmental conditions demand heavy muscular action on the part of the individual, and there is a waste of muscular tissue and a demand for its removal, the nerve which accelerates the heart action is stimulated and increased circulation results, enabling the blood to carry material for restoring the body tissues to their normal condition and carrying away waste products. At the same time that the heart is accelerated, the lungs are caused to increase their rate of respiration through stimulation of the nerve accelerating the motion of the diaphragm. Many other things too numerous to mention occur simultaneously, such as the operation of the sweat glands to assist the organs of elimination to carry off the waste products, etc.; but enough has been stated to illustrate the point I wish to make, namely, that the whole unity of action is made possible only because of the marvelous control exercised over the body by the nervous system. It is only when this control is lost, through disease or injury, that the unity of action and consequent definiteness of purpose upon which progress depends is impaired.

In order to understand the reason for the simplicity and wonderful unity of the nervous system in spite of its apparent infinite complexity, it is necessary to describe its three great subdivisions:

The *sympathetic system.*
The *spinal system.*
The *cortical system.*

Take first the sympathetic system, which is the seat of those almost entirely automatic functions over which the conscious mind has only very indirect control. This consists principally of the efferent (or out-going) nerve cells, whose bodies are collected into ganglia, or groups, located outside of the spinal cord, principally in the head and in the body cavities. For instance, the nerves which stimulate the growth of the hair, the finger-nails, and even the growth of the body itself; the vaso-constrictor and vaso-dilator nerves controlling the contraction and expansion of the blood vessels; the nerves controlling the beating of the heart and thousands of other functions are all a part of the *sympathetic* nervous system. This is so designed that it constantly reminds and, in a sense, releases the forces required to keep the routine work necessary to our preservation in motion.

Next let us take the *spinal system,* which is located inside of and protected by the backbone. This is the seat of those semi-automatic functions over which the brain has a direct and constant control. These functions—such, for instance, as walking or breathing—after once being set in motion by the will, acting through the brain, or conscious mind, are kept in motion by the nerves in the *spinal* cord without the conscious effort of the individual. It is also the seat of the so-called "reflex muscular action," which causes the body to act involuntarily for its own protection, when necessary.

The fundamental difference between the subconsciousness of the *sympathetic system* and the subconsciousness of the *spinal system* is that the stimulating nerve power of the latter is more or less directly under the control of the conscious will, while the sympathetic system performs its work independently of it.

Finally, let us describe the *cortical system,* which is really an outgrowth of the spinal system, surmounting it, co-ordinating and controlling its action. The upper portion, or cortex of the brain, is the seat of the memory, where all the sensory impressions from every portion of the body are brought by the afferent (or in-going) nerve paths, and from which originate the efferent (or out-going) impulses, which keep the body functioning properly in accordance with its environment. The will, having the power to recall and use the stored-up records in the brain, can, by means of communicating nerve fibres in the cortex, direct the organism through its outgoing nerves to useful efforts of progressive accomplishment.

Having described the functions of the three main divisions of the nervous system, it now remains to sketch briefly the relationship of each to each other.

The *sympathetic* nervous system is connected, through what the anatomist calls the "preganglionic nerves" with the brain and spinal cord and comprises the outlying efferent (or out-going) nerve cells, through which the impulses from the central nervous system finally reach the involuntary muscles and glands; the spinal cord connections coming out between the spinal vertebrae, and the direct brain connections being made through the cranial nerves coming down from the cortex direct. The so-called sympathetic nerve cells are connected into ganglia (or groups) located as before mentioned in the head and body cavities. The various nerve plexes, such as the pulmonary and the solar, are also a part of the *sympathetic* system, and the connections into these ganglia and plexes, coming from both the cranial nerves and the spinal nerves, complete the cycle which produces a harmonious working together of the parts and a continuous correcting or complementing action.

I could go on almost indefinitely with illustrations of this nature, but enough have been given to bring out the point I wish to make, namely, that the human body is an organization of many elements (and I might say of many personalities, for each cell has individuality of its own, and many can live outside of the body itself), all working together in harmony, under the direction of the will, acting through the nervous system.

If any one wishes to inquire into the forces which have led up to the individual development of mankind, he will find himself at once plunged into the realm of psychology and mental philosophy. I can heartily recommend such a course as immensely profitable and of practical value.

The five important facts, however, that have to do with the subject in hand are:

1st. That the human body is such a wonderful organization because it is the product of the forces of creation, acting through millions of years of evolution.

2d. That its capacity for progress depends upon the maintenance of the unity resulting from this creative evolution and upon a conscious recognition of this unity.

3d. That this unity would not have been possible without the development of the nervous system.

4th. That the conscious intelligent progress made by mankind could not have reached its present level until in the process of evolution a mechanism had been built up in the nervous system itself capable of recording the various impressions which the senses are constantly receiving.

5th. That the recording of past events, with the power of consciously recalling them for the solution of problems immediately confronting it, is absolutely essential to its development.

Now, what I want to point out is that inasmuch as man's progress depends upon the perfect co-ordination of his forces to produce unity of action, we have no right to expect an industrial organization to make progress (which it must do as a unit) without the establishment of a conscious co-ordinating mechanism similar to the nervous system in the human body.

Is it not a fact, then, that the success of scientific management, properly applied, is due to its action in building up the individuality of the organization? I think there is not the slightest doubt on this point, nor is there any doubt that the failure of some organizations to put their business on a scientific basis has been caused largely by the fact that they have not used the mechanism of scientific management for the purpose of perfecting its unity.

I am personally very familiar with one large, flourishing establishment, which has no less than one hundred recording and one hundred indicating instruments, representing twenty or more different kinds of sensory impressions, such as temperatures, pressures, colors, gas compositions, liquid densities, liquid levels, etc., all required in order to maintain uniformity of product and economy of operation.

Recognizing, then, these various recording devices and instruments which come in direct contact with the work as the end organs of newly acquired senses, we must conduct the impulses resulting from the instrumental contacts through suitable channels to the place where all things affecting the organization are recorded.

We must have, in other words, an organization memory, which is entirely apart and separate from the memory of the various individuals of the plant. It is only by having such a place of record, where all things affecting the organization as a unit can be recorded, that a proper perspective can be obtained.

A gradual development of such a memory by the addition of new senses will tremendously accelerate the rate at which the organization will progress, just as in the individual the addition of new concepts to the brain tremendously increases its reasoning power.

In designing the recording mechanism, or plant memory, it is best to use graphical methods in order that comparisons may be easily made. Figures, it must be remembered, are static, while curves show tendencies.

By the use of graphical records, things affecting each other can be brought in close relationship, enabling those whose business it is to control the manufacturing process to see at a glance what action is necessary on their part to produce the best results, not only with respect to their own department, but with respect to the whole plant.

If I had time, I would like to describe to you in detail a chart room containing over 1,400 separate plotted records, all used to record the operations of a single plant. These charts are so arranged and grouped as to be instantly and at all times available for study by those directing the organization's activities. This department is the plant memory and corresponds to the third and last acquired great subdivision of the human nervous system,—the brain.

Having described the memory part of the organization as corresponding to the cerebrum of the brain, let us now consider the part corresponding to the spinal cord, which is the seat of what we will call the vital or intelligent subconscious action. In our industrial organizations this corresponds to the control by the department heads and foremen, who are constantly directing and setting in motion corrective forces tending to keep the organization functioning properly. This is analogous to what the anatomist calls "reflex action."

Now, in the average organization, much of the work is done in this manner without direction from the central conscious mind. There being no plant memory, this is the only way it can act and progress is necessarily extremely slow, as it is, for instance, in the insect world where the spinal system is not surmounted by a brain.

As the co-ordinating effect of a brain, however, enables the spinal cord to do much better work, so does the addition of a plant memory tremendously aid by intensifying the subconscious action; as, for instance, when it acts through its executive branch to stimulate the creative energy of the foreman, sub-foreman, and even individuals, by giving them a record of the performance of their work and by making comparisons with others. By this means a spirit of emulation is built up which makes each man desire to do good work of his own free will. The urge comes from within instead of from without. The result of having this spirit permeate the organization means an entire reversal of the old order of things, where the chief executive uses his creative force to make his department heads carry on their work and they in turn pass the impulse along to their foremen and so on until it reaches the last man in the organization, where it is felt very faintly indeed.

The new order carried out to its ultimate point means that each man in the organization is interested because those above him have had brains enough to furnish him with the means of recording his progress. He then feels that he is creating something and is happy. His foreman, being released from the tedious work of making his men work against their will, finds stimulation in directing the forces he feels flowing upward for him to direct. As a consequence, he becomes creative in his work.

The department head has the same experience and finally the chief executive finds himself directing the forces looking to him for leadership and he himself becomes creative and no longer wears himself out by trying to drive his own creative force into the men in his organization, thereby depleting his own supply.

Finally, let us take that part of the organization corresponding to the *Sympathetic Nervous System*, for it has a very important place in our scheme of rounding out the organization's individuality. Much of the organization's activity must become automatic, otherwise our capacity to acquire new accomplishments will be greatly limited. Man's prog-

ress in the world consists largely in the conscious acquisition of new talents and making them subconscious, or automatic. We begin this when we, as children, consciously learn to walk and later in life, perhaps, learn by dint of hard work, to ride a bicycle. Once having learned these things, we no longer have to think about them, but our minds, while we are doing them, are released for other purposes.

Now, in our plant organization there is no better method of installing a subconscious control than by the use of a Tickler system, as it is used in the Taylor system of Scientific Management. This consists simply of a cabinet with a drawer for each month in the year, containing substantially built folders for each day of the month. In these drawers are placed the various memoranda, to be taken out and distributed on the proper dates, reminding those to whom they are addressed of certain routine work to be done. A system, so safeguarded as to keep the conscious mind of the organization informed when a departure is made from methods decided upon as best, or made so responsive to changes in plant conditions as automatically to allow the executive branch to know when conditions should be changed, is fulfilling a long felt want. I can describe to you a thousand ways in which such a system is serving a large industrial concern and enabling the conscious mind of its executive, department heads, foremen and others to do creative work for its advancement.

There are many other functions which can be brought into use, all of them having exact counterpart in the human body, nor is there any end to the elaboration of methods. I will not weary you, however, with any more details.

I want now to state, in as few words as possible, what seems to me are the essentials of organization work. The first thing to decide upon is what constitutes individuality. The units must be no larger than they should be to function properly as units in the performance of a common task. If the corporation ownership is large, divide it into these units and make them come into the parent organization as complete units.

Having determined your units, give them individuality in the following manner:

1st. Furnish them with means of becoming conscious of themselves and of their environment, by building up a system of scientific registration and control similar to the nervous system of the human body.

2d. Provide a definite central place for recording all of the various sensory impressions furnished by the recording mechanisms, arranged in such a way that comparisons of the whole progress of the plant can be made with the least possible effort, exactly as it is done in the brain of the human body.

3d. Provide for the subconscious control of the newly acquired accomplishments as exemplified by the *Spinal* and *Sympathetic* nervous systems in man, thereby liberating the conscious mind to deal with new problems of a creative nature.

If these three functions of management are kept in mind there will be no danger of becoming confused by the mechanism of control, for it will always be seen to be what it really is,—namely, the nervous system in progress of development in order to establish greater unity of organization.

Furthermore, a thorough recognition of these three cardinal principles for establishing unity of action is a perfect safeguard against over systematizing. The human nervous system is extremely flexible and always more or less under the control of the will and it is of the utmost importance that the mechanism for controlling and unifying an industrial organization be equally flexible and capable of being modified.

An organization filled with red tape is like a man who has lost his will power and is dominated by his appetites and desires. He cannot become efficient until the will regains control and restores unity of action.

Any system so designed that it does not permit the intimate contact of employer with employee and therefore does not fully recognize the value of the human touch is doomed to failure.

I sincerely hope that in outlining this philosophy of management I have indicated to you how an organization can be made so conscious of itself as to realize at once when the human units, of which it is composed, are not being given the proper opportunity for self expression; or to realize as well when these same human units are not receiving the sympathetic help they need for their own individual development.

Men can be productive only when they take an interest in their work and they will not take this interest unless those entrusted with the direction of their efforts realize that they must teach them constantly how to exercise their creative powers.

In conclusion, I wish to assure you that this paper is not an academic discussion of what might be done, but as true a picture as I can give you of methods I have actually used successfully.

DISCUSSION

Mr. SHELTON: Mr. Wolf has drawn an exceedingly interesting analogy, well calculated to help managing members of an industrial organization keep their balance. Yet he does not seem to stick to his own parallel. For instance, the autonomy which Mr. Wolf would give the accounting departments of the different local organizations in a large corporation does not seem consistent with his picture of centralized control over bodily activities such as is exercised by the cranial system. If the central office of the corporation can determine the one best way, whether in accounting or any other practice, should it not hold the subsidiary plants responsible for living up to that standard? The central office, it seems to me, should be in a peculiarly advantageous position in the establishing of proper standards. Therefore, I take issue with Mr. Wolf's contention that its relation to local plants should be purely advisory.

The suggestion that an industrial organization to make progress as a unit should have a conscious co-ordinating mechanism comparable to the nervous system in the human body is hardly open to argument. Neither is it open to argument that every organization can and should have a distinct individuality as a whole, to which its component parts harmoniously contribute. The question whether Scientific Management helps to build up such an individuality can certainly be answered in the affirmative. But the statement that "the failure of some organizations to put their business on a scientific basis has been caused largely by the fact that they have not used the mechanism of Scientific Management" seems to me absolutely wrong.

Tickler systems, recording devices and indicating instruments are mechanisms, valuable and often necessary. Yet Scientific Management does not lie in these. How often have we heard Mr. Taylor emphatically declare that Scientific Managerment is not a particular mechanism of any

sort, but is primarily a point of view! That, it seems to me, indicates the secret of success or failure in Scientific Management. It depends not on the mechanism, but on the individuality which controls and uses the mechanism.

Taking Mr. Wolf's own analogy:—Mr. Taylor's cerebro, spinal and sympathetic nerve systems were built on much the same plan and of much the same material as those of the rest of mankind. Yet consider the difference in the way he,—in his individuality—his point of view—used those mechanisms and with what results!

Mr. MIXTER: The paper says that an organization filled with red tape is like a man who, having lost his will power, is dominated by his appetite and desires. I think it is the other way round, that a concern dominated by red tape is like a man with excessive will power who has a fixed idea and who will not change or changes with great difficulty. I think in all human affairs whether government or industry we never can achieve anything that approximates the co-ordination of the human person. As regards the different plants under one central ownership, the problem is very much the same as the problem of controlling armies in the field in time of war. What the general staff does is to plan in advance and then the plan is executed and the two great modern innovations have been the very thorough planning in advance and also learning this lesson as it never was learned before, of never interfering with commanders. Scientific management as to planning in advance is very similar to the work of the general staff. In practice does scientific management do the other thing just as well? Isn't there a little too much of a tendency to control everything from the planning room?

As regards the personality of persons in a particular plant, it seems to me that the only thing that you can do about that is to have a working suggesting system and have every one in the planning room or in the shop realize that any idea he has that he thinks will benefit the work in any way will be considered and if found to be good will be adopted and he will be given credit for it in some money award or by publishing his name, and so given the full credit for it. It seems to me that nothing is more deadening to individuality than for clerks and foremen and others to feel that they are not given credit for suggestions of that sort. The spirit of the thing is that suggestions for improvement are welcome. Clerks and foremen do see many ways in which things can be improved and if they do not feel that they will be given a sympathetic hearing, it takes the heart out of them and they have no individuality.

Mr. FEISS: The plant is more than a building, a set of machinery, or a routine system or any mechanical device. Its ultimate success is the result of a group of individuals and is an expression of that type. Each plant I have been in has a certain type of management and a certain type of workers. I have seen two plants in the last month under exactly the same methods. They are under scientific management and still the whole organization of the plants is different. They express something, and the thing that impresses me is the type of worker and how much that type is in its expression similar to the type expressed by the personality of the management. When you get into the bigger organizations where plants in different localities are under one general management it seems to me that the point is well taken, that it is impossible to perform certain personal functions from a central location. After all, plant management is a little more than keeping a few machines running and keeping the building open. The building up of organization depends on the personal contact between the managers and their employees. That cannot be controlled in any of its expressions by anybody except the men on the job. In fact, in my opinion, that is the ultimate key to success. I believe that there is a limit in management to this expression and whenever a plant is so large that the individuality of the plant ceases to exist, that personal contact no longer is there, that it is too large to be efficient. It seems to me that is the very reason why a large controlling company does not locate all its manufacturing under one roof. There is a limit to what one man can personally do. Somebody who is on the job is essential to get the utmost efficiency and that expression of individuality which means real management and real success.

Mr. SCOVILLE: I was impressed by what the author of the evening said about recording instruments. I attended a little convention of paper manufacturers at Erie, Pa., which was presided over by a number of extremely methodical Germans. In going through a plant an American that I knew pointed out a paper machine that was running at high speed and said "Look at that gauge go", and I read several hundred revolutions a minute. I said, "Is that fast?" and he said that it was. I asked, "Why don't the others go fast?" And he said, "Mostly because they don't know how. In most paper mills they take a piece of white paper about so long (indicating) and they have some contrivance for sticking it in, and the man has to depend on his eye." A great deal of the success which those paper industries in Erie have obtained is due to the competent and systematic use of their recording instruments. That is an example that many of us will follow, and when they get recording instruments that will do what our speaker told us about, they will plot it out.

Mr. VALENTINE: Mr. Feiss struck the note that appeals to me. I felt just one lack in Mr. Wolf's paper. I felt there were a lot of things down the line that his scheme of things could not take into account. I missed the idea of will power all the way through. It seems to me that the danger that those of us who have scientific management most at heart see for scientific management, is that it shall not be adequately scientific and that it shall not sufficiently take into account the constant, continuous and forever-and-ever-amen uncertainties of things that make life both a success and a failure.

Mr. WOLF: I am glad that Mr. Valentine has pointed out that my paper apparently does not appear to put sufficient emphasis upon the human will, for I will try to correct this impression. Perhaps I took too much for granted that in comparing the organization with the human body this feature would be clearly understood. My effort has been to describe how an organization can be built up, which will allow the greatest possible latitude for the expression of the individual will.

The manager and all of his assistants must be in close touch with the men and easily accessible to them at all times.

The position taken by Mr. Feiss is very much to the point, namely,—that a plant is more than a set of machinery, or a

routine system, or a mechanical device. When we recognize the fact that the form taken by the bricks and mortar, machinery, etc., is, in the first instance, conceived by a human mind, we surely cannot fail to realize that ultimate success depends upon encouraging the creative faculty of that same mind. Truly, then, as Mr. Feiss points out, the progress of the plant is, in the last analysis, an expression of a typical group of individuals. I have been simply trying to show how this group can be aided in the expression of their creative powers by giving individuality to the group and at the same time blending every member of the organization into that individuality.

Mr. Mixter missed the point when I indicated the effect of red tape. No man can best express his will if any portion of his anatomy is overdeveloped, as, for instance, the glutton who has allowed his appetite to become his ruling passion. Unless his will asserts itself he will weaken his whole organism by becoming a slave to his stomach. The thing which makes it hard for him to break the habit is the domination of the senses, such as taste and smell, with particular reference to the demands of the digestive tracts.

It is particularly hard for the other bodily functions to get their requisitions past the overdeveloped system of the gastronomic nerves, all of which naturally tends to break up the unity of action.

I agree with Mr. Mixter that there is danger of making Scientific Management too much like a military organization by over-emphasizing the planning department. We must do more than give men a chance to make suggestions to the planning department; we must give them an opportunity to externalize the suggestions of their own minds in the performance of their work. This is something a military organization does not permit to any but the general staff. A military organization is not designed to create, but to destroy, so we cannot handle a producing system in the same way.

A central corporation office assumes the military type when it attempts to determine for all plants a "one best way" of accounting or recording manufacturing operations.

Just as individual men differ in temperament, so the individual plants differ and each one is a law unto itself.

The relationship between the directive principle back of the central corporation and each manufacturing plant should be the same as that between the common law of the land and individual men. This does not in any way prevent the central governing body from adopting standards of great value to the individual units. Except for those regulations, however, whose violations would endanger its corporate unity, it must not attempt to force their adaptation if they are not acceptable in each particular case.

Mr. Shelton, I fear, misunderstood my meaning. I did not say that the "failure of some organizations to put their business on a scientific basis has been caused largely by the fact that they have not used the mechanism of scientific management", but that their failure to use this mechanism for the *purpose of perfecting its unity* was the reason why they did not make a success.

I agree with him thoroughly that the point of view is of primary importance and the mechanism merely incidental. It helps very materially to clarify the point of view.

In concluding this discussion I feel that I must call attention to Mr. Barth's remark that he does not see how I have time to study anatomy and philosophy. I feel that I cannot afford *not* to take the time. It is of the greatest importance that we understand which way we are going in all of this complicated process of civilization. There must be some purpose back of all of the wonderful creative activity surrounding us and a philosophy of life is necessary to all of us in order that we may get our poise, otherwise we simply add to the noise and confusion. Philosophy is merely a search for the truth underlying our own individual organized life. So must we also build up a philosophy of management, which will give us the principles underlying industrial organization. In this way alone can we properly direct it.

EMPLOYMENT

(The purpose of this column is to bring available members and desirable opportunities into touch with each other. Names will not be published, but inquiries from those interested will be forwarded to the proper persons. Original inquiries will be given code numbers, to which please refer in answering.)

P1. Opening for man to take executive charge of developing Planning Department. Experience and executive ability required.

P2. Opening for man as assistant to Superintendent in machine shop. Technical graduate, with two or three years' S. M. shop experience preferred.

M1. Man, age 24, graduate of college and of a business school giving courses in Sci. Mgt., but without practical experience, seeks apprenticeship position in Planning Dept.

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MILL EFFICIENCY

By ROBERT B. WOLF

Manager of Production, Burgess Sulphite Company, Berlin, N. H.

This article is the address of Mr. Wolf at the meeting of the Technical Section of the Canadian Pulp and Paper Association, held in Montreal, November 24th and 25th, 1916. The interesting discussion that followed the reading of the paper is also included. Complimentary comments on the practical common sense of Mr. Wolf's philosophy have come from all who heard the address.

CHAIRMAN: Dr. J. S. Bates:

THE CHAIRMAN: Will the meeting please come to order.

Gentlemen, we are assembled here this afternoon to hear Mr. Wolf's talk on "Mill Efficiency".

R. B. WOLF.

Some of you have had the pleasure of hearing Mr. Wolf before, and you know that he is an authority along this line, and has something particularly interesting to tell us. I think he needs no further introduction on my part.

You are aware that Mr. Wolf is connected with the Burgess Sulphite Fibre Company, of Berlin, New Hampshire.

I have much pleasure in asking Mr. Wolf to address you. (Applause).

MR. ROBERT B. WOLF: Gentlemen, it gives me a good deal of pleasure to be here with you, and I hope the next time I attend one of your meetings, if your Meetings Committee or Board of Directors pass favorably on my application, that I will be a member instead of just a visitor. (Applause).

I want to say, on behalf of the American Association, that we want to co-operate to the fullest extent with the Canadian Association. I believe that if we are going to get the best results in the industry as a whole, it is not because on one side of the line or the other that the best results are obtained, but because we are willing to co-operate with each other.

I hope as many of you as possible will come to the meeting of the American Technical Association, in New York, in February, and I am going to urge our men to come up and visit you when you have your very interesting meetings. (Applause).

The question of mill efficiency is something of very great interest to our organization. Ten years ago, as you may know, we had the reputation of making the poorest quality of pulp made anywhere on the continent, and I guess we deserved the reputation. Mr. Burgess decided that in order to change the quality of the pulp it was necessary to apply science in place of rule of thumb, and in looking about for someone who combined a technical training with a practical knowledge of the business he selected me. He told me afterwards that I was the only man he could find who had these qualifications, so that you see my selection was more or less of an accident.

After graduating from College in 1896, I spent a number of years in the mills until I had operated every kind of machine in the various branches of pulp and paper making. While this practical knowledge is a great asset, I believe the most valuable thing I learned was the workman's point of view, by direct intimate contact with him; so that our method of organization efficiency takes this human factor into account to the fullest extent.

Our production ten years ago was only 225 tons a day and the quality was such that our customers were very careful to conceal the fact that they used Burgess pulp. We brought this up, without adding a single digester or a single wet machine, to 400 tons of pulp, which is the recognized standard of quality in the country and now our customers, when they want to emphasize the excellence of their paper add the fact that they are using Burgess pulp. By the addition of one more digester recently we are now manufacturing four hundred and fifty tons a day.

I mention this, not boastfully, but merely to let you know what has been actually accomplished. It has not been done by any one individual; and I maintain that the only way a result of this kind can be brought about is by getting the fullest co-operation from all workmen in the organization and by giving the greatest possible amount of freedom for the exercise of the creative imagination of our employees, so as to obtain the most rapid changes in the physical equipment of the plant.

It is necessary to build up an organization unity, but in order to do this it is necessary to record the

various elements that enter into the manufacturing operations, in such a way that the results can be analyzed. These analyses can then be used as a basis for changing plant conditions, so that the laws that are discovered can be specialized through the creation of conditions for their analyses can then be used as a basis for changing plant conditions, so that the laws that are discovered can be specialized through the creation of conditions for their expansion. This, as you can see, is a very definite, vital, human problem, and requires a constant development of the intellect of the men in the organization. In other words, it is an educational process and the function of the management becomes primarily educational in nature. **It is more a question of leadership than of compelling obedience.** In other words, we have succeeded in getting every man in the organization (I say this in its broadest sense) trying to produce the largest quantity of the best quality of pulp, at the lowest cost. It is not because the department heads, superintendent, or myself are making superhuman efforts to produce the results; but because we have succeeded in getting everyone to co-operate with us. There is a desire to get this result on the part of the workmen throughout the entire plant.

To be more specific, we will take the digester building as an example. You are undoubtedly familiar with the old methods of cooking, where a man judged the cooking operations by the "feel" of the digester and the relief valve, and based his judgment as to when the digester should be blown upon the color of the liquor, and the smell. You can easily imagine that with nine different men cooking our digesters we got nine different kinds of pulp. It was necessary for us to hit upon some standard method of cooking and then get everybody to follow this method. We began by putting on the bottom of the cooking records a graphical chart, upon which the cook plotted the gauge pressure, the steam pressure (which corresponds to the temperature in the digester) and the gas pressure, which was obtained by subtracting the steam pressure from the gauge pressure. By watching these curves, our cook could tell whether the relief was as it should be, by noting the drop in his gas pressure. If it dropped too rapidly he would shut off the relief valve; if not rapidly enough he would open it up wider. By gradually determining the ideal standard cooking chart, the men began to take a keen interest in their work, as they were in reality following an ideal which they recognized to be the true ideal in order to get the best quality of pulp.

Of course the men at first, not being familiar with scientific methods, were opposed to the plan. It is usually the fact that a higher good appears first as an evil, until it is thoroughly understood; but to illustrate the change of heart that takes place when the men are given intelligent assistance, I will tell you a story: I was talking one day, after we had operated under this plan for about two years, with the cook who made the greatest opposition to our plan in the beginning. He had been the surest of all that it wouldn't work, and had rebelled the strongest against being tied down to cooking (as he expressed it) with a lead pencil. After working under our plan for two years, he was much interested in it and became very enthusiastic, and still is. This man was afterwards promoted to the position of digester house foreman and one evening I had occasion to call him into the office to look over the charts that record the general progress of the work in the whole digester building. These charts we had not been running long enough at that time so that we felt safe in giving them to the men; but a question of changing our cooking methods was something that we were obliged to decide at once, in order to increase the strength of our fibre, and the reason for making the change was so clearly indicated on these charts that I thought it best to begin giving them to the foreman. He was very much surprised, and expressed his surprise a number of times, that the charts showed so clearly the effect of the method of cooking and he seemed so pleased with what he saw that I reached into my desk and took out a bunch of cooking records that I made when I first came to the plant. These were made by simply copying down the temperatures and pressures during the cooking process of all cooks that were being handled while I remained in the room for 36 consecutive hours. I copied these down personally and simply plotted the gauge, steam and gas pressure curves from them. When he saw these curves, he said "It does not seem possible that we ever cooked like that", I assured him that we had and showed him where he had actually handled some of the cooks himself, as his name was attached to the records. After looking at them for a few minutes, he said in a rather amused way: "It makes a fellow think of looking at a picture of himself when he was drunk after he had sobered up, don't it?"

This illustrates, perhaps better than anything else I can say to you, the change that takes place in the mind of the men after having commenced working under the helpful scientific methods.

Through studying the effect of the maximum temperature upon the quality of the fibre, especially the strength, and studying also the effect of the acid strength upon the maximum temperature, we gradually began to accumulate a lot of information which enabled us to co-ordinate and bring together certain parts of the plant which had been running more or less independently. There were hundreds of variables, we found, entering into the different operations and we soon began to accumulate an enormous amount of data which, because of its volume, tended to confuse our minds as to what the real facts were. In other words, by carrying the analytical process to its extreme point, we found a definite necessity for starting a synthetic process which tended to unify and bring together the various factors, so that they would enable us to see the basic underlying principles involved in our manufacturing operations. To make a long story short, we began to record our operations graphically, adding one thing after another until we now have a graphical chart room which contains over two thousand charts, all having to do with the manufacture of bleached sulphite pulp. We have many other charts for our various by-products, in addition to these, but these are handled more or less as separate organizations.

The net result of all this was a gain of over seventeen per cent. in the yield from a cord of wood. In order to do this, however, we were obliged to change the whole character of our acid making process, our process of making chips, and also our process of handling the pulp after it is cooked. This in addition to the careful regulating and recording of the cooking and bleaching operations.

Of course, it goes without saying that we were obliged to put into control of our manufacturing processes technically trained men, and this was done by gradually working these men into the plan through our

chemical and engineering departments. By putting men of this calibre in as department heads, after they were thoroughly familiar with the practical part of the business, and putting the responsibility for the operation of the department up to them, we were able to maintain, in spite of the rapid growth of the organization, the human relationship and contact with our men, which is so essential to the welfare of the workman.

As our organization methods progressed, we were able to give these men greater freedom to change the physical conditions in the plant. In the wood room, for instance, we made such changes in our chipping and screening apparatus that our sawdust has been reduced to one tenth of what it was originally, and the chips are now all of absolutely uniform length. It was a gradual evolution and required steady persistent effort on the part of an intelligent department head, who was being given every assistance to develop the machinery necessary to produce the results.

It is necessary to emphasize here the fact that the method of recording the operations in the department was such that he got the greatest possible co-operation from the men who were actually doing the work. This is not possible for a department head, no matter how intelligent he is, unless he gets this co-operation from his men, and this co-operation cannot be obtained unless full, free information is given to the workman so that he takes an interest in his work.

We make it a policy to record the operations of the individual workmen in such a way that they have some means for recording their progress and thereby able to realize just what their efforts are producing. This brings out what we call the creative faculty of the man to the fullest extent; he is able to really enjoy his work by being given opportunity for self expression. In all of our operations we work to produce this result, realizing that we are primarily developing human beings and that **plant efficiency is not an end in itself, but that the real aim is the development of men.** I could tell you some very interesting things that have happened to men in our employ who have changed their habits of living, decidedly for the better, simply because they were being given opportunity to find joy in their work, and have changed from men doing **negative, destructive** work to men doing **positive, constructive** work. It is a fact that is beginning to be recognized today by men who are thinking deeply along these lines, that a man is internally purified by doing work which is fundamentally creative in nature. The desire for self expression is one of the most fundamental instincts in human nature and unless it is satisfied, it is bound to manifest itself in all sorts of abnormal ways which today are working such havoc in society.

I would like to call your attention here to the fact that we do not use any of the so-called efficiency methods of payment, such as task or bonus and piece work. Our men are all paid by the hour, except those who are on a salary basis. In other words, we have enabled our men to forget that the dollar is the most important thing in life and by paying them liberally (much more than in any other mill) they are able to devote their energy entirely to the task and are actually doing their work well for its own sake. This brings back, as you can readily see, somewhat, the old artisan idea, where the workman took pride in the execution of his work because he had means for realizing himself in it; only in our case the man does not create the complete finished article, but does create and form a more or less definite record, and realizes its relationship to the finished product in which he takes a personal interest and pride.

The progress that we made in our organization was so rapid that I felt the necessity of becoming acquainted with the fundamental laws with which we were working. The one outstanding fact was that it was a proces sof rapid evolution and I therefore began studying Darwin's "Origin of the Species", in order to get some line on the evolutionary movement in nature. After Darwin I took up Bergson's "Creative Evolution"; then Carpenter's "Art of Creation"; following this with the works of Troward, Henry James, and others; and, at the suggestion of my friend, Mr. Ellwood Wilson, who is here with us today I read the "Ethics of Aristotle." I found that the old philosophers like Aristotle, Pythagoras and Plato had some very fundamental truths and that modern science was confirming a great many of their theories of life. I also found it necessary to take up the study of embryology, which is the scientist's attempt to record the vital processes which take place in the development of man; and finally this lead to the study of man's nervous system. The result of all this work brought me to a realization that the principle of Individuality was the thing I was after. I found that in our organization we had built up, through our system of control, a plant nervous system and that we had, without realizing it, created in our organization controlling mechanism.

1st.—A plant memory, which is, as you can readily understand, represented by our graphical department room;

2nd.—A central nervous system, which corresponds to the functioning of the spinal cord, which is the seat of the intelligent sub-conscious control, sometimes called reflex action.

This was represented most distinctly by the system of records that were constantly going out to the men in all parts of the plant, giving them information as to what they were accomplishing. In this way, groups and individuals in groups, wherever it was possible to arrange it, were being informed of their work; and because of having this information they were striving to keep the organization functioning as it should, without constant direction from the conscious mind of the organization, as represented by the superintendents and department heads. In man, for instance, such functions as walking and breathing, after once being set in motion by the will, acting through the conscious mind, are kept in motion by the nerves in the spinal cord, without conscious effort on the part of the individual. It is also the seat of the so-called muscular action, which causes the body to act involuntarily for its own protection when necessary.

3rd.—We had also, in our efforts to relieve our men of the drudgery of memorizing routine work, created, in a tickler system, something which corresponds very definitely to what is known as the sympathetic nervous system in man. In our physical bodies this is the seat of those almost entirely automatic functions over which the conscious mind has only very indirect control. This consists principally of the efferent (or outgoing) nerve cells, whose bodies are collected into ganglia, or groups outside of the spinal cord, principally in the head and in the body cavities. For instance, the nerves which stimulate the growth of the hair, the finger nails, and even the growth of the body itself; the vaso-constrictor and vaso-dilator nerves controlling the contraction and expansion of the blood

vessels; the nerves controlling the beating of the heart and thousands of other functions are all a part of the sympathetic nervous system. This is so designed that it constantly reminds and, in a sense, releases the forces required to keep the routine work necessary to our preservation in motion. In our plant system of control we accomplish this through the use of a tickler system, as it is used in the Taylor system of Scientific Management. This consists simply of a cabinet with a drawer for each month in the year, containing substantially built folders for each day of the month. In these drawers are placed the various memoranda, to be taken out and distributed on the proper dates, reminding those to whom they are addressed of certain routine work to be done. Of course, you can easily understand how a system of this kind accomplishes two distinct functions:

1st. By relieving individuals of the necessity for remembering all of the various routine jobs, and

2nd. Preventing the organization itself from departing from methods determined upon as best. Once a routine tickler is started, it cannot be changed without permission from those in charge of the operations of the plant. It is changed, however, freely and easily, whenever increased knowledge of plant conditions indicate that it is best to make the change.

You can readily see from this description of our mechanism of control how our plant became a definite organized individual and is actually carrying on its function of converting wood into pulp as a unit. We have a definite plant memory and also means for making subconscious all of our consciously acquired talents, which enable us to produce a large output, of a constantly improving quality of fibre, with greater economy.

No individual can make progress unless he has means for constantly acquiring new talents and making them subconscious. This is what our progress in the world largely consists of and it is useless to expect an industrial organization to make progress unless it is provided with a definite mechanism of control, which we have a right to pattern after the nervous system of the human body.

We, as individuals, can never create anything that we have not first become ourselves; but what we are, that we can certainly create and externalize in physical matter.

It is all, as I said before, a creative process, and whether we are creating the directing mechanism of the organization, as is done by the executive and his associates, or whether we are actually creating, or helping to create, as the workman does, articles of manufacture, the process is the same.

The desire to express life is man's most fundamental, basic instinct, and this, of course, implies the fuller expression of life, which can be nothing else but a creative process; and it is because we reckon with these forces in our organization and constantly provide means for their expression that we obtain such splendid results.

The more knowledge a man has of the laws that he is working with, the more he is able to create conditions for the expansion of these laws. As I have said before, man does not create matter nor force, but he does create conditions for the specializing of the natural process and, as this is the basic instinct in all mankind, the progress that is made in any organization depends upon the amount of opportunity given to the human units, of which it is composed, to do creative work.

Of course, the great problem of management is how this can be done and at the same time blend all of the various individuals into one great harmonious whole. If we make sure that at the same time the self conscious faculty is developed, a cosmic or universal consciousness is also developed, thereby enabling each man to realize his place in the organization, there is little danger of interferences which will cause trouble. In other words, that great power which we may call "The Will of Man," operating in the "natural or generic" field, cannot destroy itself if it becomes conscious of the great unity of the whole and its particular place in the universal scheme of things. **It is necessary to teach men their place in the parent organization, as well as teach them how they can become more intensely creative in their own particular sphere of operation.**

I will now show you, by means of lantern slides, the practical application of these principles to our industry. I will show you, first, the illustrations which have to do with our tickler system, or subconscious mind; next, illustrations of that part which corresponds to the intelligently subconscious control, as exemplified by the spinal cord and central nervous system; and, finally, an illustration of our plant memory, as illustrated by the graphical chart room.

(Here followed the lantern slides which were explained in detail).

* * *

With these slides Mr. Wolf illustrated clearly that the philosophy of management outlined was practical. He showed how by the use of the Tickler System a great mass of routine work was handled and how, by having these reminders automatically come to the attention of the men in the plant, a large amount of creative energy was liberated for improving plant conditions. The system is clearly safeguarded so that no change can be made without the conscious mind of the organization directing the change.

His illustrations of the various records which are sent out to the men showed clearly why he was able to get their co-operation. From these records the men can tell just how well their work is being performed, and see the effect of their efforts upon their standing. His statement that this function of the plant organization system prevented things from going wrong was certainly substantiated by these records and it could be easily seen how this method would produce a desire on the part of the men in the organization to do their best at all times.

Further illustrations of the Graphical Department records, or plant memory, showed how everything which in any way affected the progress of the organization was recorded; the records being made in such a way that things affecting each other were placed close together, so that it was a very easy matter to study the forces at work in the organization. This system gives not only a record of the efficiency of the men, but, what is perhaps **more** important, it gives a record of the efficiency of the management, in such a way that it can more intelligently decide upon the best policy to pursue.

Finally, these illustrations made it plain that there was a very distinct and definite **plant individuality** and that the real reason why great progress has been made in the art of manufacturing bleached sulphite

pulp was that the organization, **as a whole,** was the instrument used by the creative process for converting wood into pulp. In other words, the plant, considered as a unit, had a consciousness which enabled it to create the special conditions needed for making steady progress in the quality, quantity and economy of operation and the great vitality of the plant came from the fact that this organization unity was used for studying how it could liberate the creative powers of the individual men in the organization, by making their work so interesting that they took real joy in it.

This not only applies to the individual workmen, but also to the Department heads, who are given a distinct record of their work through the departmental cost sheets. By the use of these cost sheets the department heads are being charged with all of the maintenance materials used in their departments, so that they are, as a matter of fact, managers of the departments; being held responsible not only for the quantity and quality of the output, but also for economy of operation. The almost unbelievable saving in maintenance materials since these departmental cost sheets were put into use demonstrated that Mr. Wolf's philosophy of management is not a vague, indefinite theory, but something that is thoroughly practical and actually produces results.

The development of the larger organization consciousness is materially aided by the weekly meetings of the department heads, with the superintendents and manager; but it is evident that the organization principles, without the aid of these meetings, enable each man to become conscious of the effect of his department operation upon all of the other departments.

DISCUSSION OF MR. WOLF'S PAPER.

At the close of the address, the chairman asked for a discussion of Mr. Wolf's paper. This discussion brought out and emphasized several important points, which are summarized below.

To some of the members the greatest interest was in the entirely human aspects of the proposition. It calls out the desire of the individual to create, to co-operate and to give, three tendencies which make for greater happiness and success for both the individual and the group.

It was further shown that the cost of administering such a system is insignificant in comparison to the savings effected. But such a system cannot by planted full grown in a plant whose organization had not already begun to think along these lines. It is a process of evolution and not one of revolution. The first thing is to build up the true scientific spirit on the part of the management. The men will respond instantly, as soon as they are given a chance to know what they are accomplishing.

There is no task and bonus system or piece work. The men are paid enough so that they may forget the selfish instinct and to really do the work for its own sake. It really gets down to a practical application of christianity.

A member spoke somewhat as follows:

"We have seen here the results of giving a man an opportunity to use his brain. Is that not really what scientific management means? Depend upon your men —give them the opportunity—depend on them, and they will work out things themselves. We will get something out of them. Don't treat them as machines. If you do, you are no managers. If you cannot depend on the man's work you should not be a manager."

In reply to a question as to the relation of safety work and efficiency, Mr. Wolf replied:

"We have a safety department controlled by the men themselves. The mill is divided up into departments and in each department there is a committee of three men, one on each shift. These men make regular inspections and report their findings direct to the Engineering Department. The Engineering Department then sees that their recommendations are immediately carried out, provided they have been approved by the manager or superintendent. I want to point out, that the effect of the work done by this committee has been very far reaching. We have had practically no major accidents in the mill for over two years and almost none due to unguarded machinery or dangerous places. Through their safety committee the men are brought into closer contact with the management."

There is one more thing I would like to say, namely, that the leaders of industry must begin to realize that the main reason for its existence is for the purpose of developing men. In other words our industrial organizations should become the fields for the evolution of mankind. We are too apt to focus our attention upon how much money we can make, forgetting that if we emphasize the development of men the material results are bound to follow; for, in the last analysis, everything in civilization is created only after it is first conceived in the mind of a human being. High grade are always created by high class workmen.

MAY BUY CHIPS IN WISCONSIN.

Owing to the growing scarcity in Wisconsin of wood suitable for making paper pulp, the Forest Products Laboratory has just completed a study into the methods of barking, chipping, screening, and baling of chips. Laboratory tests show that certain western woods are admirably adapted for manufacture into pulp, and negotiations are now under way between paper companies in Wisconsin and western railroads with a view of securing freight rates on trainload shipments of chips to Wisconsin. It is estimated that some of these western woods can be cut into chips, which, when dried and baled, can be delivered to the mills in Wisconsin at a very small advance over the cost of chips made from local timbers. Since there is a market for more than 300,000 cords of wood annually in Wisconsin, an attempt to utilize western species appears worthy of consideration in order to hold the supply of wood for our American paper mills on American soil.

SAFETY FIRST FOR WOMEN WORKERS.

The women who work on and around the machines of the Thames Paper Co., England, wear a very sensible style of clothing that should be a great protection from accidents. Instead of skirts they wear bloomers. They wear elbow length sleeves and caps. A picture of this squad of women paper makers appears in the **Paper Maker.** They take the places of many of the men who have gone to the front.

ANOTHER RAW MATERIAL FOR PAPER.

Specimens of tambookie grass and paper successfully made from it can now be inspected in the South African Court of the Imperial Institute.

The Creative Workman

An Address Delivered Before The Technical Association of the Pulp and Paper Industry at the Spring Meeting, held at Dayton, Ohio, May 16, 1918

By ROBERT B. WOLF,
Manager, Spanish River Pulp and Paper Mills, Ltd.
Sault Ste. Marie, Ontario, Canada

Technical Association of the Pulp and Paper Industry
117 East Twenty-fourth Street
New York

1918

The Creative Workman

Use of Individual Progress Records as a Means of Making Work Interesting and Enjoyable

By ROBERT B. WOLF

Manager, Spanish River Pulp and Paper Mills, Ltd., Sault Ste. Marie, Ont.

MODERN industry has to a great extent made life in our large manufacturing plants almost unbearably mechanical. As a result, the workmen are in many cases in open rebellion against the entire system. The trouble arises clearly from a lack of realization of what human life is for. Therefore, an analysis of the qualities in work which attract or repel us would surely be most helpful and, if carried far enough, should reveal something of the meaning of life and of the individual's relationship to his whole environment.

The success we have had in making the work of our paper machines interesting and therefore attractive to our machine operators will, I feel sure, prove helpful to others who are endeavoring to solve the individual problem. At any rate, it is a great pleasure to us to see how our men are beginning to enjoy work, which, before the introduction of progress records, was not particularly attractive. The philosophy underlying our experience is, of course, not in any sense confined to the paper industry, and from previous experience I know can be widely extended. No philosophy of life, however, is valuable, unless it is capable of practical application, so I hope the illustrations which follow will prove to be of real value as a concrete demonstration of the principles involved.

The development of this philosophy was based upon results obtained in The Burgess Sulphite Fibre Company's mills at Berlin, N. H. There we were making sulphite pulp with its accompanying by-products, and had recorded almost all the operations in the process. We had, however, no experience in that plant with the recording of operations on paper machines, so when we started our work at the Sturgeon Falls plant of The Spanish River Co., we decided to undertake this investigation, especially as we were having considerable trouble with uneven weights of paper. We determined to go at this problem from the *quality* basis, as our experience at the "Burgess" plant had been that the quality records were the most important. *Quantity* records we found usually tended to make hard feeling among the men, as many of you have probably observed, where one machine crew disputes with another because of a difference of opinion as to who should be credited with a roll at the end of the shift. I found that the international officers of the Paper Makers Union felt very much the same way about it and were inclined to be instinctively opposed to the posting of production records. Quality records, however, are of a different nature, as they bring into play the reasoning, thinking power of man much more than quantity records; the latter reflect the physical side of his nature rather than the intellectual side. Wherever the competition is on a quality basis, cooperation results, and cooperation of this nature does not diminish the spirit of emulation but on the contrary tends to strengthen it.

Before referring to the illustrations which show in concrete form our results, I believe it will be helpful to review our general philosophy of management. I sincerely hope what I say will be looked upon as simply my own interpretation of the facts as we have observed them, and even though I may seem to be dogmatic at times, that you will be indulgent and consider this as possibly an inherent defect of any individual interpretation of a vital process. I feel that our experiences stand out only as so many isolated and disconnected fragments unless we are able to connect them by a process of reflection into a philosophical concept. It is this concept of a law or principle which we can pass on to others, and it is useful in proportion as it is practical. If it does not fit into the general scheme of life it is not worth our serious consideration. On the other hand, if it does prove its practical value, its presentation adds something to the sum total of human happiness. It is with this thought in mind, therefore, that I am taking the liberty of weaving a philosophy of management around the concrete facts of our paper machine operations.

The basic principle of our philosophy is that a man must be interested in his work in order to get good results. If he is not interested, he will not do his best. He is simply in this case reacting to externally applied force or stimulation, and is doing his work more because he is compelled to do it, from fear of either losing his job or being penalized in some way. A man in this frame of mind cannot do his best work and will really do as little as possible. If the work is interesting, however, he works "from within out" as it were, because he *desires* to do so and not because someone is all the time "following him up." This type of worker is what we call the *creative* type and a plant is successful in direct proportion to the number of men that it has of this type.

Is the discontent and restlessness in and around our great over-specialized industrial plants (in spite of their so called welfare work) not due to the fact that the creative impulse of the worker has no chance to develop in them? Efficiency it seems to me has too often been made an end in itself to be attained at all costs regardless of individual wellbeing. In many of our mills and factories men are used simply as intelligent machines and are given no opportunity to use their thinking powers. Regardless of how seemingly well operated a plant of this kind may be, how can it even approach a maximum of good results if 95 percent of its employees are not permitted to use their brains in their work? Does this form of industrialism differ very materially from that of the older mediæval form of industrial slavery which Germany has so *efficiently* brought up to date? It is no accident that practically the entire working world is willing to make untold sacrifices to crush out this giant organization which seeks to dominate by repression, and it seems to me that the only way that we can avoid a deadlock in this present war is to concentrate our efforts to organize without repression and remove from the face of the earth forever the pernicious doctrine of the "divine right of kings." This war has

been called an industrial war — a war of machine power. If this is so, how long can Germany hold out when she is using only about 5 percent of her people in creative work? If we have the intelligence to organize our industries so that ten times this percentage are using their brains, we can set in motion such intensely powerful forces that the German machine will be absolutely unable to withstand them. Can this be done? I believe our experiences show that if granted their undeniable right to work intelligently, even a larger percentage than the 50 percent suggested above will do creative work.

As an indication of the low percentage of creative power used by the Germans, I will cite two industries which are typical. Over two years ago one of the directors of a great transatlantic steamship corporation told me that in twenty years to his own knowledge no basic invention in shipbuilding had come out of Germany. They have analyzed and refined what others have created but that is all. The same is true in the steel and iron industry, so I was informed a few days ago by the head of one of America's greatest steel corporations.

We recognize in our work three fields of operation. The FIRST we may call the "field of nature," and such sciences as chemistry, physics and mechanics record the operations in this field. All that these sciences do is to organize the observed facts in the physical world and by means of this organization record the laws of the various physical elements which make up the raw materials. The laws of the raw materials and the effects of the various manufacturing processes upon these raw materials must be recorded if we are properly to enlist into the service what we recognize as the SECOND great field of industrial operation, namely, "the will of man."

The realm of so called "exact science," does not extend to this field. It is only in proportion as we are able to give to man the greatest possible amount of knowledge of the first field and to create conditions where he can use this knowledge in constructive, imaginative work, that good results are obtained. It is beginning to be recognized today that we cannot drive men to do work against their will and obtain anything like the best operating conditions in our plants. The thing that a man does unwillingly he is not interested in and will not do well; neither will he do good work if he is indifferent as to whether the work is well performed or not. The problem is how to produce a desire upon the part of the workman to do the work for its own sake. Our experience has shown that this can be done when conditions in the plant permit him to use the creative power of his intellect and thereby become the conscious director of the natural forces that he is using. It is not only necessary, however, to give this originating, choosing and adapting power of the intellect a chance to operate, but if we are to invoke it to the greatest degree, we must record—insofar as it is practical—each man's progress. The progress record, as indicated by the score, is the thing which makes a game interesting and the pleasure we derive from a game comes largely from the consciousness that we are matching our own intelligence against the other man's intelligence. It is for this reason that in quality records we get, exactly as we do in games, a spirit of fair play and friendly competition, rather than the hard unfriendly feeling which comes when the records are mainly those of production or quantity only.

The THIRD field has to do with the "spirit of unity" in the organization which men call *esprit de corps*. It is invoked largely through teaching each man his part in the organization by enabling him to become conscious of the effect of his acts upon every other part of the organization. It is not enough to teach a man his own work well and to create an environment in which he can obtain the best results on his own job, but he should realize the effect of his work on every part of the organization and, therefore, his relationship to the whole. It is, of course, largely the function of the executive branch consciously to develop this spirit of unity, but this spirit must be developed if the best results are to be obtained.

In Philadelphia a few days ago, I heard the head of one of our large shipbuilding corporations, when asked how he got such splendid results in his plant, reply that 80 percent of the results were due to the spirit of the men. He added, however, that this spirit is largely emotional and therefore apt to change suddenly. It is this very spirit of enthusiasm which, if properly directed, overcomes all obstacles, and the great problem in management is how to develop it rationally and in constantly increasing proportion. What I hope to point out to you today is that if we are to perpetuate this spirit, it will be by showing how these strong emotions can be controlled by the mind through the use of the intellect and that if we intelligently build up in our plants many individual progress records, which not only inform each man of his own progress but also of the effect of his work on others working with him, we will have something tangible which men can recognize as the result of their unfolding spiritual consciousness, which is the mainspring of every one's activity. I do not mean by this that all of our activity should be purely intellectual, but that by the use of the intellect we must learn to control our emotions if the great power stored up in the emotional nature is to be used in constructive work for the advancement of the human race. Instead of poking fun at anything intellectual, why not get over this prejudice by recognizing the intellect as simply the instrument used by the mind? What we all do is simply to select from our outer experiences (the field of our activity) what it is we wish to leave our impression upon; then by the use of our intelligence (intellect) we make up our minds what course to follow. This is no "high brow stunt," but just plain commonsense.

It is necessary, if an industry is to make genuine progress, that a real science of the industry be built up. So far we have been very largely concerned with the art of making paper and not with the science. I am afraid that we have forgotten that we can only have a great art where the organized facts, which record the science, are so complete and comprehensive that the individual who wishes to express this art can master the laws as recorded in the science. As it has been so well expressed by A. F. Sheldon, "Science is organized facts," and "Art is a science practised," so that unless we can organize the facts underlying the industry—the chemistry, physics and mechanics of the process—it will be impossible for the men in the industry properly to express the art. The art, however, must be expressed not only through the emotions but also by the mind through the use of the intellect.

Is not the reason it has taken so long to learn a trade, in the great majority of cases, that there is no science of the trade where a man can study the natural

THE CREATIVE WORKMAN
REEL RECORD

TOUR NO. 1 MACHINE NO. 1 MACHINE TENDER BENNETT DATE Oct. 16 1917

TIME	REEL	UNIFORMITY RECORD 1	2	AVE	WEIGHT OF SAMPLES 1	2	3	4	5	TOTAL WEIGHT REEL AVERAGE		AVERAGE FOR DAY		WEIGHT RECORD REEL RECORD	AVERAGE RECORD	PER CENT MOISTURE ROLL	REEL	AVE.	MOISTURE RECORD REEL	AVE.	POP TEST TEST	REEL	AVE
8 20	1	~~90.0~~	~~90.0~~	~~60.0~~	~~30.75~~	~~29.00~~	~~28.75~~			29	50			50.0		~~7.3~~	~~6.5~~		~~62.5~~		~~37~~	~~35~~	
					~~28.50~~	~~27.50~~	~~27.00~~			29	50	29	50	50.0	50.0	~~6.1~~					~~35~~		
																~~6.2~~	6.5	6.5	62 5	62.5	~~34~~	35	35
9 00	2	~~70.0~~	~~60.0~~	~~65.0~~	~~33.25~~	~~32.50~~	~~34.25~~			33	33			74.0		~~8.3~~	8.0		100.0		~~41~~	38	
					~~30.50~~	~~30.00~~	~~31.50~~									~~7.7~~					~~40~~		
										62	83	31	41	124.0	62.0	~~8.1~~	14.5	7.2	162.5	81.2	~~33~~	73	36
9 40	3	~~70.0~~	~~100.0~~	~~85.0~~	~~30.75~~	~~30.00~~	~~30.00~~			30	25			66.0		~~5.7~~	6.4		60.0		~~30~~	32	
					~~29.00~~	~~28.00~~	~~28.00~~									~~6.7~~					~~31~~		
										93	08	31	02	190.0	63.3	~~6.7~~	20.9	7.0	222.5	74.2	~~34~~	105	35
10 20	4	~~100.0~~	~~50.0~~	~~75.0~~	~~30.25~~	~~29.00~~	~~30.25~~			29	83			56.0		~~6.6~~	5.9		47.5		~~34~~	33	
					~~28 25~~	~~27.50~~	~~28.50~~									~~5.2~~					~~34~~		
										122	91	30	73	246.0	61.5	~~5.9~~	26.8	6.7	270.0	67.5	~~32~~	138	35
11 05	5	~~70.0~~	~~90.0~~	~~80.0~~	~~31.75~~	~~30.75~~	~~31.00~~			31	17			84.0		~~6.3~~	5.9		47.5		~~33~~	32	
					~~29.75~~	~~29.75~~	~~29.50~~									~~6.5~~					~~30~~		
										154	08	30	82	330.0	66.0	~~4.8~~	32.7	6.5	317.5	63.5	~~32~~	170	34
11 45	6	~~50.0~~	~~80.0~~	~~65.0~~	~~32.50~~	~~31.25~~	~~30.75~~			31	50			92.0		~~6.0~~	6.1		52.5		~~36~~	33	
					~~30.25~~	~~29.50~~	~~29.00~~									~~6.6~~					~~34~~		
										185	58	30	93	422.0	70.3	~~5.7~~	38.8	6.5	370.0	61 7	~~29~~	203	34
12 20	7	~~100.0~~	~~50.0~~	~~75.0~~	~~32.25~~	~~31.00~~	~~30.25~~			31	83			96.0		~~7.0~~	7.4		85.0		~~33~~	31	
					~~30.00~~	~~28.50~~	~~30.00~~									~~8.1~~					~~37~~		
										217	41	31	06	518.0	74.0	~~7.0~~	46.2	6.6	455.0	65.0	~~30~~	234	32
12 55	8	~~90.0~~	~~80.0~~	~~85.0~~	~~31.75~~	~~31.00~~	~~31.50~~			31	42			88.0		~~7.1~~	6.6		65.0		~~34~~	32	
					~~29.50~~	~~29.00~~	~~29.50~~									~~6.4~~					~~31~~		
										248	83	31	10	606.0	75.7	~~6.3~~	52.8	6.6	520.0	65.0	~~30~~	266	33
1 35	9	~~90.0~~	~~90.0~~	~~90.0~~	~~30.25~~	~~30.75~~	~~30.50~~			30	50			70.0		~~5.8~~	6.5		62 5		~~33~~	31	
					~~28.50~~	~~28.50~~	~~28.50~~									~~7.3~~					~~31~~		
										279	33	31	09	676.0	75.1	~~6.5~~	59.3	6.6	582.5	64.7	~~30~~	297	33
2 45	10	~~70.0~~	~~80.0~~	~~75.0~~	~~32.75~~	~~31.50~~	~~32.00~~			32	08			98.0		~~6.9~~	6.5		62.5		~~34~~	33	
					~~30.50~~	~~29.50~~	~~30.00~~									~~6.3~~					~~35~~		
										311	41	31	14	774.0	77.4	~~6.3~~	65.8	6.6	645.0	64.5	~~30~~	330	33
2 55	11	~~70.0~~	~~80.0~~	~~75.0~~	~~33.25~~	~~32.00~~	~~32.50~~			32	58			88.0		~~8.3~~	7.4		85.0		~~31~~	31	
					~~30.50~~	~~29.75~~	~~30.25~~									~~7.0~~					~~32~~		
										343	99	31	27	862.0	78.4	~~6.9~~	73 2	6.7	730.0	66.4	~~30~~	361	33
3 30	12	~~60.0~~	~~90.0~~	~~75.0~~	~~31.75~~	~~30.50~~	~~30.75~~			31	00			80.0		~~6.2~~	5.9		47.5		~~32~~	35	
					~~29.75~~	~~28.75~~	~~29.00~~									~~5.8~~					~~35~~		
										374	99	31	25	942.0	78.5	~~5.7~~	79.1	6.6	777.5	64.8	~~38~~	396	33
	13	Total		~~90.5.0~~																			
	14		Ave.	~~75.4~~																			
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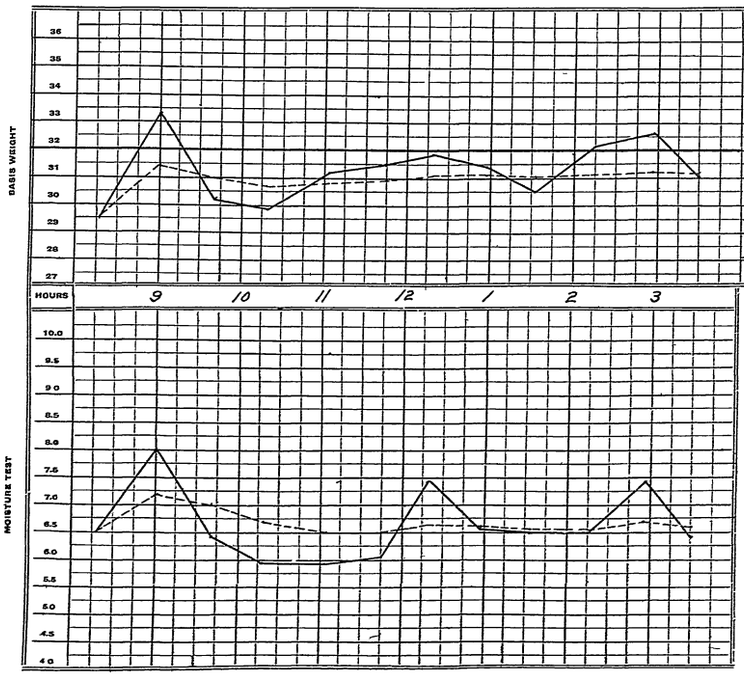
TOUR NO. 1 MACHINE NO. 1 MACHINE TENDER BENNETT DATE Oct. 16 1917



PROGRESS RECORD

Items	Day	Period
Weight	78.5	79.3
Moisture	6.8	6.8.6
Total	71.7	73.7

laws of the process. In most trades the workman must see everything actually happen before he can tell what to do in an emergency and this of necessity takes a long time. It is the length of time required for a man to develop himself into an all-round craftsman that is, perhaps, one of the main reasons why the employer has resorted to those methods of extreme specialization which the workmen are certainly justified in resenting.

The trade school movement, as it is developing in this country, gives great promise of correcting the evils of the present system of education which in the past has taken so little account of the practical arts.

With us the movement is the direct opposite of the Prussian system which fits the man into a predetermined place in the industrial machine, for our system aims to help him find the kind of work *he* desires to do and is best fitted for. In the past the industrial system has been mainly used to exploit men and this misuse of the industrial organization has perhaps been largely responsible for the apparent failure of the democratic form of government. The great problem is how to unite men without crushing them, and the answer to this problem will not come from the politicians and lawyers, but from those who are masters of material forces and therefore know the law. We are to recognize at last that the real reason for the existence of industry is to form a field for the development of the human race.

We should begin to look upon our industrial institutions as primarily educational in nature; for education does not consist simply in the acquiring of facts by a process of accumulation and then making no use of them. Real education is not only proper nourishment of the mind, but proper use of the mind; in other words, there must be *ex*pression as well as *im*pression.

So it seems to me that if we look at our industrial institutions from this point of view we will see that the process of education is continuous throughout life, as indeed it should be, for it not only means equality of opportunity for all but knowledge of individual capacity which is more important still. The old idea that education ends with our graduation from school or college, has to be replaced by the saner conception that this preliminary training really only stimulates a desire for knowledge by furnishing us with a means for knowing how to acquire more knowledge.

Some of our so-called learned men exhibit the least amount of intelligence and therefore in reality have the poorest education. A man does not have to be a college man or a high school graduate to be educated. In fact some of our greatest scientists have never been to college. They obtained their education in the school of life. Any man who keeps an open mind, free from prejudice, and is intelligently inquiring into the reason why things happen as they do, is educating himself. He is studying nature's forces in action, and, if he intelligently inquires why they act naturally as far as they do, he will learn how to create the special conditions to make them go further. It was because man observed things which floated in a natural way that he was able to discover the law that "anything which bulk for bulk was lighter than the water it displaced would float." He was then able to begin the organization of the facts which make up the science of shipbuilding. He now makes iron float by the use of the very same law by which it sinks. We can see then how man, by the use of his intellect, creates a set of conditions which do not occur spontaneously in nature—nature serves him in proportion to his knowledge of her laws—an education is nothing more or less than obtaining a knowledge of natural law.

We are wasting one of the greatest oportunities for the development of the human race when we so design our industries that a man ceases to consciously accumulate experiences and simply becomes an automaton in the performance of his day's work. When we recognize the fact that the intelligence of an institution is but the sum of the intelligences of its individual members, we will see how absolutely essential it is that we make our main object the development of man power. If the men are right, the plant can not help being right.

The idea that one man can arbitrarily dominate an organization and drive it as he wills is fast giving place to the saner conception that the manager must lead and not drive, and he is successful in proportion as he encourages those entrusted to his charge to work out things for themselves. He must learn to delegate authority and not try to hold it all in his own hands. Why not, therefore, recognize the fact that, if it is necessary for the manager to throw responsibility upon his superintendents, department heads and foremen, it is equally necessary to place responsibility upon the individual worker as well? Contrary to the commonly accepted impression, it has been our experience that men crave responsibility. My own belief is that no stable form of society will be secured until our industries are so designed that workmen feel this responsibility. They can become responsible members of society only when they are responsible members of industry, for the obvious reason that the unthinking man is not a responsible man.

My personal feeling is that the main reason why labor organizations have been formed is to prevent the exploitation of their members. Men do not want to be made into machines and the reason there is the constant demand for shorter hours and more pay is that men desire to get away from the deadening sameness of the work which is destructive to individuality. They feel that the trend of modern industry is more and more to make automatons of them and that this tendency is inevitable. Therefore, the only possible chance for individual development of the men is outside of the mere routine of the workshop. They forget, however, that the work by which man lives must in the very nature of things furnish him with an opportunity for self-expression and that if the element of joy in work is lacking from his daily task, the man's life will be anything but full and complete (as it is destined to be). It is only when employers recognize this condition and earnestly strive to remedy it, that there will be any relief from the present industrial unrest. It might be proper to explain right here that I did not reach this conclusion by reading books on philosophy or political economy, but by actual contact with the men. I have had twenty-two years experience as both workman and employer and have talked with men individually and collectively through our labor organizations, and invariably when I mention making the work interesting and enjoyable the suggestion is welcomed with enthusiasm.

While men must be fully paid for the services they render and must have sufficient time for recreation and leisure, it is nevertheless true that shorter hours and more pay by themselves will not solve our labor problems. Joy in work is equally essential, and this

cannot be made real unless the workman has an opportunity to learn to express consciously that which is unique and individual within himself.

Before giving you actual illustrations I would like to explain the causes leading up to our decision to keep these records. In the first place, the publishers are very particular about the weight of the paper they use. A ream 24x36—500 sheets—should weigh exactly 32 pounds, as this is the standard weight for newspaper. If the paper runs lighter than this, it is apt to cause breaks in the pressroom and if it runs heavier, a publisher will not be able to get as many editions out of a ton and his paper cost will increase in proportion. It is also true that if the paper is overdried on the machine it becomes brittle and, therefore, breaks easily in running over the printing press. In addition, the dryness makes it impossible for the sheet to take a good finish and as a result the surface will "fuzz up" and fine particles will come off on the type of the printing presses and cause trouble, especially with the cuts, by filling up the fine corrugations or meshes. Therefore, the main problem is to make an absolutely uniform weight of paper, which has a good finish and at the same time elasticity without the objectionable fuzziness.

In the ordinary course of events, the publisher makes a vigorous complaint to the sales office who will pass the complaint along to the manager's office. We then take the matter up with the superintendent and he in turn passes the "kick" along to his assistant, who passes it along to the boss machinetender, until it finally reaches the machinetender or backtender or any member of the crew who is responsible. Things will go along fairly well for a time and then the process is repeated and each time we have to think of a new way of expressing the same old "kick." We made up our minds, therefore, that the trouble was due largely to a lack of interest on the part of the men operating the machines in keeping the operating conditions where they should be to eliminate complaints, and that this lack of interest came largely from their lack of knowledge as to what the conditions actually were; in other words, there were not enough samples taken of the sheet as it was operating on the machine to inform the machine crew of what was occurring. The ordinary method is for the backtender to take a sample off each reel, and weigh it and let the machinetender know the results. The machinetender then turns on or shuts off stock according to whether the sample is light or heavy. A sample from the front, middle and back of the sheet is taken occasionally, but as a rule not as often as it should be in order to get the most uniform results. Realizing that the problem was to produce a desire upon the part of the machine crew to get the results we were after, we put on to each shift, a man (one for every two machines) whose duty it is to take a sample every time a reel is changed (once in every 30 or 40 minutes), from the front, middle and back of the sheet. These three samples are weighed and recorded as indicated on the form shown on Plate 1, reproduced herewith.

These forms, which are kept in the machine room, are filled in by the "sample tester," who needs to be a good, bright, intelligent young fellow, quick and accurate with figures. While these men are instructed in the work by the research department, they are largely recruited from the machine crews and in our mills are members of the labor unions. There is no thought in the minds of our men that this is a "follow-up" system designed to enable the management to find fault with the workman. They recognize it to be a system to help them get information which they would not have time to get themselves and which they must have in order to do their work more intelligently. As you will soon see, we are recording the facts which enable all of us to recognize the natural laws underlying the process.

The first column marked "Time" shows when the sample was taken (at the change of the reel). The second column gives the continuous reel numbers for the shifts (the process is continuous—three 8-hour shifts in twenty-four hours). The next column was designed originally to "tie up" the reel number to the numbers of the rolls made from each reel in order to enable us to trace responsibility for complaints, but as the uniformity of results obtained later made this unnecessary, we abandoned its use and used this column to record the "Uniformity Record," which will be explained later.

The next main column marked "Weight of Sample" shows under the headings 1, 2 and 3 the weight of the samples of paper taken at the front, middle and back of the sheet, respectively (taken across the machine). On our medium-width machines at Espanola we planned to take four samples and on the wide machines at the "Soo" five samples instead of only three as on these narrow machines at Sturgeon Falls; hence the reason for the five columns.

The first entries on the upper line are the exact weights (on a ream basis) of each of the three samples taken, and the first entry under the main column headed "Total Weight" is the average of the three samples. All of the other figures in the "Total Weight" column explain themselves. It is only necessary to remark that they are for the purpose of determining the average weights and weights to date for the shift.

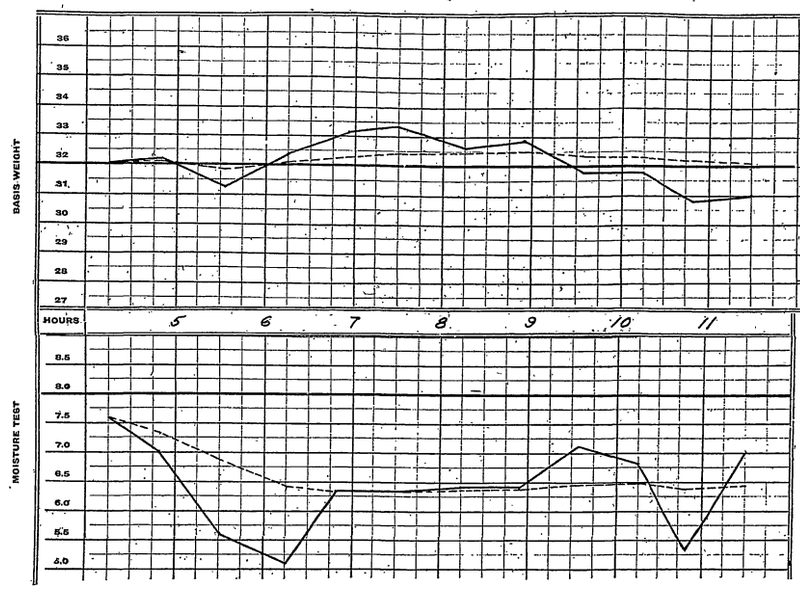
These figures are plotted on the chart at the bottom of the sheet marked "Basis Weight," and thereby enable the machine tender to visualize quickly what he is doing. The 32lb weight is drawn in as a heavy line so a quick comparison with the ideal standard can be made.

Before explaining the other figures on the chart, it is necessary to tell you the facts leading up to their inclusion in our records. When we first talked with our men about recording the "basis weight" in this way, they called our attention to the fact that the record of basis weight alone would not be sufficient; that the moisture in the sheet should also be recorded. Our research department then worked out the details of the plan, but the most valuable suggestions came from one of the international officers of the Paper Makers' Union. We built a small drying oven which was placed close to the work table where the sample cutter and scales are located, and as soon as a sample is weighed it is marked and immediately placed in this oven and dried to bone-dryness. (This takes about 10 minutes.) It is again weighed and the figures entered in the "Weight of Sample" column just under its original weight. From a direct reading table, it is easy to compute the moisture test of each sample which is entered in the "Percent of Moisture" column under "Roll." The average of the three is entered under "Reel." The average to date for the shift is then computed exactly as in the case of the "Total Weight" column.

This moisture test is then plotted on the bottom

1

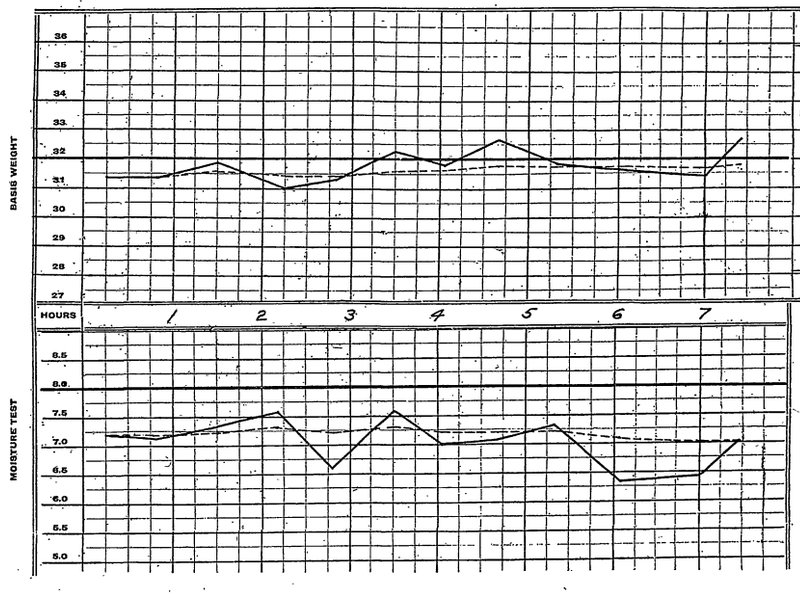
TOUR NO. 2 MACHINE NO. 1 MACHINE TENDER SAWYER DATE Oct. 16 191 7



PROGRESS RECORD		
Items	Day	Period
Weight	85.1	85.0
Moisture	60.0	67.6
Total	72.6	77.8

2

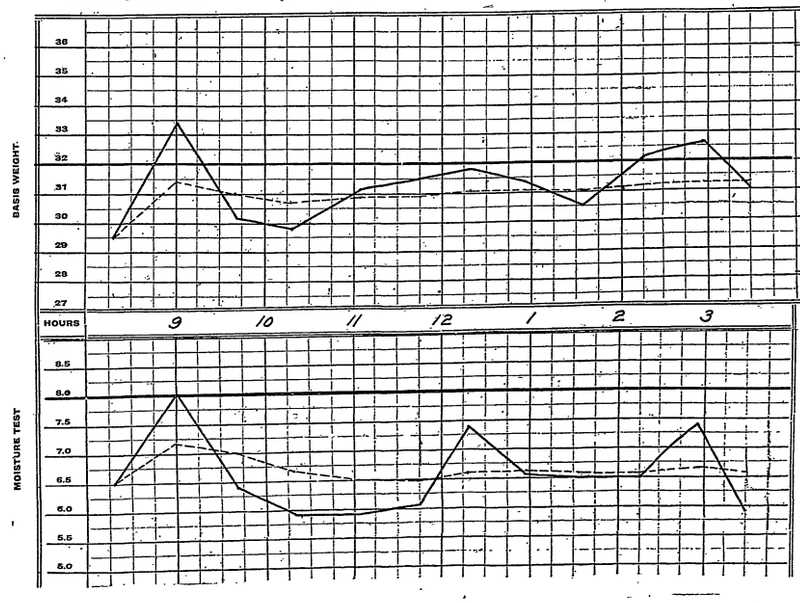
TOUR NO. 3 MACHINE NO. 1 MACHINE TENDER TAYLOR DATE Oct. 16 191 7



PROGRESS RECORD		
Items	Day	Period
Weight	90.0	82.1
Moisture	74.3	72.7
Total	82.2	76.2

3

TOUR NO. 1 MACHINE NO. 1 MACHINE TENDER BENNETT DATE Oct. 16 191 7

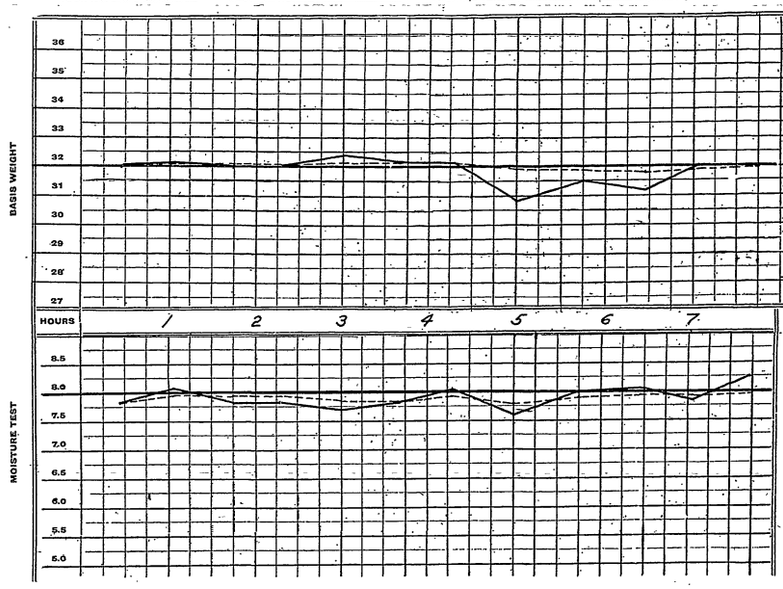


PROGRESS RECORD		
Items	Day	Period
Weight	78.5	79.3
Moisture	64.8	68.6
Total	71.7	73.7

PLATE II

4

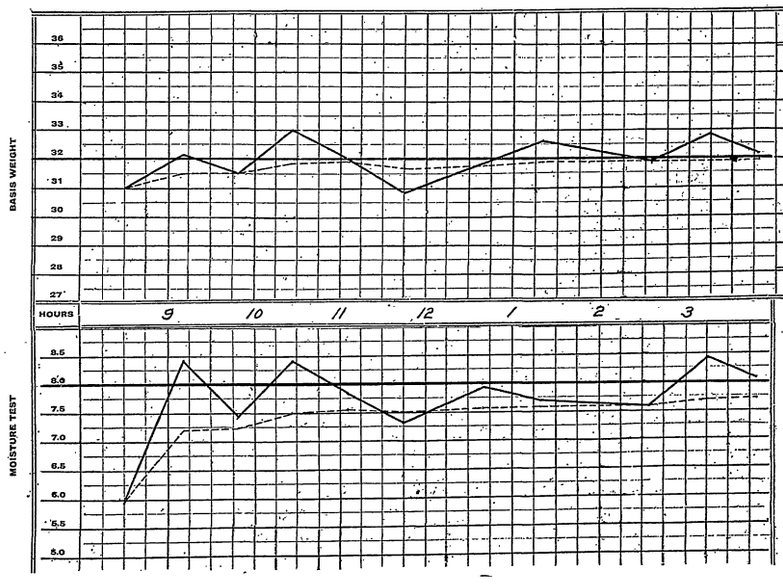
TOUR NO. 3 MACHINE NO. 1 MACHINE TENDER TAYLOR DATE NOV. 27 191 7



PROGRESS RECORD		
Items	Day	Period
Weight	94.5	91.5
Moisture	95.2	91.8
Total	94.9	91.6

5

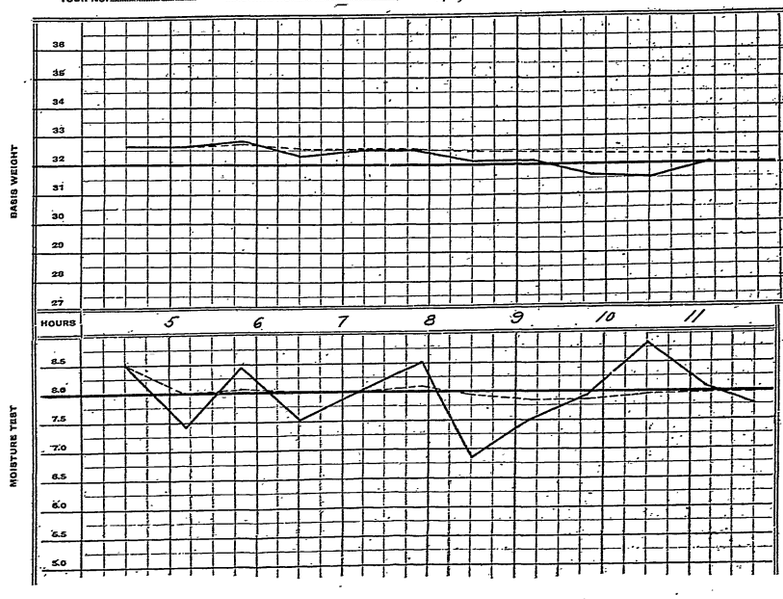
TOUR NO. 1 MACHINE NO. 1 MACHINE TENDER SAWYER DATE NOV. 27 191 7



PROGRESS RECORD		
Items	Day	Period
Weight	89.8	89.8
Moisture	87.0	82.4
Total	88.4	86.1

6

TOUR NO. 2 MACHINE NO. 1 MACHINE TENDER BENNETT DATE NOV. 27 191 7



PROGRESS RECORD		
Items	Day	Period
Weight	92.3	87.3
Moisture	88.8	82.7
Total	90.5	85.0

PLATE III

chart sheet marked "Moisture Test." This, of course, proved to be a wonderful help to the back tender, whose work it is to regulate the steam pressure on the drying cylinders. Before this plan to give the exact moisture test was put into execution, the only way the backtender could tell anything about the moisture content of the sheet was to "feel" it as it passed from the calendar stack to the reel. Of course, no record of this "feel" could be made to enable the backtender to tell how well his work was being done, so there was no particular reason why he should be interested in this part of his work. It is only the exceptional man who has imagination enough to create within himself a consciousness of his progress.

Now this brings me to the "Weight Record" and "Moisture Record" columns. Our view is that every man is entitled to know how well he is doing his work and that it is one of the great moral obligations of the management to furnish him with a means of recording his progress. Aside from the satisfaction it gives the workman it is also a means of eliminating favoritism from the plant, for each man's record speaks for itself. The modern industrial plant with its specialization of functions, where each man does only a fractional part of an operation, no longer allows the operator to leave the impress of his personality upon the work itself. In the old days when the workman made the complete finished article, it literally reflected his individuality, and being a creation of his own mind, he found joy in its production. The desire for self-expression, which is the most fundamental instinct in life, had been gratified through the creation of the article produced.

We must either accept the illogical premise that the combining of men into large industrial production units is contrary to the natural law of life, or we must squarely face the fact that this creative instinct, which the old order satisfied, must be permitted in the new. At first sight this may seem hopeless, but on further examination we find this not at all to be the case. On the contrary, because of the wonderful advance of modern science which has increased the reasoning power of the human mind to a marvelous extent there is vastly more opportunity for the individual to do creative work. We must, however, begin to study the problem with an earnest desire to solve it, for its solution is the most pressing and vital question before the civilized world today. It is with the hope that these examples will help point a way toward the solution of this problem, that I am offering them to you for your consideration.

My attention was called in a striking manner to the increasing interest taken in the problem by the public generally when in Washington a few days ago. While waiting for a trolley on Pennsylvania avenue a policeman, waiting for the same car, remarked to me that the Capitol was a lively place just now; to which I assented, saying it was perhaps a good thing to wake up the old crowd a bit. This apparently met with his approval, for he admitted that the government employees really took little interest in their work. Upon asking him for his explanation of this, he said—and I am giving it as nearly as I can in his own words—"The reason is, that they don't have a chance to express their individuality in the work, so it doesn't interest them."

I mention this incident to call attention to the circumstance that a great many men are thinking along these lines, and even the policeman is becoming a philosopher.

Man never creates matter or force, but he does through his conscious mind create conditions for the expansion and control of these great primary universal energies, and this creative function has as its instrument the originating, choosing and adapting faculty of the human intellect. Suppress, or rather misdirect it—for it cannot be suppressed—as we are so unthinkingly doing in the world of modern industry, and we are simply turning the "will of man" into forces of disintegration, which will eventually destroy society. The only remedy is so to reorganize our business and social systems that the creative power residing in the "will" can become constructive and therefore cooperative with the great natural laws of evolution.

The trouble with the average employer is that he has been so engrossed in the task of creating an efficient organization to express his *own* individuality that he has entirely overlooked the fact that in the creation of this thing he has forgotten to extend the same privilege to his employees. If he only stops to think of it he will recognize at once that he cannot hope to get the initiative of the workman except by giving him a similar privilege of seeing his own creations grow, either by leaving the impress of his personality upon the article produced or upon the progress record of his work.

The workman has combined against the employer in order to obtain the freedom which he sees steadily being taken away from him, as industry tends more and more to make automatons of men; and the unfortunate part of it all is that he has accepted in all too many cases the premise that this tendency is logical and, therefore, inevitable.

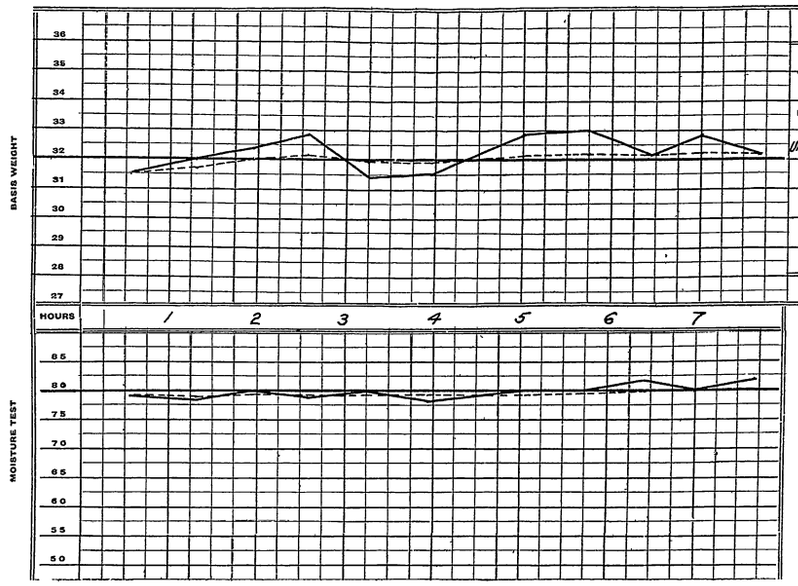
The ideal of some labor leaders inclining toward the socialistic philosophy is that man should be able to produce in a few hours each day all he needs to support himself and his family, and will then have the rest of the day to do as he pleases.

This idea has been strengthened undoubtedly by the workmen seeing men who apparently do little or no productive work, profit out of all proportion to their efforts. Does the remedy not lie in, first, correcting the laws which create special privilege; and, second, in making our economic teaching conform to the universal law of compensation? It can be made plain to all that a man cannot safely consume more than he produces, for the law of the conservation of energy is as exact in its operation in the field of economics as it is in physics. I see no reason why these basic facts of economy cannot be taught by analogy to every one. When they are understood, men will concentrate their organized efforts upon creating an environment which will make work a joyous thing and stop trying to get away from it as so many are now doing. The question of producing what we need for the full enjoyment of life will then be a long way toward being solved. For we will then make the work by means of which we earn our livelihood, a source of joy and inspiration. The illustrations will, I hope, give you a hint of how this can be accomplished, even as industry in the main is today constituted.

Does not the reason that the average employer is opposed to labor unions lie in the fact that he is afraid that the restrictions which he thinks the unions seek to impose will take away his own opportunity for self-expression by preventing him from working out his

7

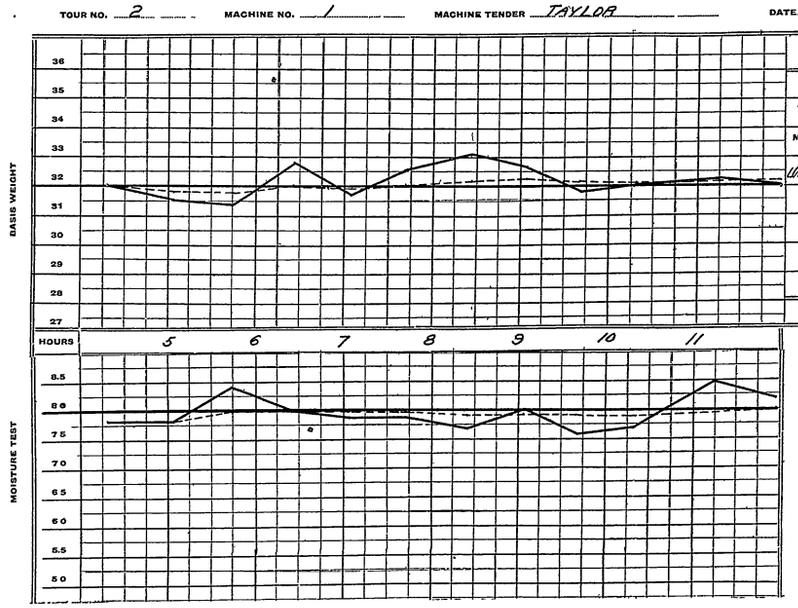
TOUR NO. 3 MACHINE NO. 1 MACHINE TENDER BENNETT DATE May 10 1918



PROGRESS RECORD		
Items	Day	Period
Weight	89.3	88.3
Moisture	97.3	93.2
Uniformity	81.1	86.2
Total	89.2	89.2

8

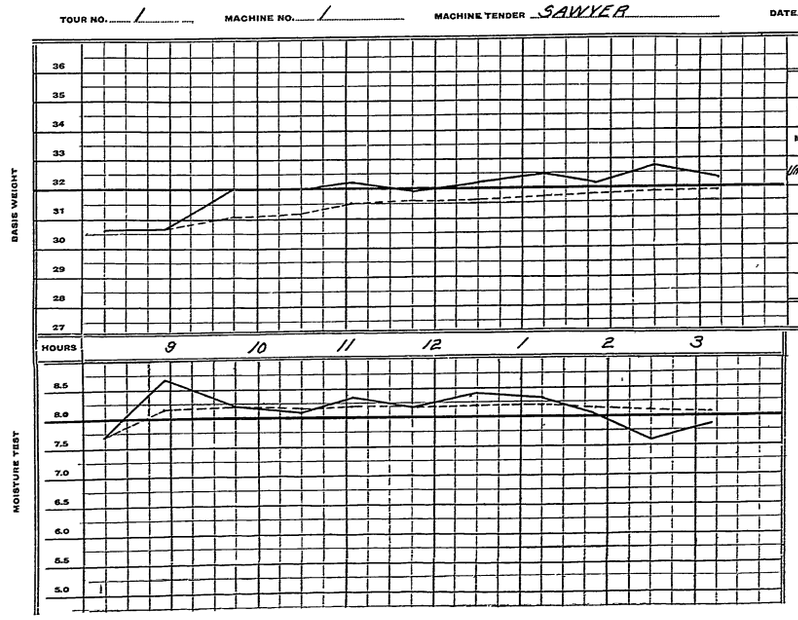
TOUR NO. 2 MACHINE NO. 1 MACHINE TENDER TAYLOR DATE May 10 1918



PROGRESS RECORD		
Items	Day	Period
Weight	92.0	90.9
Moisture	94.4	91.3
Uniformity	85.2	84.5
Total	90.5	88.9

9

TOUR NO. 1 MACHINE NO. 1 MACHINE TENDER SAWYER DATE May 10 1918



PROGRESS RECORD		
Items	Day	Period
Weight	91.1	91.2
Moisture	92.7	88.2
Uniformity	86.9	87.2
Total	90.2	88.9

PLATE IV

individual problems in his own way? Furthermore, if the unions can demonstrate, as they have in our plants, that this fear is unfounded, but that on the contrary their united cooperative effort helps to develop *esprit de corps,* would not this antagonism on the part of the employer disappear?

Now let us examine further the sheet which gives these progress records. The standard of weight being 32lb, we mark this 100, using the same basis of marking as is used in any other educational institution, 1lb heavy and 1lb light being marked 80.

As with the "Total Weight" we naturally must carry an average to date on this record. How this is done, can be readily understood from the entries and needs no explanation. The same method is used for marking the "Moisture Records," except that in this case we mark 8 percent moisture content 100 and 1 percent more or less 80, the average to date for the shift being cumulative also.

Finally this figure is entered up under "Day" in the progress record attached to the graphical charts. This, together with the cumulative weight record, forms the record for the day (the two being averaged). These sheets are checked up by the research department to make sure that they are free from errors, as the men have no confidence in records they feel are not accurate. The chart on the bottom of the sheet is then torn off and the three for each machine (one for each shift), are posted on a bulletin board in the machine room. The record having the best period average appears first, as indicated on the accompanying charts. (See Plates II, III and IV.)

The period is four weeks and the average to date begins all over again at the end of each four weeks' period. The reason for indicating the standing of the men on a period average rather than the day's average is that it tends toward greater continuity of effort, which is a source of much greater satisfaction to the workman. It is the steady progress that really counts and not the spasmodic, spectacular high record for any one day. *The record, to give joy to the worker, must reflect the constant, steady inner urge which indicates the degree of his mastery of the forces he controls in the day's work.*

The improvement in the records from October 16 (made about a week after the recording commenced) to November 27 is very noticeable. The records of May 10, however, show how completely the men became the masters of the machine. From the first three records (of October 16) it is evident that the machine was more or less controlling the men who really formed a part of it. In the last three records (of May 10), however, the machine was completely under control and was literally an instrument for expressing the degree of the man's mastery of the science and art of making paper. The difference is enormous!

The three sets of records of the same machines, and machine crews, on three different dates show the actual results obtained, and I would like to call your attention to the last three of May 10. (See Plate IV). You will note that while at first there was quite a range of difference between the men, that on May 10 the records were 89.2, 88.9 and 88.9 respectively. This shows very clearly that the spirit of friendly rivalry and competition will increase rather than diminish, if only the progress records are made interesting and do reflect the quality of the work. The old idea that competition in the sense of making money is the mainspring of every man's activity, is passing out, for we are realizing that the possessive instinct which economists over emphasized in the past is giving place to the creative instinct. Competition from the purely moneymaking sense is not the life of trade, but rather the reverse.

We do not pay a man more money for a good record but pay the prevailing union scale for all positions in our plants. These are adjusted each spring by joint conferences with our men. In this way we keep a proper wage balance between the different classes of work in proportion to the skill required and as a consequence avoid all the innumerable difficulties which confront the piece work system, task and bonus plan and all other direct payment methods. It is often argued that it is not right to pay a good man the same rate as a poor man and to this I absolutely agree, but the fact is that when these progress records are furnished to men, all men in a certain operating class finally come to be practically equal in performance and the differences will be only between the amount of skill required in each different class of work and in these classes there *is* a difference in compensation. Proof of this statement is brought out by the three records of May 10; but for those who do not wish to take so few examples as conclusive, I would like to say that it has been my experience that invariably the competition is keen enough on all quality records to bring nearly all men, (who have been at the work a sufficient length of time to become expert) practically to the same degree of proficiency.

Every organization should encourage its employees to progress from one class to another, so as to have as many "all-round" men in its employ as possible, and it has been our experience that you can practically always convince a man who asks for more than his particular job is worth, that the way to get more pay is so to master his own job that he can be promoted to a higher class. Men have confidence in a company where promotion from the ranks is the rule.

Perhaps some principle of paying men an increase of a certain amount per hour for each month's continuous service can be worked out between certain maximum and minimum rates. A man would then start in at a fixed minimum per hour and advance automatically to a maximum rate representing the value of his particular occupation as decided upon in joint conference between the employer and employee. This principle is not new in unionism, and is even now operative in some trades.

You will notice that on the record of May 10 there appears a "uniformity record" which was not on the records of October 16 and November 27 (although for the sake of explaining its method of computation it was shown on the large record sheet). This was added because the machine tenders themselves wanted us to find some way of measuring how near they came to having the weight across the sheet uniform. The third column marked "Uniformity Record" (Plate 1) previously referred to, shows how this record is kept. It will be noticed that the three weights are 30.75, 29. and 28.75 the front, middle and back of the sheet, respectively. In obtaining this uniformity record, we take the middle weight as the normal, to which the other two are referred, and for each ¼lb from the normal (not average) we take off 10 points. In this case 29 happens to be normal, therefore,

30.75 = 30
28.75 = 90
—
Total..120
Average 60

You will notice we have kept a number of other lines in the progress record attached to the charts. We did this realizing we would be sure to have requests from our men for other factors which they would like recorded, and while we have not had time to work them out as yet, we have already had a number of suggestions. We find that the greater number of factors or laws that we record, the greater is the interest in the work, because it brings to bear upon the problem a greater amount of thought.

Form M-1. BACK TENDERS MOISTURE RECOR.

Date Nov. 30, 1917

No. 1 Machine.						No. 2 Machine.				
Name	Moisture		Progress Record.		Name	Moisture		Progress Record.		
	Day	Period	Day	Period		Day	Period	Day	Period	
JOANIS	7.9	7.7	94.1	94.2	FRENCH	7.7	7.8	92.7	93.1	
McCLELLAND	8.3	7.8	82.7	83.8	ANDREWS	7.4	7.5	81.8	80.2	
BEAUDOIN	7.9	7.6	89.3	83.5	TALLON	7.4	7.2	84.2	78.9	

The "basis weight" and "moisture test" records had only been operating a short time when the machine-tenders called our attention to the fact that they could get better results if the stock thickness or density furnished them by the beater room was more uniform. They asked us to find some way to measure the thickness of the stock so that the beater engineer could do his work more intelligently. As a result of this suggestion and after discussing the matter with the beater engineer, our research department has tackled the problem of measuring this stock thickness and it is now practically solved. The beater engineer immediately suggested to us that the variation in the stock thickness which was furnished him by the sulphite pulp mill and groundwood pulp mill was not uniform, and that we should find some way of recording the thickness at these points. We found that to do this we had to increase the amount of agitation in the pulp storage tanks, and as a result are making some radical improvements which will tend to produce greater uniformity throughout the entire process. Right here it might be well to call attention to the fact that our experience has been that men do not have to be stimulated to make suggestions by offering prizes. They are glad to suggest improvements, for in this way they are helping to create conditions in the plant which help them to get better results (the results being indicated by their progress records). Then, too, they are sure to receive recognition for their suggestions, for the foreman knows our judgment of his ability depends largely upon how he succeeds in getting his men to use their brains. He naturally hastens to give credit for all suggestions made. Of course, it goes without saying that this greater uniformity is bound to result not only in a better quality of paper, but in increased output as well; in fact our Sturgeon Falls mill, without making any changes in the speed of the paper machines, has already increased its output over 5 percent as a consequence of more uniform operating conditions.

Form M-1. BACK TENDERS MOISTURE RECORD

Date May 10, 1918

No. 1 Machine.						No. 2 Machine.				
Name	Moisture		Progress. Record.		Name	Moisture		Progress Record		
	Day	Period	Day	Period		Day	Period	Day	Period	
FORTUNE	8.0	8.0	97.3	95.5	JOANIS	8.0	7.9	97.5	92.1	
McCLELLAND	8.1	7.9	92.7	92.0	ANDREWS	7.9	7.8	95.0	91.9	
MARCHILDON	8.0	7.8	94.4	90.2	FRENCH	8.0	7.8	95.6	91.8	

We have further made the discovery that what we call the slowness or freeness of the stock has quite a bearing on the quality of the paper as it comes off the paper machines, and as a result we adopted a method which would record this slowness and freeness. By free stock I mean stock that the water leaves rapidly and by slow stock a stock which the water leaves slowly. We found incidentally that this slowness and freeness is one of the best indexes of the quality of the groundwood pulp, and we are now working upon a series of factors which will record the operations of the grinders upon which the wood blocks are reduced to pulp. This work has always been one of the most uninteresting and monotonous jobs in the plant, but from the small amount of work we have already been able to do, we find increasing interest upon the part of the worker, and I feel free to prophesy that when these several factors have been recorded, we will convert this into one of the most interesting jobs in the plant. I base this prophecy on my previous experience at the Burgess Sulphite Fiber Company where we recorded hundreds of operations. These records we found to be grouped under three general classes: *quantity* records, *quality* records and *economy* (or cost) records. Quality records (which occupy the middle position), are, perhaps, of the greatest importance for they bring the individual's intelligence (brain power) to bear upon the problem and as a consequence by removing the obstacles to uniformity of quality, remove at the same time the obstructions to increased output. The creative power of the human mind is, however, not content simply to produce the best quality under existing conditions of plant operation. So the desire to create new conditions for the more highly specialized working out of the natural laws of the process, demands expression and this expression at once takes the form of suggestions for improvements in mechanical devices.

This desire contains within it the germ of economic thought which will unfold and express itself eventually in a request for cost records, and the organization that neglects its opportunity to satisfy this desire is overlooking one of the great avenues leading toward intelligent productive effort.

Because of the interrelation of Quality, Quantity and Economy records, any complete record of individual progress must, of course, take them all into account. However, as this is not always practical we have at least one of three ways of measuring progress always open to us.

As further illustrating the necessity for giving individual records to the men, we discovered that the backtenders who sometimes work on other shifts than their regular ones lost interest in their records to a certain extent when on a different shift and, therefore, a request came to keep the backtenders' records separately, so that no matter what machinetender he happened to be working for, his record would follow him. This was done, and the two records of November 30 and May 10 reproduced herewith, show clearly not only the gains made but the increasing competition for a good record. I would like to say that other factors under control of the backtenders have been already suggested for recording, and these we are planing to work upon as soon as our Research Department has had time to develop a plan.

We had an interesting experience with one of our backtenders which illustrates how men appreciate these progress records. At Sturgeon Falls we have two small 120 in. machines. At Sault Ste. Marie our narrowest machine is 164 in. and the widest 198 in. Whenever we have openings on these wide machines, which pay more money for backtenders, we like to advance our own men. One of our men went from Sturgeon Falls to the "Soo." His machinetender, who told me the story, said he noticed this man ran his paper much more uniformly than any backtender he had ever had as regards moisture test. Upon inquiring where he had learned to run paper so uniformly, he explained that it was at Sturgeon Falls, where they had a "scheme" for letting backtenders know just what the moisture was every time a reel was changed. He said the scheme was "great" and he hoped they would start this same thing at the "Soo."

I referred to the fact that mistakes in records cause a lack of confidence. It may interest you to know how we overcame this trouble by giving "accuracy" records to the "sample tester." This was done by having the Research Department check over the number of mistakes made each day in the "reel record" sheets. A perfect score with no mistakes we call 100; 2½ points were taken off for every mistake. An average of eight or ten mistakes a day was a common occurrence and almost immediately this changed so that today a mistake is decidedly the exception rather than the rule.

At the Burgess plant (and we are now developing the same system at our Canadian mills), the same principle of developing the individuality of each man was extended right up to the department heads, who have complete records including cost sheets of the operations of their departments. We also developed a system of reports for the maintenance and construction crews by giving the men records showing the cost of jobs that they were working on, together with detailed figures of the cost of all the materials they were using. The saving, because of the creative power released, through the aid of these records, was enormous, and the fact that our men did this for us without being paid on a piece-work system, or a task or bonus plan, demonstrates, it seems to me, conclusively that men instinctively desire to do the right thing. and do not have to be bribed (as a workman once expressed it to me) to do good work. It is unnatural for men to work in a negative and destructive manner and the fact that so much of this sort of work is done is not so much a reflection on the individual workman as it is upon the manager who has failed to create an environment in which a man can work intelligently.

Is it not, perhaps, unfair to the workman to hold the "almighty dollar" constantly before him and thereby stimulate his selfish instincts? Our experience at least has demonstrated that it is better to reward merit by promotion and to pay a regular hourly rate of wages; then by means of progress records to help him measure the result of his efforts in such a manner that he is consciously increasing his knowledge of the work. There will be no lack of cooperation in the plant where these principles are used, for goodwill which is based on knowledge will build up an *esprit de corps,* which is not a purely emotional thing that may disappear "over night." It is rather a spirit which recognizes consciously the universality of law and the stability of things generally.

Of course, such vital questions as steadiness of employment, cost of living, and justice in division of

profits—the public included—must be solved. The solution, however, requires democratic cooperation between employer and employee and the elimination therefore of every form of paternalism. The workman must have a chance to express his individuality, and the degree of conscious self-expression which he can attain is in direct proportion to the ability of the organization to measure, for his benefit, the impress of his personality upon it. The most democratic industrial plant, therefore, is the one which permits the fullest amount of individual freedom to each member, irrespective of his position and, at the same time, is so sensitively adjusted that it reflects immediately the effect of his actions. If his actions result in injury to others he will see that, as a part of the whole, he himself must also suffer. An organization of this kind can never be used by the employer to exploit the employee, for it will be continually demonstrating to both that the success of any one part of the organization is absolutely dependent upon that of every other part, and therefore upon the success of the whole.

In conclusion I would like to call your attention to the fact that the great life movement (which brought industry into existence) is not to be recognized in its stationary aspect, i.e., as it is crystallized into the forms of things which we can possess, but in its working, moving aspect that constantly tends toward a fuller, and more complete expression of life. To be conscious, however, this expression must at the same time be individual, so in its working through humanity it can only come to its highest state of development through self-expression, i.e., by release of individualized creative power. This is the reason why, as our knowledge of the great forces of nature increases, we desire more and more to express this knowledge in the creation of conditions (or particular situations) in which we can observe these forces in action, and especially where this action records the degree of our mastery of the law.

As we come into a consciousness of the unity of all life, and see the expression of this unity in the universality of the laws of nature, we know that freedom to express this knowledge in creative work is the only real freedom.

Have we not a right then, to assume that the possessive instinct, which has caused so much unhappiness in the past, is influencing our lives less and less each day, and that the creative, which is the impulse back of all healthy growth, is coming to be more and more the quickening influence, not only in the lives of our leaders, but also in the lives of the workmen as well?

Discussion of Mr. Wolf's Address

Afternoon Sitting

Thursday, May 16, 1918

HENRY P. CARRUTH, President, in the Chair.

After the meeting was opened, the secretary announced a paper by Otto Kress and George C. McNaughton on "The Effect of Varying Humidities on the Strength of Fiber Board and its Component Plies," which he recommended to be read by title, unless there was time later in the afternoon. President Carruth then introduced Robert B. Wolf who addressed the meeting on "Results Obtained in Recording of Operations on Paper Machines," his remarks being illustrated by stereopticon views of progress records, charts, curves, etc. The revised text of Mr. Wolf's address is published in this issue as a separate article. The discussion which followed the exhibition of slides is reported below, as follows:

MR. FLETCHER—You raised a point there where you called attention to the fact that the men were far apart at the beginning and close together at the end. That struck me as very interesting. Naturally the men were working for a good record. Now, as a man goes off a shift, he usually does not inform the man that follows him of the condition of the machine. All of us who handle machines know that there is quite a variation; that it takes a few minutes for you to pick up information regarding the condition of the stock. Now, if the men could realize the service they might render by informing each other, they would keep themselves in closer touch with the work, and if this was done on all three shifts it would improve operating conditions. Unfortunately this friendly spirit does not ordinarily exist. How do you find it where you keep these records?

MR. WOLF—We found, Mr. Fletcher, that when we changed our records from a *quantity* to a *quality* basis that we always got a friendly spirit of rivalry instead of an unfriendly one. It is not exactly what you would call a "sporting spirit," but the kind of spirit which enters into a game which requires brain power. The competition which results has in it most decidedly the element of fair play, which is usually lacking where the competition is on the basis of physical production only.

TOM HARVEY—How often do you take the samples for records of weight and moisture?

MR. WOLF—They are taken every time a reel changes; that is about every thirty-five minutes.

MR. HARVEY—Through the entire twenty-four hours?

MR. WOLF—Yes; we have a man on each shift for every two paper machines. As mentioned previously, these men are members of the labor organizations; naturally there is no feeling that we have some sort of a "follow-up" system but that the entire function of the records is to give more information to the machine crews in order to enable them to do their work to better advantage.

(A member made inquiry at this point regarding the control of the moisture test, but the exact phraseology of his query could not be made out by the stenographer.)

MR. WOLF—Personally, I do not approve of automatic regulation of stock going to the paper machines unless it saves men. I think it is much better to give the man a chance to control the machine than to have it automatically controlled for him.

A MEMBER—I mean the drying end.

MR. WOLF—It seems to me it is much better if the backtender regulates the drying of paper by hand. Our experience is if we furnish the machine with uniform stock that there is very little difficulty about proper regulation of the drying; in other words, the changes are so gradual and slight that they can be easily controlled. And here again, Why deprive the backtender of the privilege of controlling his operation personally?

A MEMBER—I understood you to say you regulate the density of the stock. Do you do that automatically?

MR. WOLF—We have not started this stock thickness regulation, but are installing two Trimby regulators for regulating the uniformity of the stock in the storage tanks, from which it is pumped to the beaters.

MR. HARVEY—Your process is a comparatively simple one. You are running with just one stuff pump and one stuff box board we have as many as seven machines combined in one, there are seven chests, seven stuff pumps and seven stuff boxes to regulate. It is a well known fact, the thinner the paper we are making, the faster the machine is running, the less variation you will have in weights. Our machines instead of running paper at 24x36—30lb, or for example four one-thousandths thick and running 600 ft. a minute run probably 100 ft. a minute on paper which gauges .030 thick, so we have considerable more trouble in keeping our weights correct than you have on a news machine or book machine and this variation of weight is probably caused by the variation of the density in the stock. Is it possible to regulate the density of that stock automatically?

MR. WOLF—Yes, absolutely. Mr. Rhodes of the International Paper Company, who is here, I believe has had some experience with this regulator. Would you kindly tell us about it, Mr. Rhodes?

MR. RHODES—I don't see why the regulator that Mr. Wolf is speaking of wouldn't operate the same for board machines. Do you use a weight regulator on the machine?

MR. WOLF—No, we have not used weight regulators on our machines.

MR. HARVEY—We furnish them three or four different kinds of stock.

MR. WOLF—One man runs all kinds?

MR. HARVEY—Yes.

MR. WOLF—Why not have a different standard to work to for each order, calling the normal weight or the weight desired 100, varying the moisture test in accordance with requirements; for instance, our standard on hanging paper instead of being 8 percent moisture is 6 percent.

MR. HARVEY—What I am getting at, the variation of the weight and thickness of the paper, depends more on the beater man than it does on the machine man, and if we can to regulate the weight on your machines. In making box get away from that variation of the thickness of the stock and variation of beating conditions we can practically eliminate all our trouble as regards variation in weight.

MR. WOLF—There are instruments on the market to record the beating operation. I believe one invented by the Eastern Manufacturing Company and the other by Mr. Green, formerly of S. D. Warren & Company.

A MEMBER—We had great difficulty in getting the stock to a proper density in order to measure it out in the right proportion.

MR. WOLF—I understand the Eastern Manufacturing Company solved this problem by putting all of their halfstuff in centrifugal machines which brought it to a constant density.

A MEMBER—That is what we are doing now. We then have a record which enables us to get correct results. We used a centrifugal pump to work up the stock; that didn't work very well. The regulation of the beater is the proper thing.

MR. WOLF—We have so far not had occasion to record this operation along the lines you mention.

A MEMBER—How about one man leaving his shift without leaving complete information as to what has happened for his running mate? Will these records help you in this?

MR. WOLF—They do. We find when these quality records are posted that men are always careful to leave full information for those who follow them on the machines. It may interest you to know that these records are all finally plotted together on a big record sheet which enables the shift foremen to compare the results of their shifts. We also keep individual records of each machine which enables us to correct mechanical difficulties when the records show that these exist. The whole idea of this grouping of individual records is to get shift and department records which will reflect the individual progress of the group as well. Our progress records as a whole have increased from the original figure of about 70 to something over 90. All these records are available to any man in the organization.

MR. CARRUTH—I would like to inquire if you have attempted to record operations where the records are based on appearances and decided by the personal judgment of the "sample tester." For instance, take the question of finish or formation. This may vary so much as

to completely ruin a sheet and yet so far as I know there has not yet been developed a means of measuring it.

MR. WOLF—We have not worked on this problem but are planning to do so, as it is an important factor. I believe, however, that it will be solved as soon as sufficient study has been put upon it. Whenever records are kept, however, it should be borne in mind that they should be based upon something exact and not mere personal opinion; otherwise, the men will not have any faith in them.

MR. OBERMANNS—I understand that the record of the machinetender is based or determined by his paper weight and the moisture. How do you ascertain the moisture content? It necessarily must be a very fine instrument to determine accurately the moisture content of a sheet of paper.

MR. WOLF—In order to get more accurate results of the weights, we were obliged to design a much more delicate scale than was on the market. The scale we are using is very far superior to the German quadrant scale and was designed by Dr. Thwing of the Thwing Instrument Company, Philadelphia.

A MEMBER—How long does it take to make the moisture test?

MR. WOLF—Fifteen minutes. It really only takes ten to dry out, but we allow fifteen to be safe. Perhaps Mr. Shipman will explain the proceedings in detail.

MR. SHIPMAN—We at first attempted to use a scale where a balance is effected by moving a small rider back and forth on a beam. We found that the sensitiveness of such a scale was insufficient for our purposes inasmuch as, no matter how conscientious the operator, weights varying by as much as half a pound could be obtained on the sample of paper.

We then decided that we should have some sort of direct reading scale. The so called quadrant scale is not sensitive enough to allow for moisture determinations. By this, I mean we decided in order to save time in the manipulation to use the wet and dry basis weights for calculating the percentage of moisture in the paper. A simple calculation will show that if either your wet or dry basis weights are in error by as much as half a pound that your moisture determination will be in error by over 1 percent. Inasmuch as your total range of moisture content is only from around 6.5 percent to around 9 percent an error of 1 percent is not allowable.

It was necessary therefore to design and build an entirely new type of direct reading scale whose readings should be sensitive to one-tenth pound basis weight.

We have five of these scales in constant daily operation and they are giving very good satisfaction, being both fast and accurate.

With regard to the drying of the samples of paper for moisture determination, the problem was to be able to dry six sheets of newsprint 24x36 inches and do it in fifteen minutes since the reels were finished in about that time on the paper machines. The oven is an ordinary galvanized iron box, heated with two layers of ¾ inch steam coil to a temperature around 240° Fahr. The air in the machine room being too damp to fully dry the samples, we built a small brick chamber, set the oven on top of it and ran a pipe from the bottom of the chamber to the finishing room taking our air through this pipe. In order to make sure that our air was sufficiently dry to carry off the moisture quickly we built a shallow box, twelve feet long, divided into two compartments one over the other, filling each compartment with quicklime. The air for drying the samples is drawn through both these compartments and dried by contact with the lime. It is then blown by a small 2 inch direct connected blower to the brick chamber underneath the oven. In this way a slight air pressure is always maintained on the oven so that no damp air from the machine room can enter the oven through the cracks around the doors. An outlet on the brick chamber allows for readings with wet and dry bulb thermometers to indicate when the quick lime has been spent in its absorbing power.

The above air-drying apparatus was installed at only one of the plants and tests are being made with it to determine whether it is necessary to employ such an apparatus. This point is not yet fully determined.

(At this point a slide showing the scale was thrown on the screen.)

MR. KLUND—With a system of this kind based on the records of the individual machines, do you find that any jealousy exists between tenders of machines that may be side by side? In our own mill the tenders of adjoining machines are expected to assist each other in case of trouble.

MR. WOLF—I can only give you the results of our actual experience. We never have any of these jealousies which cause hard feelings when the records are on a quality basis. I believe, as I have said before, that *quality* stimulates the intellect, whereas *quantity* does the physical or lower animal nature. A man instinctively begins to realize that only as he cooperates with his fellow man can he have the greatest possible amount of freedom for his individual development. This conception comes to him through the use of his intellect and for this very reason the quality records which stimulate the intellectual faculties are bound to produce in him a larger social consciousness which makes him less selfish and more anxious to cooperate in a larger way for the benefit of the whole. When the man in the groundwood mill becomes conscious of the trouble he is causing a man in the beater room if he doesn't run his stock uniformly, he naturally is more careful, especially if the care that he exercises is being recorded for him in the progress record. This is also true of the man in the beater room when he becomes conscious of the effect of his work upon the machinetender. A spirit of unfriendly rivalry simply cannot exist in a plant where the "will of man" is operating in this conscious manner.

(This brought the discussion of Mr. Wolf's paper to a close, and after making a few announcements regarding registering, etc., Chairman Carruth called upon George E. Williamson to present his paper on "Modern Methods in a Paper Mill Boiler Plant."

DISCUSSION OF BOILER PLANT METHODS

The following discussion of Mr. Williamson's paper, then ensued:

(The text of Mr. Williamson's paper will be found in PAPER for May 22, 1918.)

MR. KRESS—The gentleman who was to open the discussion asked me to take his place. There is hardly anything that I can add, and I would like to say that Mr. Williamson's paper is now open for discussion.

J. H. WRIGHT—In getting your records of CO_2 gases, do you employ a recorder?

MR. WILLIAMSON—We do not have a recorder. We had an old style recorder, which became a nuisance. We have now an ordinary hand sampler and collector, and we have pipes running from each boiler uptake to our control board.

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NON-FINANCIAL INCENTIVES

By Robert B. Wolf,[1] Sault Ste. Marie, Ont., Canada
Member of the Society

The author contends that creative work by the workmen in the industries is not only possible, but that with it there can be introduced a personal interest in the work alike beneficial to the employee and employer.

Accounts are given of instances where this has been accomplished, through supplying foremen and workmen with information upon costs, methods of operation, possibilities in the direction of economy and efficiency, etc. Progress records are also furnished so that the employee will know from day to day how he is improving in the mastery of the process upon which he is engaged.

Freedom to express one's individuality in constructive work, properly restrained by law, is considered by the author to be essential.

THE basis of all "non-financial incentives" is interest in work. Interest in work implies a desire to produce actuated by internal motives rather than external discipline.

2 Production means creation and the industrial creative function in man is a mental process and lies in his intelligent adaptation of means to ends. It is useless, therefore, to look for real creative work unless the workman has a chance to think and to plan; any other working environment either fails to attract or actually repels the workman, and as a consequence offers no incentive to increased effort.

3 Work which does not call for thoughtful reflection, and which uses only muscular effort, tends to draw man down to the level of the brute and makes for industrial irresponsibility and consequent social disorganization. The unthinking man cannot be a responsible man.

4 It is the self-conscious faculty of man which distinguishes him from the animal and makes him above all a creative center through which the universal life giving power can deal with a particular situation in time and space.

5 To use a homely illustration with which every one is familiar

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— the traffic at each crowded street crossing cannot be regulated from the City Hall; it requires an individual (the traffic policeman) in the congested spot to deal with each particular situation as it arises, and upon his powers of observation and selection depends the orderly flow of traffic.

6 It is only through the individual life that the universal life can act and therefore the universal is compelled to evolve many individual lives if organization and order are to replace the unorganized state represented by the purely generic operation of natural law.

7 The problem of social organization is, then, how to organize society upon the basis of respect for the individual. This is also the industrial problem as well, for industry in the broadest sense is society in its highest form of activity because it is essentially constructive and therefore creative activity.

8 It was an inevitable corollary to the universal plan of creation that the individual life came into being not to create material substance, as that had to be before individual life could gain consciousness. The function of the individual life, however, is to create by a thought process conditions especially selected to produce results which nature unaided would fail to produce.

9 This is what the horticulturist does. His power lies in his knowledge of natural law and his creations are made possible because he conforms to the law. The uncultivated orchard reverts to its original wild state when no longer attended by man, but increases in productiveness by continued thoughtful application of man's power of selection and adaptation.

10 It is by a similar process of conscious selection that such devices as the steamboat, steam engine, electric generator, and the telephone came into existence. They did not come into being and never would have been created by the generic operation of nature's laws.

11 To illustrate further: the desire of the savage to cross a body of water too wide for him to swim caused him to observe the floating of things which floated naturally. As a result of this observation he built a raft; and finally, by further observation, he discovered the principle that any thing which, bulk for bulk, was lighter than the water it displaced would float, and although he perhaps unconsciously applied this principle, it is true that from its application he evolved the canoe.

12 It is by a continuation of the application of this same law that, almost within our own memory, it has been made possible for

the vessels of the world to be built of iron, something which the old shipbuilders thought impossible. We see then that it is the application of the personal factor that now makes iron float by the use of the very same law that makes it sink.

13 Upon a higher plane, the modern electric generator was evolved by observing that a wire passed at right angles through a magnetic field would induce an electric current to flow through it in a certain direction.

14 It was only by creating, through the application of the personal factor, conditions by which this law could be expanded that electricity was generated commercially. The electric generator is nothing more than a large number of such wires, insulated one from another, passing in and out of a number of magnetic fields, plus a device for collecting and conducting away the current generated. The important point to remember is that there never would have been an electric generator without the introduction of the individual personalities who literally created it.

15 In this connection it is well to observe that all of our creations, if they are to be successful, depend upon the strict observance of the laws of nature. When we clearly see man's place in the universal life movement we can understand why it was that in the long process of evolution it was inevitable that a being capable of measuring by reflection be evolved. The very word "man" is derived from an Arian root meaning to measure.

16 All this may seem at first sight far removed from the problem of "non-financial incentives," but it seems to me it is necessary before proceeding further to gain some conception of the reason for man's existence. The concrete illustrations of the operations of non-financial incentives will then have greater meaning.

17 Man, through the exercise of his intellectual faculties so laboriously acquired through ages of slow evolution, literally reflects the universal creative process upon the plane of the particular. There can be no organization of material substance except through an individual who can observe the laws inherent in the materials themselves. Then, by a process of reflection, these materials can be organized into forms which they could not take unaided by the individual will or a power external to themselves.

18 To state the matter more concretely: man, we know, cannot bring matter into existence, neither can he create the force which resides in the physical elements he uses in the day's work; what he does is to observe nature's forces in action and then, having learned

the laws, i.e., the reasons for their action in any particular direction, he seeks for means to make them express themselves more fully.

19 This, of course, necessitates the creation of conditions which do not occur spontaneously in nature. We have here the beginning of what we call the artificial and it is significant that the highest type of this form of creation, upon a higher plane than the natural, is termed art.

20 This creation of artificial conditions which, taken all together, we call civilization is of course the product of man's organizing power. While self-consciousness, the power of realizing the self as apart from the rest of the universe, has been a human faculty for untold ages before the present highly-organized state of society had been attained, it is nevertheless true that now, for the first time in the history of the white race, we are confronted with the problem of correcting the repressive or selfish character of civilization so that it will serve the mass of humanity. If we fail to accomplish this it will be destroyed by the same creative power which brought it into existence.

21 We must learn how to change the industrial environment from one which repels mankind to one which attracts. In other words, the incentive to work must be inherent in the nature of the work itself.

22 Now what are the conditions which we must meet in the industrial world to make work attractive? We have ample evidence that increasing financial returns have failed to stimulate productivity and, on the other hand, the constant demand for shorter hours and the increasing labor turnover is proof that work in most of our industries not only does not attract but actually repels the workman. We must therefore look into the working conditions themselves for the answer. This is the only scientific method of procedure.

23 I would like to quote from a letter received from a very intelligent labor leader recently,[1] to show how the mass of employees look at the problem and how urgent is the need for its immediate solution if we are not to have a greatly reduced production of the necessities of life brought about by the concerted action of the workers —

> Is it not true that the industrial evolution which has brought the trusts into existence has been the means of eliminating the "human touch" in industry? During the days of small industrial plants, the employer and the employee, of course, were really fellow-workmen. At the present time, however, the employee has perhaps never seen any of the stockholders of the industrial plant where he is employed.

[1] John P .Burke, Int. Pres., Pulp Sulphite and Paper Mill Workers Union.

You say that: Men can be productive only when they take an interest in their work and they will not take this interest unless those entrusted with the direction of their efforts realize that they must teach them constantly how to exercise their creative powers.

While I agree with everything you say relative to creative work and have thought along these lines considerably myself, still, is it possible in industries, as they are constituted at present, to enable the average workingman to do creative work? Isn't it true that industry is becoming so specialized that the workman is no longer a creator? I realize that while it may still be possible for the workman doing certain jobs in the mill to do creative work, to a certain extent, still isn't the tendency of modern industry more and more toward making the workman simply an appendage of the machine?

In the paper you sent me, you described how you designed a plan for the men operating the hydraulic press to take an interest in their work. This certainly is a practical illustration of what can be done, and perhaps could be cited as a refutation of what I have just written above. I realize that there may be certain jobs in the mill where the creative powers can still be allowed to develop, and that the workman may be given a chance to express his individuality, but the point I am trying to bring out is that the tendency of *modern industry* is away from creative efforts and gives the workman less and less opportunity for individual development. When I worked in the factories, which I did from the age of 12 to 25, one of the things I found the most dissatisfaction with was the deadening sameness of the work. I never remember a time, when working in the factories, that I became so interested in my work that I didn't long for quitting time to come. After leaving factory work I got a job with a building contractor. As I became more proficient as a carpenter, I have time and again been put doing certain work that was more or less creative, in which I have become so interested that I paid no attention to quitting time and have worked for two or three hours after the time when I might have quit work. There is joy in creative work. But, in my opinion, no matter what schemes we will try to devise, modern industry is going to tend more and more to make simply automatons of men.

I may say, however, that I could find very little to criticise in either of your articles. You have demonstrated, from practical experiments, things that I have often theorized about. The conflict in industry during the next few years, in my opinion, will be between the democratic and autocratic ideas. The autocratic idea, I think, is best exemplified by the German military machine.

24 I was able to convince the writer of the letter from which I have just quoted that creative work could be done to a great extent in modern industry, and, further, that this could be accomplished, without any radical changes in equipment, greatly to the advantage of both employer and employee.

INDIVIDUAL PROGRESS RECORDS

25 To do this, individual progress records are necessary so that the workman can know from day to day how he is improving in the mastery of the process.

26 The first example, illustrated by Fig. 1, is from that branch of the wood-pulp industry known as the sulphite process and shows

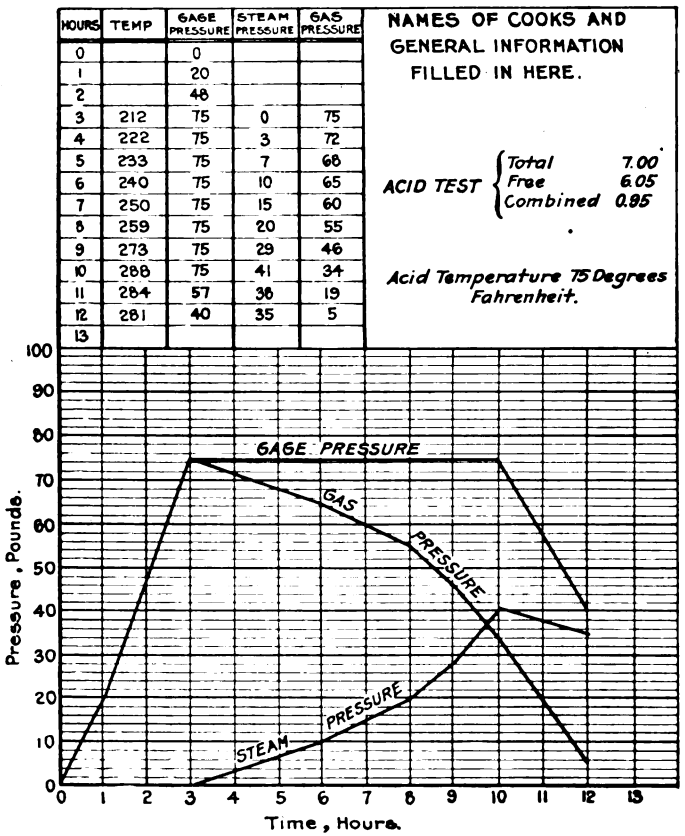

FIG. 1 REACTION IN DIGESTERS IN WHICH WOOD CHIPS ARE COOKED

a cooking chart which was designed to give the cook information about the reactions in the digesters in which the wood chips are cooked in a 6 per cent solution of sulphurous acid partly combined with a lime base.

27 The digesters have a conical top and bottom and are usually 50 ft. high by 15 ft. in diameter. After the acid and chips are put

into the digester and the cover is put on, steam is turned in at the bottom and the pressure brought up to 75 lb. per sq. in. above atmospheric pressure.

28 As this does not heat the digester sufficiently to produce disintegration of the wood, it is necessary to relieve gas through a relief valve on the cover. Because of the removal of this gas, which is afterward reclaimed, more steam can come in at the bottom and thus the temperatures are advanced. The skill in cooking consists in the proper control of the relief valve.

29 Before the introduction of these cooking charts illustrated by Fig. 1, all this was left to the unaided judgment of the cook with usually nothing to help him but a small hand thermometer and a pressure gage. Of course, great variation in the pulp was the result. The cooking charts, plotted by the cooks themselves, however, helped greatly as they enabled the quick visualization of the work. On these charts temperatures are converted to pressures for the reason that the pressure in the digester comes from two sources, one the natural pressure due to steam, and the other due to the sulphurous-acid gas. The pressure, for instance, which would correspond to a temperature of 212 deg. would be 0 or atmospheric, yet from the chart you will see that the gage pressure actually showed 75 lb. The difference between 0 and 75, therefore, is caused by the presence of sulphurous-acid gas. As the cooking progresses, the gas is naturally used up; first, by being relieved for the purpose of making room for more steam; second, by the natural combination of the acid with the organic compounds liberated during the cooking process.

30 At the end of the cooking process the gage and steam pressures will naturally come very close together as the greater part of the SO_2 gas has been used. The gas-pressure curve is obtained by subtracting the steam pressure from the gage pressure. It is really a resultant of the other two. If it drops too rapidly the cook knows he is relieving his digester too hard and checks the opening of the relief valve. If it does not drop rapidly enough he knows he must open the valve wider in order to increase the relief. Of course, the figures are taken from recording instruments which are checked daily to insure accuracy. Naturally, an ideal cooking chart was soon formed, being the joint work of the cooks handling the digesters and of the chemical research department.

31 Immediately after the introduction of these charts a very marked increase in the uniformity of the pulp was noticed, and the cooks, while at first opposed to the new method of "cooking with a

lead pencil" as they called it, soon learned to like their work much better for the reason that they now had some way of visualizing the work in its entirety. In addition to more uniform quality of the pulp, the yield from a cord of wood increased something over 5 per cent.

CONTINUOUS PROGRESS RECORD

32 We soon found that it was necessary to give some sort of continuous progress record if we were to keep up the interest in the work, because no man could carry in his mind anything but a general impression of his progress from day to day. Several good records for one day are only like so many good golf drives. They are a source of satisfaction at the time, but just as the score in golf denotes our real mastery of the game, so does the progress record measure the man's increasing mastery of his work, and we feel that it is one of the moral obligations of the management to keep such records for the individual workman. Without these records men will not think of improvements in the process and they cannot be blamed for becoming indifferent. How long, for instance, would a superintendent or manager retain his interest in the economical operation of his plant if his cost sheets were withheld? We, as executives, must have quantity, quality, and economy records, otherwise our interest soon lags. Why, then, should we expect the workman to be interested when he is not furnished with a record which at least reflects one of these elements?

33 Such records can be grouped, under three main headings: quantity records, quality records and economy or cost records. Quality records, which occupy the middle position, are, perhaps, of the greatest importance for they bring the individual's intelligence to bear upon the problem and as a consequence, by removing the obstacles to uniformity of quality, remove at the same time the obstructions to increased output. The creative power of the human mind is, however, not content simply to produce the best quality under existing conditions of plant operation. The desire to create new conditions for the more highly specialized working out of the natural laws of the process, demands expression and this expression at once takes the form of suggestions for improvements in mechanical devices.

34 This desire contains within it the germ of economic thought which will unfold and express itself eventually in a request for cost records, and the organization that neglects its opportunity to satisfy this desire is overlooking one of the great avenues leading toward intelligent productive effort

35 Because of the interrelation of quality, quantity and economy records, any complete record of individual progress must, of course, take them all into account. However, as this is not always practical we have at least one of three ways of measuring progress always open to us.

36 Table 1 shows how we keep a continuous progress record of the work which is mainly one of quality. By quality I do not necessarily refer to the quality of the material produced, as most of our records refer to the quality of the work performed; in other words, the nearness to which the workman approaches the ideal standards which he has helped to form. The democratic coöperative forming of these standards by the joint work of the trained technician and the practical workman is absolutely essential, otherwise continuous progress will not be made. The whole plan must be really educational in nature and to be so the records must record the natural laws of the process and the individual's degree of control of forces in the material elements that he is using. The more factors that can be recorded, the greater the interest in the work. The reason for this is obvious.

37 Referring again to Table 1, it will be noted that there are nine men cooking. These men are posted in the order of seniority, with the highest monthly record on top. There are three foremen at the top of the record. Each of these foremen has three cooks under him and their standing is made up by taking the average records of the men under them. In this way we are enabled to get not only the individual records of the men, but the group, or team-work records, as well. The lower group is merely for the convenience of the department head in charge and gives the relative standing of the large, medium, and small digesters. This is irrespective of the men who are working on them.

38 The total progress record figures in the first column are made up of the temperature, color, time and blowing records. The relative values that these have in the total record are shown at the top of each column, the total adding up to 100. The small variation in the monthly average column is characteristic of all our progress records, and shows how great is the incentive when individual effort is intelligently recorded.

39 The temperature record is obtained by taking half-hourly readings from the recording-thermometer chart, upon which a standard temperature curve has been plotted, calling each reading which happens to fall on the standard line 100, and a reading 20 deg.

TABLE 1 RECORDS OF INDIVIDUAL COOKS

Date, June 2, 1916.

Name	Total Progress Record		Relative Value 50		Relative Value 35		Relative Value 10		Relative Value 5		General Information					
			Temperature Record		Color Record		Time Record		Blowing Record		Average Maximum Temp.		Average Test 5th Hour 1.25		Average Test 6th Hour 0.80	
	Daily Avg.	Mo. Avg.	Daily Avg.	Mo. Avg.	Daily Avg.	Mo. Avg.	Daily Avg.	Mo. Avg.	Daily Avg.	Mo. Avg.	Daily Avg.	Mo. Avg.	Daily Avg.	Mo. Avg.	Daily Avg.	Mo. Avg.
Myler	88.2	88.3	84.8	85.9	99.3	98.3	90.6	88.6	58.8	59.5	293.6	294.7	139	134	100	103
Duggan	86.2	87.7	81.8	85.1	96.4	97.7	95.3	91.9	59.2	60.8	299.0	298.5	134	133	96	95
S. T. Ellis	85.8	87.1	79.1	83.2	98.8	97.7	95.1	93.8	57.9	59.7	299.8	299.6	125	129	101	102
Rodgerson	86.7	89.3	83.3	88.2	99.2	99.0	92.5	88.8	64.3	62.1	296.2	294.7	161	134	105	103
J. P. Ellis	89.5	88.7	87.2	86.8	96.7	97.7	96.7	94.8	56.3	62.0	294.7	297.2	123	129	94	96
McKee	88.8	88.3	84.8	86.0	100.0	98.9	90.5	90.0	56.4	59.9	294.4	294.7	132	133	96	101
Teeling	88.0	88.2	84.2	85.9	100.0	98.5	92.8	90.7	62.0	61.0	299.5	298.3	128	135	91	104
McKelvy	83.1	87.1	77.1	84.4	96.0	97.8	93.3	89.0	62.0	60.5	204.3	298.8	122	129	96	97
Element	84.9	87.2	79.1	83.8	96.7	97.7	95.2	92.2	59.3	59.9	297.8	299.7	130	131	98	95
McLean	83.9	87.2	75.3	81.9	98.8	99.1	97.8	93.3	59.2	57.8	306.4	302.1	137	134	109	102
Johnson	85.4	86.4	77.9	82.2	97.5	96.1	94.4	97.0	52.3	60.2	294.5	296.3	136	131	102	101
Neil	89.2	86.1	89.2	86.1	86.3	83.7	98.8	96.8	54.6	56.3	289.3	294.4	130	133	100	105
Large	86.6	87.4	82.0	85.5	98.5	98.3	91.9	87.0	59.8	59.9	299.0	296.4	129	133	95	100
Medium	87.2	87.9	83.3	85.7	98.5	97.7	94.9	91.8	58.6	61.6	298.2	296.9	134	132	99	99
Small	85.9	86.5	80.1	83.1	98.2	97.9	94.9	88.3	57.6	58.3	298.4	299.3	131	133	102	100

either side of the standard line 0. This means that for each degree off of the standard, 5 points are deducted from the progress record.

40 The color record indicates how near the men come to blowing the digester when the color of the liquor shows the proper amount of lignine in the solution. The sample, drawn from the side of the digester, is compared with the standard color. To get a mathematical value for this factor a range of colors from a very dark to a very light was obtained, the particular shade which was taken as standard marked 100 and one shade either side 10 points less than 100.

41 The time record is obtained by calling a certain time of cooking 100 and taking off on each digester cooked one point for each minute above or below this standard.

42 The blowing record is obtained by calling 30 lb. pressure 100 (most of the cooking being done at a pressure of 75 lb. per sq. in.) and 60 lb. 0, the idea being to get the pressure as low as possible before blowing the digester.

43 It will be noted that the temperature value is higher than any of the others. This is because it is the most important element. The color record coming next in importance is given the next highest value, etc.

44 By an arrangement of this sort, by simply changing the relative value of the different factors, it is possible to emphasize any particular phase of the work. The men willingly pay the greatest attention to the factor that has the greatest value because it gives them the better record and because they know the reason for the change. For instance, if it is desired to emphasize quantity, we give a larger value to the time record and a lesser value to the temperature record. Production is then somewhat increased at the expense of quality.

45 While I could give many illustrations similar to the one just given of our cooking operations, I will give only one final illustration of how economy progress records meet with equally great response. In the plant where this system was developed were employed over 1200 men and perhaps half of these men had individual progress records and the rest came under some sort of group-progress record. Invariably the records proved themselves to be an incentive to greater productivity.

COST RECORDS OF WORK

46 Below is shown a foreman's detail job sheet which indicates the method we had for giving our maintenance foremen cost records of their work. It is obviously a difficult matter when dealing with maintenance and construction work to give quality or quantity records as the work varies so much from day to day, so the only kind of records we could give the men were records of cost. The original suggestion to give these records grew out of the fact that we gave to each operating department head a complete cost of operating his

FORM NO.8

FOREMAN'S DETAIL JOB SHEET.

Job 2771 Foreman John Laffin Date 1/10/16

Name of Job Install 2-35 Hp. Motors on Coarse Screens in West Mill.

Description Electrical Dept.-Power Wiring.

Date Started 1/7/16 Worked on 4 Days

Labor Cost to Date	31.6
Material Cost to Date	7.38
Total Cost to Date	38.54
Labor Cost Yesterday	0.80
Material Cost Yesterday	6.41
Total Cost Yesterday	7.21

DETAIL OF MATERIAL USED YESTERDAY.

ITEMS.	PRICE.
2-1½" Long-Turn Elbows,	0.51
4½ lb Solder,	1.23
4-1½" Type E Condulets.	2.02
4-1½" 4 Hole Porcelains,	0.64
1 Roll Oiled Lined,	0.24
1 Roll Friction Tape,	0.11
16-100 Amp. Terminals,	1.66
	$6.41

FIG. 2 FOREMAN'S JOB SHEET

department for which he was held responsible. As soon as he began to realize this responsibility, because all the repair materials were charged to him, he at once began to make intelligent criticism of the engineering department, and especially was he critical of the maintenance foreman if he was wasteful in the use of materials. As a result of this, the maintenance foremen asked the master mechanic if they could not have job costs showing how economically they were doing their work as they had no idea of the value of materials that they were using. The foreman's detail job sheet shown is the result of this request. It will be noted that the job is fully described, the total

cost for labor and material to date is given, as well as the cost of labor and material for yesterday. Then below is listed the itemized cost of all materials used. The men soon became educated as to the value of the materials they were using and we noticed a great change in the amount of waste; in fact, we had frequent cases where maintenance foremen would bring scales into the mill to make sure that the storehouse was giving them full measure of materials and we were soon

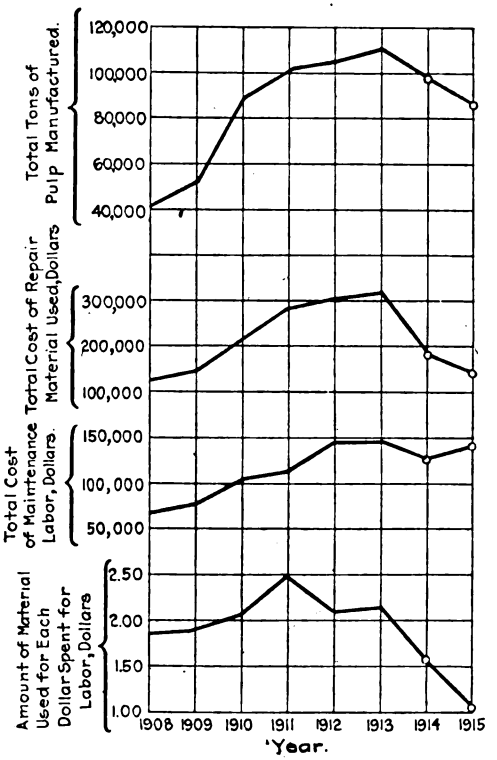

FIG. 3 SHOWING CONCRETE RESULTS OF COST SHEETS

obliged to get up a system of giving credit for material returned to the storehouse in order to help foremen keep down their job costs. This was in no sense a form of contract system, for all of our maintenance and construction men were paid by the hour and did not receive any more money for doing a job economically.

47 Fig. 3 shows the concrete results obtained by giving the cost sheets to the department heads and job costs to the maintenance

foremen. It will be noted there was a rapid increase in production from 1908 to 1913, also a rise in repair material used as well as an increase in the cost of maintenance labor. The fourth curve, showing the amount of material used for each dollar spent for maintenance labor, is more or less a resultant of the other two. The gradual rise from 1908 to 1911 in this curve was due to the increased material-consuming power of the maintenance men because of the introduction of labor-saving devices, such as pneumatic and electric portable tools. There was a drop in this figures in 1912 and 1913 but we were unable to get a real thought of economy started in the plant until the departmental cost sheets and job-cost sheets were started. These were put into effect first in the beginning of 1914 and there was an immediate drop in the curve from an average of about $2.15 worth of material spent for each dollar spent for labor, down to $1.55 in 1914 and $1.05 in 1915.

48 That this drop is due to the greater economy and thought in the use of materials is indicated by the fact that our maintenance crew was not very much reduced, the saving coming almost entirely in the use of materials.

49 The drop in production in 1914–15 was due to war conditions which were unavoidable. It is a significant fact, however, that in spite of this drop in production the maintenance material cost per ton of pulp was reduced to approximately half the amount under the conditions of higher production during the two preceding years.

50 In none of this work did we pay bonuses to a superintendent, department head or workman; our salaries and wages were high, but payments were all on a monthly, weekly, or hourly basis. The increased effort therefore came entirely from a desire within the individual to be productive. Of course this sort of creative effort produced great changes in operating conditions; we increased our yearly production from 42,000 tons to 111,000 tons without adding to the number of digesters for cooking the pulp, or wet machines for handling the finished product and we changed our quality from the poorest to the very best.

51 Due to the intelligent suggestion which came from our men all over the plant we were able to make very radical changes in the manufacturing processes. Entirely new methods of preparing our wood, making acid, bleaching, etc., were created, all of which we paid for out of the earnings.

52 I maintain that this was all the result of the freedom our men were experiencing because they were working in an environment

which stimulated thinking. They had ample opportunity constantly to increase their knowledge of the underlying natural laws of the process, and were therefore able to realize the joy which comes from a conscious mastery of their part of the process.

53 This freedom to express one's individuality in constructive work according to law, is the only real freedom, for freedom unrestrained by a consciousness of the universality of natural law leads to anarchy.

54 We should never lose sight of the fact that the degree of conscious self-expression which the workman can attain is in direct proportion to the ability of the organization to measure, for his benefit, the impress of his personality upon it. The most democratic industrial plant, therefore, is the one which permits the fullest possible amount of individual freedom to each member, irrespective of his position and at the same time is so sensitively adjusted that it reflects immediately the effects of his actions. If his actions result in injury to others he will see that as a part of the whole he, himself, must also suffer.

55 I have made no attempt in this paper to touch upon our method of arriving at the proper financial compensation as this is beyond the scope of the subject assigned to me. I feel that I should state, however, that in our mills in Canada, where the same scientific recording of operations is being developed, our wage rates are adjusted each spring after careful discussion with the representatives of our local labor organizations. This has proved to be a very just and satisfactory method, for the rates thus determined are really a consensus of opinion of both employer and employee and once the wage question is disposed of, all are free to devote their energies to the intelligent solution of manufacturing problems. Constant agitation of the question of financial renumeration only detracts from the work, and our experience has invariably been that there will be plenty of incentive to productive effort if the working environment is such that the workmen can express himself as an intelligent human being.

56 Man is not an animal, but a free, self-determining mental center of consciousness whose reason for existence is that the universal life can deal with a particular situation in time and space and, by this means, be enabled to evolve a material universe organized to express the one great individual life of which we are all a part.

57 In conclusion, let me say that I am well aware that to some of you this may seem like pure philosophical speculation far removed from the practical affairs of every-day life. I have said nothing, how-

ever, that I cannot back up by any number of additional illustrations, and my hope is that the examples given will stimulate others to make similar investigations, so that we can fulfill our mission in this country by evolving an industrial philosophy which will have for its ultimate aim the continuous unfoldment of the latent powers in man.

DISCUSSION

WALTER N. POLAKOV, who opened the discussion, said that the impression should not be gained that financial incentives are not important or even superfluous as long as non-financial incentives are at work. To illustrate his point he showed on the screen three charts dealing with fuel losses in a power plant. In the first chart, with neither financial nor non-financial incentives at work, the loss amounted to over 30 per cent. In the second, with non-financial incentives only, the loss had been reduced to 17 per cent, while in the third, with both financial and non-financial incentives, the preventable losses had been wiped out. The type of chart employed by Mr. Polakov is that shown in Fig. 2, page 718, *ante*.

W. E. PULIS, who followed Mr. Polakov, showed two slides dealing with the increase of production in a shop brought about by the introduction of financial incentives.

IRVING A. BERNDT [1] wrote that he was particularly impressed and in accord with what Mr. Wolf had said concerning the necessity of providing workers with environments which attract, and providing incentives inherent in the nature of the work itself. This was fundamental and basic. Were he to add any thought to this, it would be that the responsibility for this lay with the individual employer, manager and executive and should under no circumstances be passed on to society or to the worker himself. To show how large the non-financial incentive bulked in the production problem, Mr. Berndt enumerated twenty-four factors and ten methods which influence industrial relations, of which but two factors and one method had to do with monetary reward.

Being at one time confronted with the problem of reducing supplies taken from storerooms in a large plant — supplies used for maintenance and repair — Mr. Berndt found it possible to secure

[1] Care of C. E. Knoeppel & Co., 6 East 39th St., New York City.

interest among the men calling for them by placing at the storeroom window a list of current prices and a weekly bulletin telling how much the supplies used by each man or group had cost, comparisons being given. The two simple records stimulated interest and the desired result was secured. He had never found a foreman who was unresponsive to confidence placed in him by showing him records of costs, performances and even profits. He would not consider a monetary incentive properly applied unless it included a plan for keeping each man advised of current progress and also giving him a written statement of results.

HENRY L. GANTT said that the paper was an important contribution because it emphasized democracy in industry, and also that there could be no democracy in industry unless there was common knowledge of what was going on. Mr. Wolf had obtained remarkable results by letting every man know what he was doing and what was expected of him. The discussions of Messrs. Polakov and Pulis had indicated what could be accomplished when it was known exactly what men should do and when they were shown how to do it and paid a premium for doing it.

To know in advance how much each man should do of his various tasks, to know afterward how much he did do and to find the reasons why more had not been done, was not very easy, but it could be done in most cases. In many shops, however, it was not known how long it should take to perform the various operations or even the sequence in which they should be performed. He had found that incomparably better results were obtained by helping the slow and incompetent men to learn rather than by speeding up the man who was already fairly efficient.

In settling the problems confronting the employer and employee each concern was going to lay a foundation for harmonious coöperation by learning more about the conditions in its own shop and what there was that was hampering its workmen.

RICHARD A. FEISS thought that there was danger of interpreting Mr. Wolf's paper as a condemnation of financial incentives. Both financial and non-financial incentives had their place and must be taken into consideration. There were no cure-alls in industry, and failures in the application of so-called efficiency methods had grown out of a loss of perspective. The object, after all, was to obtain the best possible result from the human element in industry, and that

involved a psychological question. The problem of employment would be solved only by maintaining a broader vision, by remembering that the human being is a human being and must be studied from all points of view and under varying conditions. Mr. Wolf's paper had called attention to but a single element in management and it, with all the other elements in a given case, must be taken in consideration, remembering that man was a complex psychological as well as physical being.

A. L. DE LEEUW said that the lasting growth of labor could only be caused by making labor develop from the inside out. The effort must be made by the laboring man, and not by the employer. The employer had only helped labor in general, but had not caused it to grow. Labor had taken the stand that it could grow only by antagonizing the employer, who, at one time, had held this same view regarding labor. Something should be done to make labor start developing itself in the proper direction. If labor had not already seen these facts, should not some one hold out the hand and invite labor to move in the right direction? Had not the time come when the engineer should get in touch with labor and invite it to discuss economic questions from a standpoint of pure and simple engineering, dropping all ideas of malice, and presenting the idea that a true bargain is one which benefits both parties? Should there not be a third party more or less disinterested, or, rather, interested in the welfare of both, who would hold out the hand to labor and invite it to develop itself, to make an organic growth from the inside outward? Would it not be well if some engineering society were to invite labor into its counsels and see that a proper organized effort was made to have it look at the question not only of its own development, but of the development of industry as a whole, and so bring labor to realize that no real benefits can ever come to it and be lasting unless similar benefits come to the industry as a whole?

CHARLES WHITING BAKER pointed out the necessity of keeping up the volume of demand so that every workman might be employed, and that this could only be done by bringing down prices to where the people here and in Europe could buy. The industrial situation would have to be treated as a whole and if labor could be made to realize that raising wages by specific industries helped but little and that they would have to be reasonable in their demands so that prices could be sufficiently lowered, then it would be possible to get somewhere in the solution of this great problem confronting the country.

HUGO DIEMER said that to understand the economic principles underlying demand and consumption meant that the worker, the engineer and the general public must be educated. It was frequently stated that the engineer's viewpoint was narrow by reason of his not having given attention to the human phase of the situation. A course in Industrial Engineering given at The Pennsylvania State College for a number of years had been planned to remedy this in some measure. There students are given instruction in cost accounting and time study and devote considerable time to the study of labor, welfare and other industrial problems.

JOHN CLINTON PARKER said that the $30 a month the soldier in the war had received was certainly no financial incentive to him. He would define the non-financial incentive as being the same as that which prompted those who competed in sports or strove otherwise to win an honor or prize — that which impelled them to creditable performance.

FRANK B. GILBRETH spoke of the changed conditions confronting industry with the close of the war. Where a soldier was returning to his former job, held by some one whom he considered his inferior as a mechanic, he found that more output had been accomplished than he had been accustomed to do, and that greater productive effort was to be required of him in the future. So true was this in Europe that it had resulted in the elimination of practically all restrictions upon the size of individual outputs. The realization had now come that the financial success of a country depends upon the size of output per individual worker. Engineers and economists had known this fact for a long time, but many workers had not. They had held an honest belief that restricted output was the one thing which assured a job for every man. They were not going to believe this any more because the labor leader now knew that it was not true. Further, the worker henceforth would not only release all limitations upon output but would use his craft knowledge and skill to increase output. The workingmen's committee had been operating in a number of places as yet unannounced and with remarkable results. They were not interfering with the management in obtaining intensive outputs but were working on such things as the regulation of heating and ventilating, reduction of labor turnover, the selection and placement of the right man for the right place, fatigue elimination, education and corporation schools, and in some of the more advanced instances in

the motion-study laboratories for determining the One Best Way to do work.

While non-financial incentives that would cause the workers and employers to coöperate should be fostered, it must be ever borne in mind that the financial incentive is the cause of *maintenance* and *permanency* of coöperation and it should be large enough by itself alone to maintain the state of hearty coöperation through and past the reign of the malefactor.

ARTHUR C. JACKSON drew attention to the law that investment is entitled to an income. This investment might be in any of the following forms — cash, invention, accumulated earnings, or the results of the continued services of an employee. There should be a standard way of measuring all of these investments and it is the duty of the engineer to solve the problems of the fair division of the profits resulting from these investments. Wealth is not alone measured in money, but in the end in production. This country must continue to be an exporting nation and also an importing nation if it is to maintain its position among the countries of the world. We can only maintain a wage scale above that of our competitors by the proportion that our production exceeds the production of our competitors, either in quantity or quality; and this can best be done by the careful development of true coöperation by employee and employer. This coöperation could best be obtained, in his opinion, by the worker's being allowed a share in the management and in the profits.

OBERLIN SMITH, commenting on the law forbidding the use of stop watches and time studies in Government arsenals and navy yards, said that while congressmen and labor leaders were in the main well-meaning and patriotic men, they nevertheless needed to be taught the true nature of scientific management, as their actions showed they did not understand it. Whether the combined engineering societies could do anything in the matter was a question to consider. Hence the desirability of electing men of the engineering fraternity to both houses of Congress, which important bodies are now almost entirely lacking such a personnel.

ARTHUR L. WILLISTON felt that the interest stimulated in an employee by teaching him how to perform his job properly would begin to lag after the attainment of the desired degree of perfection became an old story. He considered that the employer should have

a new and greater lesson to teach as the simpler ones were mastered, looking upon his workmen as progressing from stage to stage in his industry as students progress in college from one class to another.

SPENCER MILLER said it would seem that the author had contradicted himself in stating that men were rewarded by promotion and that the incentives were at the same time non-financial. He was very certain that there would be no conflict between capital and labor provided those involved comprehended that whatever stood for the idea of might would be defeated because public opinion would be arrayed against it. Public opinion in America was thoroughly united for righteousness, and if that could be finally kept in mind along with the fact that every human being would respond to it, then there would be no difficulties and the period of reconstruction would be passed through without strife. He proposed a vote of thanks from the Society to Mr. Wolf for having brought out so clearly in his paper the growing amity between capital and labor, which was unanimously adopted.

ROBERT L. SACKETT spoke of the increasing movement toward offering opportunities for instruction to the employee. This, he thought, was a form of non-financial incentive in spite of the fact that improvement on the worker's part would probably lead to increased compensation. In Pennsylvania alone nearly 5000 men had received instruction during the previous year in regularly organized classes, and in over 50 per cent of the cases the students met in the industrial establishments where they were employed. Aside from its value from the educational standpoint, this movement was finely effective in bringing employer and employee into closer sympathy. There was a real growth of appreciation in technical schools of the desirability of giving instruction in the humanistic side of engineering, and quite a number already included such instruction in their curricula.

THE AUTHOR in his closure, said that in his plants there was little consciousness of antagonism between employer and employee — all were fellow-workmen. He had secured the spirit of coöperation with his employees by appealing to their intelligence and sense of justice, adjusting their wages by conferences, etc. The men were promoted throughout the plant in much the same way that men progress through an educational institution. In his opinion there would never be any trouble with labor if the employer went to labor in a frank spirit of

open coöperation. Moreover, he believed labor leaders were beginning to realize that the workman must stop focusing his entire attention upon the distribution of wealth and focus it mainly upon the production of wealth, and that then the desired compensation must inevitably follow.

In reply to Mr. Polakov, he said that the reason his non-financial-incentive records did not show as great a saving as when a bonus was attached was because the plan of giving the men the record of their accomplishment without the bonus attached to it had not been properly tried out. Without deprecating bonuses entirely, he was of the opinion that they should be carefully considered. Men (both union and non-union) had said to him, "We don't like to be bribed to do a good job. We would like to have the privilege of doing a good job without being baited to do it."

Referring to Mr. Miller's comments, he said that he by no means deprecated the value of financial incentives; nevertheless, men did not do their best work for money. It was the record, the accomplishment of the man that counted, and it was fundamentally self-expression that the man wanted. The financial reward was bound to follow, and the employer who gave a man a chance to use his brain power and did not give him the financial compensation that went with it, was doomed to failure.

Regarding the disposition of the saving due to the improved efforts of employees, he was of the opinion that the money should be divided in proportion to actual earnings, that the men should be part owners of the industries. It had been because workers had not worked intelligently that employers had been able to deprive them of this division of profit. The employer had used his brain to exploit the employee; and the employee had countered by organizing his against the employer. That employee must be encouraged to use his brain for productive work. Then he would see to it as his mental capacity increased that proper reward followed.

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SECURING THE INITIATIVE OF THE WORKMAN

Industrial and National Organic Unity a Necessity for Developing Individual Initiative

By Robert B. Wolf, M.E.

The Emergency Fleet Corporation

The present labor unrest is the natural result of diverting the creative instinct of the workmen from *con*structive into *de*structive channels. The repressive form of most of our industrial organizations is responsible for this state of affairs.

The remedy lies in making our industrial organizations democratic so that the workmen will have a voice in the determination of working conditions.

Until we have changed the autocratic character of our industries (which really dominate the political situation), it will be impossible to have a democratic society.

By a democratic society I mean that form of social structure which encourages and aids the growth of the creative spirit in man, expressing itself through the trades and professions and the organized industries.

This I do not believe can be accomplished until the executive, legislative, and judicial functions of the government coöperate with the trades and professional associations and industrial organizations to give greater opportunity for the free expression of individuality. When this is done we shall have an organization of society based upon respect for the individual, which is the only true democracy.

Not until the workman, however, is conscious of his own part in the whole production process will he become interested in his work and begin to think and to plan how to improve the operating conditions. Improvement implies change, but no change can come except by expression of creative effort—either generic or individual. *Generic* change is the kind exhibited by nature in all of her infinite activities, and, as modern science has conclusively demonstrated, operates always according to exact predetermined law.

Modern industry, however, while it must, of course, conform to the natural laws inherent in the raw materials, is primarily concerned with *individual* creative effort. Industry is artificial and has to do with conditions which do not occur spontaneously in nature; in other words, the creative power which sustains our civili-

zation and prevents it from reverting back to nature resides in the originating, selecting, and adapting faculty of the human intellect, but—and here is the crux of the whole matter—this faculty of mental creativeness is *not* confined to a few individuals who are in charge of our industries. It is common to all mankind. Proof of this statement lies in the fact that the majority of our industrial leaders have risen from the ranks.

What right have we then to expect a high development of productive (creative) effort when we limit the intelligent handling of materials and forces to the few who autocratically claim it as their right to dominate the wills of others, especially when their contact with the actual work, because of the increasing size of our industrial organizations, is becoming constantly more remote? Of course, we must have leaders; otherwise there can be no organization, but leading is vastly different from driving. "Teach, don't boss" is a sign we see posted in industrial plants quite frequently in these days, and it is one of the healthy "signs" of the times.

When our industrial leaders become our industrial teachers, then will "the will of man" be a much greater factor in the universal creative plan.

Just so long as the majority of workmen are using their brains merely to direct their bodies and are doing work which requires little or no thought, just so long shall we have industrial unrest. Man is not an animal, but a free, self-determining *mental* centre of consciousness who has the power to work *with* or *against* the natural law of evolution; that is, *con*structively or *de*structively. If he had not this power, he could not become conscious of the law, for he must know its negative as well as its positive aspect. He can only learn the negative, however, by a process of trial and error. Naturally then, without an opportunity of first-hand experimentation in industries, there can be no real intelligent industrial growth. The autocratic industrial methods of Germany, which caused her notorious lack of inventive spirit, have taught us this. We must not fail to profit by the lesson.

The short-sighted employer may prevent his employees from using their brains at their work, and, because of this, hold their compensation down to a low level. There is no advantage in so doing, however, for the result of the attempt to repress individual initiative is simply to deflect creative power into destructive channels.

This autocratic domination of the wills of the workmen, by

preventing free self-expression, is the cause of practically all the destructive forces, exhibiting themselves in certain phases of Bolsheviki and I. W. W. movements. The creative process in the individual cannot be suppressed—it can only be deflected (perverted) into useless or, worse still, destructive channels.

A comparison between the human being and a steampower plant illustrates what I mean. The internal energy of the power plant comes from properly bringing together fuel, air, and water. The energies released from these elements result in steam pressure, which can be conducted to the cylinders of the engine. If, however, the steam pipe leading to the engine becomes plugged, and we continue to feed fuel into the boilers, we must allow the steam to escape and dissipate itself into the surrounding atmosphere. The word dissipate is significant when applied to men. If this relief be not provided, the accumulated pressure will build up and the whole plant will explode and destroy itself, and may destroy, at the same time, many other devices that are useful to man.

The employer who closes the avenues to constructive work, by preventing the employee from consciously expressing his individuality in his day's work, is no more intelligent than the engineer who shuts off the steam valve leading to the engine and sits on the safety valve of the boiler.

Natural laws must always operate, and if disobeyed, destruction is sure to follow. Providence gave to man the power to work *with* the natural law or *against* it, and for this reason the exact operation of this law had to be predetermined. The great law of evolution is for man's benefit, for nature serves him in proportion to his knowledge and intelligent use of her laws. He could *not* increase his knowledge of the law, however, if it changed from day to day.

The higher creative power in man is a mental process, and lies in his intelligent adaptation of means to ends. He cannot create matter or force, but once he has learned how nature works, by study and conscious observation of the laws underlying natural phenomena, he can tell what must be done in order to create combinations of material elements that do not occur spontaneously. This is what the horticulturist does. He studies nature's laws *in action* and then works *with* them. For instance, the wonderful juicy peach of today was literally created by the specializing faculty of the will of man. An uncultivated orchard will revert, however, to its original wild state when not attended by man. We are

beginning to realize through the aid of modern science the truth of the world-old proverb that "nature unaided fails."

I will give a different illustration from the wood-pulp industry. A number of years ago the cooks who handled the digesters in which the wood chips are disintegrated discovered the natural law that, if the strength of the cooking acid was increased, we could cook in a shorter time. Because of the careful records kept by our organization, this information, which was available to the acid makers, enabled them to recall the fact that we were able to make stronger acid in winter than we could in summer. From this we saw that, if we could create by artificial means the same low temperatures in our absorbing systems in summer that we had in winter, we should have a uniformly strong acid all the year around.

As natural laws never change, we, of course, could prophesy what would happen if these temperatures were reduced, but, what is more important, we could calculate the size of the refrigerating plant needed to exactly reproduce the winter conditions during the summer months.

Because of this accumulated knowledge of natural law, we installed a refrigerating plant which cost us nearly $60,000, and paid for it out of the increased earnings in about three months.

While I could give many other illustrations of a similar nature, this one illustrates what is meant by the creative power of the intellect, and how, while man does not create material substance, he does create combinations of material substances which could not exist without the aid of his powers of observation and selection.

We cannot logically accept the point of view that man's only mission in life is to reproduce his kind; so, obviously, his creative power must have another outlet. What other outlet can there be than that of mental creativeness, illustrated above?

The more progressive manufacturers are realizing this, as indicated by a recent utterance at the Chamber of Commerce meeting at Atlantic City by one of the largest employers of labor in the country. What he said was:

"I believe that that man renders the greatest social service who so coöperates in the organization of industry as to afford to the largest number of men the greatest opportunity for self-development and the enjoyment by every man of those benefits which his own work adds to the wealth of civilization."

This quotation indicates clearly that industries are beginning to develop along truly educational lines, which, of course, means fur-

nishing men throughout the entire production division with progress records of their own individual operations, as well as educating them to a knowledge of the relationship of their work to the finished product. This is being done in a number of manufacturing plants with great success, and, furthermore, it is being done in many instances in coöperation with organized labor. Naturally, this insures a democratic handling of the situation, for the workmen have a chance, through their unions, to have a voice in the determination of the manufacturing standards. The great problem in industry today is how these organizations can be brought to realize that their members will only attain industrial freedom and material prosperity when they direct their main energies to the creation of wealth instead of to its distribution. Capital is simply a medium through which society can give material compensation to the individual for services rendered. It is an effect, not a cause.

Ex-President Taft, in an editorial in the Philadelphia *Public Ledger*, recently pointed out that: "Organization of labor has become a recognized institution in all the civilized countries of the world. It has come to stay; it is full of usefulness, and is necessary to the laborer."

This being the case, is not the employer who opposes the movement extremely short-sighted?

A manufacturing industrial unit divides naturally into three main divisions—supply, production, and administration. For convenience in presenting the subject, I have symbolized these divisions on the accompanying diagrams, so it will not be necessary to incorporate in the text of this paper a detailed description of the diagrams, which are fully explanatory in themselves. It will be noted that the main function of the *administration* division is to provide an environment in which the greatest possible number of men in the *production*[1] division have the very best opportunity to express their individual creative power in constructive work. And it is the main function of the *supply* division to provide a sufficient quantity of the most suitable materials in order that the highest type of organized creative power can be developed.

I am using these illustrations from actual industry to point out

[1] Broadly speaking of course, "production" covers all the activities of the organization. For the purpose of this analysis however it is used in its restricted sense as applying to the immediate conversion of raw materials into the finished product.

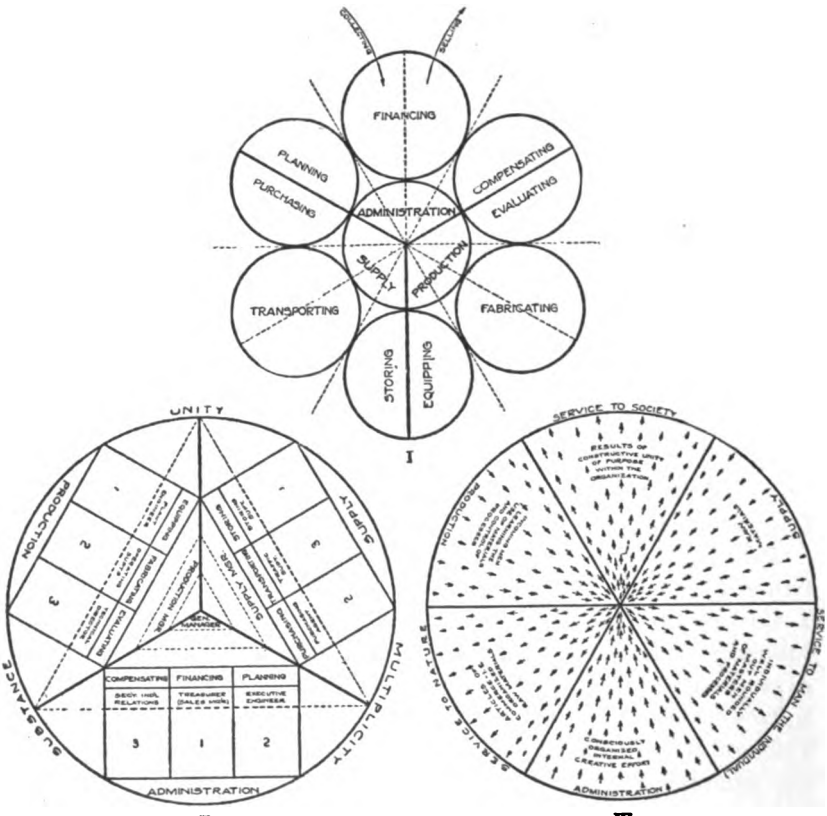
what seems to me is an obvious fact; namely, that as the unit of which the individual plant is composed is the man, and the unit of which the large corporation is composed is the individual plant or department, so, in the natural course of evolution, the corporations must unite into industrial associations, which reflect their particular kind of creative activity in society—society being represented in its organized aspect as government.

There is this fundamental difference between the industrial plant and government; namely, that, while the administrative division of the industrial plant organized material substances by consciously bringing together raw materials and men, the function of the administrative (executive) branch of the government is to organize humanity by consciously bringing men into contact with industrial organizations. The substance of which society is composed is man. Men, however, in order to express their particular kind of creativeness, naturally associate themselves into varied types of industries, so that the industrial aspect of our governmental organization should be represented by the legislative or planning function.

Believing that the principles underlying industrial organization can be applied to the organization of political and social structure, I am taking the liberty of comparing the functions of organized industry with what it seems to me can become the functions of organized society. In doing this I realize that I am trespassing upon economic ground, which, as an engineer and a manufacturer, I should perhaps know enough to keep off of. I feel, however, that the principles of individuality are universal, and if we are to organize society to permit the exercise of freedom, it must be done according to laws which are fundamental and capable of demonstration in the world of material things. When we get into the mental realms, we must, of course, resort to analogy in order to clarify our conceptions and make them practical.

The first set of diagrams illustrates the principles of industrial organization, and, as they are fully described on the cuts, it will be unnecessary to explain them further.

The second set of diagrams, which are also fully described, suggest a way of applying the same principles upon which the individuality of the industrial organization is built to the individuality of the government itself. The titles that have been applied to these various headings are, of course, merely suggestive, and have been chosen because they describe the kind of function which it



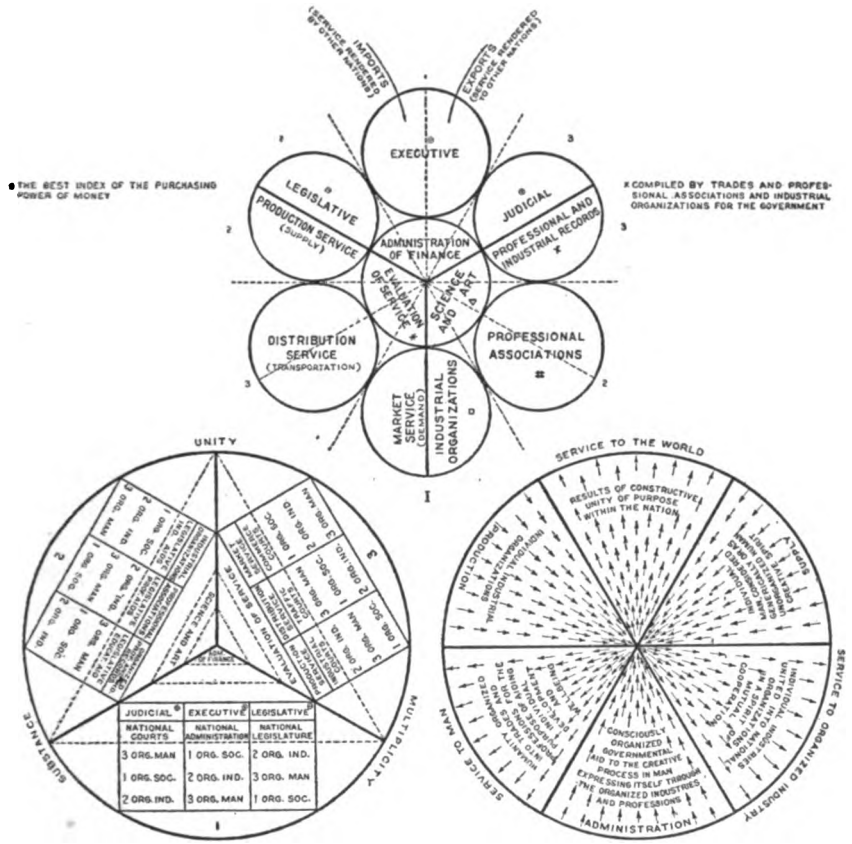
DIAGRAMS SYMBOLIZING
INDUSTRIAL INDIVIDUALITY

Division		General Functions			
(1) Administration	1	Financing	General Accounts	Sales	Collections
"	2	Planning	Budgets	Plans & Estimates	Ways & Means
"	3	Compensating	Employment	Service	Compensation
(2) Production	1	Equipping	Constr. & Maintenance of Buildings.	Constr. & Maintenance of Equipment.	Constr. & Maintenance of Power Plants.
"	2	Fabricating	Preparation of Raw Materials.	Fabrication of Prepared Materials.	Finishing of Product.
"	3	Evaluating	Progress Records	Research and Investigation	Planning for Improved Equipment
(3) Supply	1	Storing	Crude Materials	Sundry Supplies	Apparatus
"	2	Purchasing	" "	" "	"
"	3	Transporting	" "	" "	"

(1) These headings naturally can be modified to meet local conditions and different types of industries. The purpose is to illustrate principles only.

(2) In a small plant, for sake of economy, several functions can be combined under one head.

(3) In the central organization of a large corporation made up of a number of plants the activities are largely functional. In the individual plant they are administrative.



DIAGRAMS SYMBOLIZING
NATIONAL INDIVIDUALITY

- JUDICIAL - FOR DETERMINATION OF JUST COMPENSATION FOR SERVICES THAT HAVE BEEN RENDERED.
- LEGISLATIVE - FOR ESTIMATION OF FUTURE SERVICE RENDERING POWER OF EXISTING OR PROJECTED ASSOCIATED ENTERPRISE.
- EXECUTIVE - FOR EXECUTION OF PROPER COMPENSATION FOR PAST SERVICES RENDERED, AND ALSO CREDIT EXTENSION (CAPITALIZATION) BASED UPON ESTIMATED FUTURE SERVICE CAPACITY.
- PROFESSIONAL ASSOCIATIONS IS USED IN THE BROAD SENSE, TO INCLUDE TRADES UNIONS AS WELL AS PROFESSIONS. THEY ARE ORGANIZED HUMAN MOTIVES AND FORM THE CONNECTING LINK BETWEEN EDUCATION, (SCIENCE) AND THE INDUSTRIAL ARTS (APPLIED SCIENCES).
- INDUSTRIAL ORGANIZATIONS ARE PRIMARILY FOR THE PURPOSE OF PROVIDING FACILITIES FOR THE INTELLIGENT PRACTICE OF THE SCIENCES, AND THEREFORE THE DEVELOPMENT OF MAN.
- SCIENCE IS ORGANIZED FACTS, (PROFESSIONAL AND INDUSTRIAL RECORDS) AND AN ART THE PRACTICE OF A SCIENCE.

NOTE: ON EACH SUBDIVISION (DIAGRAM II) SHOULD BE "REPRESENTATIVES OF" ORG. SOC., - ORG. IND., - ORG. MAN.

* THE BEST INDEX OF THE PURCHASING POWER OF MONEY

x COMPILED BY TRADES AND PROFESSIONAL ASSOCIATIONS AND INDUSTRIAL ORGANIZATIONS FOR THE GOVERNMENT

seems to me should be performed by the three main divisions of government.

It will be noted that under each of these headings I have suggested that representatives of the three aspects of society be included. *Man*, of course, represents the substance of which society is composed; *industry* (used in its larger sense) symbolizes the organization of men under a multiplicity of different aspects of creative activity, and *government* represents the organization of society to produce unity of action within the nation.

While all three of these aspects of society are included in each of the headings, the dominant note in each subdivision is indicated by the one which appears at the top. As an aid to show the relationships, I have numbered society 1, industry 2, and man 3.

Is it not true that before we can fully secure the initiative of the workman—I use the word "workman" in its larger sense to include all of humanity—we must conceive of the judicial function of the government as primarily adjudging merit instead of demerit? I believe its main function should be the determination of just reward for services rendered, for if men were working in an environment which gave full opportunity for individual self-expression, there would be very little destructiveness to punish.

In order that the courts can function in this way, however, the legislative bodies must change their repressive character by making laws for aiding industrial development rather than laws which hinder. When the industries cease exploiting humanity and recognize that the basic reason for their existence is to provide the best possible environment for the development of mankind, then it will be safe to make the organization of industry legitimate.

Of course, this would not have been a safe thing to do until humanity had been organized into the trades and professions. What has occurred in Germany is proof of this, for in that unfortunate country autocracy captured industry and dominated it before man himself had learned to organize for his own protection. There is no reason for believing that the results would have been otherwise in this country if the Sherman anti-trust law had not prevented the industrial combinations from forming first. May I suggest that this is perhaps the reason for this law, which has now become inoperative by the action of the government itself when it became necessary to marshall the creative forces of the nation in the great war emergency? To marshall these forces the government authorities did two things:

1. They called upon the practical men, the representatives of the workmen, the engineers and scientists to tell them *what* to do and *how* to do it. They asked those men to build up organizations to direct the industrial operations of the country. Gradually this group of men, whose training had made them masters of the material forces, began to accumulate information which enabled them to know what the nation's resources actually were. They encouraged the producers to organize into associations to aid them in making a complete survey of the field of resources and requirements, and in this way were able to determine which organizations had the greatest capacity to render service. The legislative branch of the government was acting under the direction of these bureaus of industrial leaders for the simple reason that it could not act intelligently without them.

How can we expect to get intelligent legislation in peace times without this same coöperation between nationally organized industry and the national legislative body?

2. The second thing the government did was to administer the finances of the country in such a way that credit was extended to those who were estimated to have the greatest capacity to render service. Without this executive power to administer credit where needed, little could be accomplished for it had to be administered for the good of the whole country. Why then isn't this a necessary peace-time executive function also?

With the government administration of credit for the benefit of society, the interest charges would naturally be made as light as possible in order to reduce the burden, and thereby stimulate creative enterprise.

With legislative coöperation to aid organized industry, and judicial assistance to determine just compensation for services that have been rendered by individuals, the executive branch of the government could administer credit for the benefit of all. Credit capital did not exist until we had associated enterprise, and its function is to form a medium through which society can measure its indebtedness to the individual for services rendered. It is one of the most subtle forces we have at our command for it transmits mental impulses and therefore measures mental relationships primarily. While we refer it to gold in order to give it a material basing, as it were, nevertheless it is so fluidistic and reflective of human creative spirit that it can only be expressed in symbols such, for instance, as an entry in ledger or an engraved certificate of indebtedness.

I wish to state right here that I am not in favor of governmental domination by any particular political party. My personal feeling is that what has been advocated by a certain type of political socialism will not, in any way, lead us out of our difficulties. I am an individualist, and believe in the fullest possible opportunity for individual self-expression, but I feel absolutely certain that, as the individuality of the industrial organization must be developed in order to give full opportunity for the development of the individual workman, so must the individuality of the nation be developed if we are to give full opportunity for the development of the individual industrial organizations and the individuals of which those industrial organizations are composed.

The law is always the same; namely, that any individual center of consciousness expressing life, in order to express life in its fullness, must be organized so that it is conscious of its *inner* organic unity and of its *outer* environment; that is, what is going on within the organism itself and of the external effect of its actions.

The three aspects of individuality, as indicated by the diagrams, consist of, first, *substance*, then substance organized under a *multiplicity* of individualized activities, which perform the special functions to enable the whole to become finally a conscious *unity* for expressing itself in constructive service for advancing the welfare of the world.

Surely an association of nations based upon this conception of rendering service need not think of a type of internationalism which does away with national characteristics. Those groups which logically and naturally should work together must form themselves into individual societies or governments; otherwise, the progress of the human race will not be individual but generic. The individuality of the nation must be just as carefully and conscientiously developed as the individuality of the plant in the larger corporations, or, as the individuality of the department within the plant or the man within a department. When each nation realizes that its growth in creative power depends upon its coöperation with other nations for the welfare of the whole world, the attitude of exploitation which has dominated national life in the past will disappear, for it will be soon that the greater the service rendered by the nations, the greater the reward, and that no true growth can come to any individual organism that does not recognize this principle, whether the organism be a man, an industry, a state, or a nation.

In concluding this paper, I wish to state that I am offering these suggestions for developing national consciousness, fully realizing that the solution is a problem of gradual evolution and can only be solved successfully when many minds are at work upon it, each completing and correcting one another. It is the world-old question of the relationship of the individual life to the universal life, which, to my mind, will not be solved until we understand the principles underlying individuality, that is, how the greater life can include the lesser without hindering, but aiding its development.

The problem is not impossible of solution, however, for man is the product of the whole evolutionary movement and therefore must contain the essence of it within himself. He is destined to become conscious of his own part in the great plan of cosmic evolution; for it is only as he *consciously* reflects the universal life that he can understand its meaning.

A vitalized form of organization and order must therefore take the place of the present unorganized state of society if man is to develop to the full his latent creative powers.

NOTE.—Other articles by Mr. Wolf, describing the details of his organization may be found as follows:

"Making Men Like Their Jobs," *System*, Jan. and Feb., 1919.

"Non-Financial Incentives," Amer. Society of Mechanical Engineers, N. Y. City.

"The Creative Workman," Technical Ass'n of the Pulp and Paper Industry, 131 East 23d St., New York City.

"Individuality in Industry," "Discussion on Beating Paper Stock," and "Control and Consent," in Bulletins of the "Taylor Society," Aug., 1915, Oct., 1916, and Mar., 1917, "Boxleigh," Chestnut Hill, Pa.

SYSTEM

THE MAGAZINE OF BUSINESS

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QUICK *loading—through a window, if it's most convenient, as in this instance—is only one way of increasing the efficiency of motor trucks. A number of other ways of getting the most out of motor trucks will be described in the pages of February* SYSTEM

"ONLY ONE KIND OF CRIPPLE"

HERE'S an echo from the double page of pictures that appeared in the December issue: a letter from Rodney G. Bryson, of the firm of Williams and Bryson, attorneys and counselors at law, of Covington, Kentucky. The problem Mr. Bryson suggests is going to face a lot of employers when most of the boys are back from "over there." He says:

"There is but one cripple and that is the *mind cripple*, as no other deformity amounts to a hill of beans unless you permit the mind to entertain such an erroneous idea.

"I started to work as a messenger boy for the Western Union Telegraph Company at Cincinnati immediately after the loss of my left arm three inches from the shoulder, and studied telegraphy at nights. I was so interested that it seemed no time before I was advanced to a branch office operator. How well I recall the chief operator's words when I was transferred from branch operator to the main office. He said: 'Of course you will never be able to work our fast wires, but we can use you on our city lines.'

"I smiled and said that I would work every wire in the office. I did work every fast wire in that office and worked every fast wire the Western Union and Postal Telegraph Companies had in almost every large city in the United States.

"It is not so hard for a cripple to convince himself that he can do things as it is to convince the other fellow that he can, but if he will turn a deaf ear to pity and sympathy, he can be among the best of many, many vocations, instead of sitting upon a sidewalk with his hand out.

"Give the 'cripple' a chance instead of charity and you will be well repaid."

WANTED—THESE ISSUES OF *SYSTEM*

THE British Museum is compiling a set of SYSTEM and has sent the publishers a request for several issues needed to complete the file. The publishers have exhausted all except the file copies of many issues, but they think it likely that many of these back copies are in the hands of readers who will be glad to part with them in order to help the Museum get together in its files the complete set. Look through your files, won't you, and see if you have any of the following issues that you feel you can spare:

Volumes 1 to 6, inclusive (all issues)
Volume 7—Number 2
Volume 8—Numbers 2, 4, 6
Volume 9—Numbers 1, 3, 6
Volume 10—Numbers 2 to 6
Volume 24—Number 6.

If you have any of these on hand, and are willing to part with them, please notify the editors. They will be glad to get and pay a reasonable price for copies of these numbers.

"A MIGHTY GOOD ARTICLE"

"AS president of the Central Western Credit Association," writes E. I. Leighton of the Leighton Supply Company, "also as a member of the executive committee of the Central Supply Association, and a member of the executive committee of the National Pipe and Supplies Association, I have written letters to these different associations suggesting that they call the special attention of their members to the article, 'Are You Your Customers' Banker?' which appeared in the December issue of SYSTEM.

"This is a mighty good article, and one that should be read by every business man—retail or wholesale.

"We should like to make use of this article by sending a copy to our customers. As SYSTEM goes to retailers as well as wholesalers, we see nothing about the article but what would be good for the retailer as well as the wholesaler. It is right along the line of work in which we are interested, in shortening terms and getting our money a little quicker. In order to be successful in this, we must educate our customers to get their money in the same manner.

"We have approximately 5,000 names on our mailing list, to whom we would like to send copies of this article, if you are able to furnish them. We would prepare a circular letter and send it out with the article."

MAKING MEN LIKE THEIR JOBS

By ROBERT B. WOLF, M. E.

THIS ARTICLE, one of the most important which SYSTEM has ever published, outlines the philosophy of work as applied in a practical manner to the daily direction of workers. Mr. Wolf shows why men leave, why they are dissatisfied, why they take no interest in their work. He traces the causes and then shows that the surface indications are due to a disobedience of fundamental laws. Then he explains how in his own work he has obeyed these laws, and describes the remarkable results attained. He cuts under the surface and gives "reasons why." We all know the surface, but no one, so far as the editors know, has worked out so completely as Mr. Wolf, the causes.

It is not an article to be merely skimmed through; it is to be read and reread, for it unfolds a whole philosophy of work. And every executive knows that today the human problem is the biggest. Mr. Wolf is manager of the Spanish River Pulp and Paper Mills, Ltd.

WE all know that no man will loaf or slack on a job when he is interested in it. Neither will he slight the quality. It may be possible to work without interest, spurred on by some force of necessity, but the man working in such fashion has no heart in his work.

Why do men work half-heartedly, giving a minimum of return for their wages? Why are they so commonly dissatisfied, grumbling at petty annoyances, resentful of efforts to help them, and quitting their jobs apparently without reason? Why do they strike, and why are they so willing to listen to those who are capable of voicing their discontent? By men, of course, I mean all employees, men and women, in every branch of industry and merchandising.

One can answer glibly, of course, that people are naturally lazy and that it is human nature to want to get something for nothing; that the present demand for workers and the resulting tremendous wages offered through necessity have unsettled a class of human beings which was particularly anxious to be unsettled. Or, if one wishes to be cynical, it is easy to remark that all are opportunists anyway, and that the workers just now see their opportunity. Such answers, however, go only to results—they do not touch causes.

Intelligent workers and intelligent employers are more interested in locating causes than in tabulating results. They want to prevent labor diseases rather than treat them. For the present labor unrest, which we are right in calling "dis-ease," is one of the most serious things that confront the nation today. The worker is the biggest national asset, the most potent in war or peace. Labor is not an incident of industry. It is industry.

¶ IS THERE A CURE FOR UNREST AMONG EMPLOYEES?

Everything seems to indicate that we are approaching an industrial crisis in which the differences between employer and employee will grow more sharp and bitter; it is therefore vital that the employers who are directing the industrial situation use their utmost efforts to get down to fundamentals and cease confusing results with causes. This will be no easy task for the average employer, as he has so long been engrossed in the immediate manufacturing problems that he has given little thought to one that is larger and more important, the human problem.

I hope, therefore, that our experience will prove helpful. If the principles involved are universal, as I believe them to be, investigations in other lines of productive effort will confirm the conclusions, and as a result of the combined efforts of many minds, each completing and correcting one another, we should be able to evolve an industrial philosophy in America which will enable us to avoid the threatening deadlock so seriously interfering with productive effort today.

The cause of practically all labor inefficiency—a prelude to labor disturbance—is lack of interest. There are only two ways out of the dilemma. The first is to create interest in work, and the second is to accept disinterestedness as inevitable and to speed up the treadmill so that a certain amount of work has to be turned out, interest or no interest. The first is the democratic American way, the second is the Prussian. In reality, there is no choice, as the Prussian method is now in the process of destroying itself.

Therefore, the way of expression, rather than the way of repression, is the only course open to us. At first sight it may seem impossible to change the monotony of routine work without extremely radical changes in operating conditions, but I know from actual experience that it is possible so to stage even routine work that it will draw and hold the interest of the worker to an absorbing degree.

In other words, the work ceases to be routine under methods which bring forth intelligent conscious control of the process on the part of the worker, when we make him master of the machine instead of merely furnishing the machine with organs of sense.

It is just as necessary to get away from "rule of thumb" methods in directing human activity as it is in the process of handling materials which conform to natural laws. There are laws underlying human nature, and it is the function of the science of philosophy to organize these laws for the benefit of all those who wish to study them.

I worked at days' wages for several years in different paper mills in New York State and New England, so that I approached the problem from the practical side, working from the bottom up and not from the top down. It was this intimate association with the workers that gave me, first, the point of view of the workers, and later, the point of view of the operator.

While I had the direct object in view to learn the papermaking business, and cannot say that I found the work uninteresting, nevertheless I could see that most of the work was done by pure "rule of thumb"; that the workman in the big majority of cases had no real intelligent interest in his work, and no means of knowing exactly what he was doing.

Personally, however, I found a great deal to interest me in the working out of the underlying laws of the various processes, and to this conscious use of brain power I attribute the fact that I was able very quickly to learn to operate all of the various machines in the industry.

¶ HOW THE WORKER OFTEN VIEWS INNOVATIONS

The average workman, however, because he did not go into the industry equipped with technical training, could not of himself so easily work out the laws of the process. And while he was constantly desiring to have his ideas developed, he nevertheless found it difficult to express them, and therefore, because of the lack of encouragement, he soon became set in his ways and antagonistic to innovations.

What I say about papermaking I know from observation in other industries applies equally well to them, and the more specialized the work the less interest the worker shows. In many of our industries the worker is no longer a mechanic or a craftsman, but performs merely a series of motions in which there can be no pride because in the minds of the men these motions are only remotely related to the finished product.

John P. Burke, who is president of the Pulp, Sulphite and Paper Mill Workers' Union, expressed this thought very clearly in a letter which I received from him recently. I quote in part from Mr. Burke's letter:

"When I worked in the factories, which I did from the age of 12 to 25, one of the things I found the most dissatisfaction with was the deadening sameness of the work. I never remember a time, when working in the factories, that I became so interested in my work that I didn't long for quitting time to come.

"After leaving factory work I got a job with a building contractor. Becoming proficient as a carpenter, I time and again did certain work of more or less creative nature; I often became so interested in it that I paid no attention to quitting time. I have worked for two or three hours after the time when I might have quit work. There is joy in creative work."

This feeling of being an automaton, with a lack of responsibility that goes with it, is to my mind the greatest cause of the workman's dissatisfaction. Unfortunately, the workman has in too many cases accepted the state of affairs as inevitable and inherent in the modern industrial movement, so that his idea is to shorten the hours and raise the pay, in order to have as much time away from the work as possible to develop himself along the lines he really enjoys.

¶ WHAT IS THE REAL MOTIVE THAT MAKES MEN WORK?

Every individual craves responsibility – this is the very foundation rock upon which individuality is built; but modern industry tends to take responsibility away from men and they cease to care—for there is nothing to care about. Of course, they can be made to work faster by giving production bonuses, but the production bonuses operate very much like the outer pressure which comes from low wage conditions. They are outer stimuli, whereas what we need is the inner desire, which is the real motive power of all individual creative activity.

A man cannot work from within, however, unless the work interests him, and the work cannot interest unless the man is using his mental as well as his physical powers. There is nothing creative about pure physical, muscular effort, as creative work begins only when the mental powers of selection and adaptation of means to ends come into play.

What, therefore, has happened to the creative spirit in the progress of industry from individual craftsmanship to infinitely divided, standardized, machine production?

The development of modern industry has taken away from man the opportunity to create a finished article. In other words, the man has become part of a larger individual which we may term an organization. An industrial organization that is performing a particular function in our industrial life is really creating as a whole what the individual man once created in its entirety. Therefore, if we are to enable this larger individual to do its creative work well, we must so design it that the greatest possible number of men are conscious of what the whole organization is doing. They must be conscious participators in the creative process of the organization, which must be so sensitively adjusted that it in turn will be conscious of the welfare of individual members, and of the degree, therefore, of their intelligent participation in the work.

We must give individuality to the organization, in order to give individuality to the men in the organization.

Of course, it is true that because of the creation of this larger industrial unit, with its accompanying specialization through the aid of mechanical devices, production has been enormously increased. But if through these same mechanical devices we destroy the individuality of the workman, the apparent advantage to society will soon be seen to be a disadvantage. We cannot get greater enjoyment out of life by simply increasing our possessions, but only by increasing our capacity for self-expression. Greater expression means manifestation of greater life and therefore a fuller realization of individual capacity which, after all, is what we are striving for.

It is useless for us to try to develop an *esprit de corps* in an organization by artificial means of a purely emotional nature. The only kind of an organization that will have a permanent *esprit de corps* is the kind where the creative power of the individual is freest to express his real inner spirit. Unless men intelligently participate in the productive process the organization cannot be efficient, for team work comes only when men work together not only with their muscles but also with their hearts and minds.

When we realize that every industrial organization is created by man and that he cannot create something of which he does not contain at least the essence within himself, it seems to me we have a right to take the human body as an example of the highest type of organization. Why not, then, pattern our system of control after the nervous system of the human body, through which the life impulses or vitalizing forces are distributed to the bodily structure?

¶ A GOOD PATTERN FOR A SYSTEM OF CONTROL

The nervous system of the body is made up of three parts:

1. The sympathetic nervous system, which controls all the subjective or involuntary functions of the body, such as the beating of the heart, contraction and expansion of the blood vessels, and thousands of kindred functions, which are in a certain sense automatic.

2. The spinal cord, that part of the cerebrospinal nervous system controlling many of our reflex or semi-automatic functions, which we have by conscious effort learned to perfect, such as walking, riding a bicycle, playing a violin, and so forth. This system is the great connecting link and coordinating factor between the highest controlling nerve centre—the brain, and the more widely distributed functions of the individual groups of cells or organs immediately controlled by the sympathetic nervous system.

3. The cerebral part of the nervous system (the brain), which is the seat of our memory, through which most of our past experiences can be consciously recalled when needed to solve problems immediately confronting us. It is therefore the seat of our consciousness and volition.

These three parts of the nervous system of the body in the same order correspond (1) with the principle of general or universal activity, such as is exhibited by the myriads of body cells, each one of which conforms to the law of the body; (2) with the principle of individual specialized activity, which is reflected in the internal organization of the body cells into organs performing special functions; (3) the principle of unified activity, which coordinates both the general and specialized activities of the body—to form the one resultant personality that the philosopher calls the ego. It is this we mean when we say I am.

All of this may sound rather erudite and irrelevant to the subject of interesting men in their work, but it seems to me that if we are to understand the laws underlying human activity we must first understand the laws underlying individuality, and that if we are to understand the laws underlying individuality we must look for them in the highest type of individual that has been created, namely, man.

¶ GIVING MEN A GREATER CHANCE TO EXPRESS THEMSELVES

Industrial organization, when consciously patterned after the organization of the human body, is bound to cease repressing the life principle in the individual workmen, for bodily organization in man does not repress the development of the individual cells or the development of the individual bodily organs, but works consciously to give them a greater chance to express life.

To continue the analogy between the organization in man, and the industrial organization created by man, I would like to call attention to the fact that man's body is made up,

First, of substance which functions according to exact natural law. This law must be obeyed if the individual is to express the greatest possible amount of life and vitality;

Second, bodily organs and structures which exhibit certain definite characteristics, these organs, of course, being created out of that material substance of which the body is composed; each organ, however, takes on individual characteristics, depending upon the function that it has to perform. This aspect of the body we might call the aspect of multiplicity, and the more highly organized is the body the greater the power of expression of the individual;

Third, the unity principle which uses the nervous system as its great channel of expression, bringing all parts of organized man into intimate and close relationships, associating and coordinating the parts with the spirit of the whole, restraining and accelerating all functions so that perfect equilibrium and balance may be maintained between inner and outer stimuli or impressions. Every man knows

that he is One. It is not an accident that both the letter "I" and the figure "1" are expressed by the same symbol, and the foregoing is merely a way of defining in physiological and psychological terms what everyone knows to be a fact. It is only when the nervous system is diseased, and therefore unable to keep proper balance between the various individualized bodily activities, that we are conscious of the lack of oneness or unity.

From this we see that every individual centre of life expresses itself in three aspects: the aspect of unity, the aspect of multiplicity (individual interior organization), and the aspect of substance, which modern science today is disclosing to be a universal form of activity. To illustrate what I mean, I will quote from an article on "Periodic Law"—the law which indicates that all chemical elements are created from one primordial substance. This quotation is taken from the *General Electric Review* and is written by Dr. Saul Dushman of their research laboratory.

"Considering the relationships exhibited by the different radio-active elements, one realizes that the dream of the alchemists may not have been as fatuous as has appeared until recently. The concept of an absolutely stable atom must be discarded once for all, and its place is taken by this miniature solar system, as it were, consisting of a central nucleus and one or more rings of electrons.

"But the nucleus itself is apparently the seat of immense forces, and in spite of its exceedingly infinitesimal dimensions it contains both alpha particles and electrons. Once in a while the nucleus of one of the atoms will spontaneously disintegrate and expel an alpha or beta particle.

"A new element has been born. What causes these transformations? Can they be controlled? These are questions which only the future can answer. But if we had it in our power to remove two alpha particles from the atom of bismuth or any of its isotopes, not only would the dream of the alchemists be realized, but man would be in possession of such intensely powerful sources of energy that all of our coal mines, waterpowers, and explosives would become insignificant by comparison."

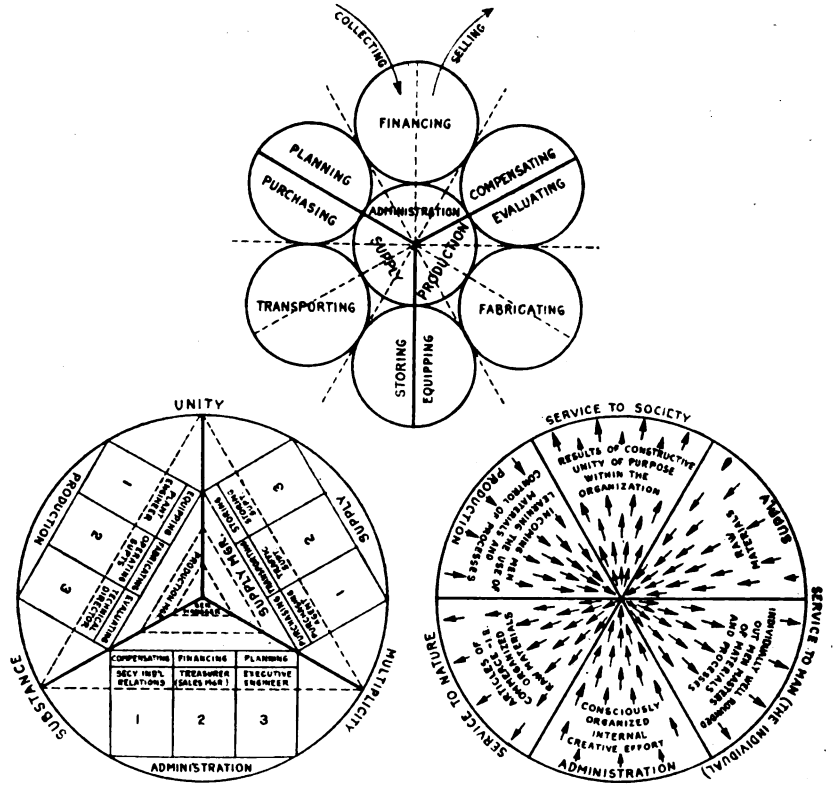
Put in less technical terms, this means that modern science has discovered that there is no dead or inert substance, but that the form and character taken by the various chemical elements is caused by their particular type of internal activity. Logically, when this manifestation of life stops, the atom ceases to exist. The internal character or vitality of the atom (or molecule) depends upon its rate of vibration; its form upon the direction of this vibration, that is the axes of growth, and its bulk or outer form upon the extreme limits of these vibrating paths.

Now let us turn to our industrial organization to see how this analogy must hold in order to obtain a high degree of creative power within the organization. The chart on this page is a convenient way of expressing the principles of unity, multiplicity, and substance. It will be noted that unity corresponds with the function of administration, multiplicity with production, and substance with supply.

Supply is naturally made up of three functions: purchasing, transporting, and storing.

Production: Of equipping, which has to do with plant design and naturally is more or less concentric with storing; fabricating, which has to do with the organization of the individual parts; i.e., finished or partly prepared materials and evaluating, which has to do with the recording of individual operations with reference to quality, quantity and economy of performance,* assembling these for the purpose of research and investigation; and then giving unity and vitality to the productive process by providing means for the creation and design of more suitable operating equipment, thus completing the productive function that the plant is organized to perform.

(Note: I use the word *evaluation* because it is more comprehensive than "statistical"; it includes statistics but adds the implication of judgment based upon knowledge.)



DIVISION		GENERAL FUNCTIONS			
Administration	1	Compensating	Employment	Compensation	Service
"	2	Financing	General Accounts	Sales	Collections
"	3	Planning	Budgets	Plans & Estimates	Ways & Means
Supply	1	Purchasing	Crude Materials	Sundry Supplies	Apparatus
"	2	Transporting	" "	" "	"
"	3	Storing	" "	" "	"
Production	1	Equipping	Constr.& Maintenance of buildings	Constr.& Maintenance of equipment	Constr.& Maintenance of power plants
"	2	Fabricating	Preparation of raw materials	Fabrication of prepared materials	Finishing of product
"	3	Evaluating	Progress records	Research and investigation	Planning for Improved equipt.

(1) These headings naturally can be modified to meet local conditions and different types of industries. The purpose is to illustrate principles only

(2) In a small plant, for sake of economy, several functions can be combined under one man.

(3) In the central organization of a large corporation made up of a number of plants, the activities are largely functional. In the individual plant they are administrative

This chart—the circles, lines, and arrows of which you may at first glance think rather complicated—indicates graphically the principles underlying Mr. Wolf's philosophy of work. In his article he tells how he applies these principles

Administration is made up of compensating, which has to do not only with employment and service, but also with the establishment of proper industrial relations within the organization from the point of view of reward for services rendered, in other words, the democratic carrying out of the law of compensation within the organization.

Financing has to do with the organization's relationship to its environment, or the general market, and therefore the assembly of all data for the finished cost statement of output; the disposal of the finished product at proper market prices, and the final collection of all the money due the organization for the

services that are being rendered. It is distinctly a unity function in the administrative branch of the organization. Planning is the third administrative function and has to do with the determining of ways and means for the proper disposition of the incoming financial returns for services rendered.

¶ HOW THESE LAWS ARE PUT TO WORK

To record the laws in such a way that they are quickly available for use, the evaluating department uses graphical charts. In the production divisions the graphical department is the memory and corresponds to the cerebral part of the nervous system. Of course the production progress records which are given to men and groups of men throughout the plant are the means of releasing intelligent thought wherever a particular operation is performed. These records insure proper functioning without direction from the conscious mind of the organization, so correspond to the reflex action of the spinal cord. The sympathetic system of the production division is the system of daily reminders not to forget to do certain things, which experience has taught us are necessary as a matter of routine. We call this our plant "tickler" system and through its means not only release creative power by relieving our department heads of the burden of remembering routine work, but insure against forgetting important operations which should be repeated at regular intervals.

Just as evaluating and compensating are more or less concentric functions, as they are the point of contact with the production and administrative divisions, so planning and purchasing are also concentric functions.

The stream of finished product, after proper evaluation, passes out through the selling side of the financing function, and the reward for the service rendered by the organization comes in on the collecting or receiving side, which contacts the planning sphere of the larger organization. Of course, by the operation of the law of cause and effect the greater the service rendered the greater the reward.

This is the basic law of life as it is known to all engineers and scientists. We call it the law of the conservation of energy on the material plane. The philosopher who deals with mental concepts calls it the law of compensation. No one can escape the working of this law.

The employer may pursue the short-sighted policy of preventing the employee from using his brains in his work and thereby hold his compensation down to a low level, but he does not gain one single advantage by doing so. The result is simply to repress creative effort and, what is even worse, to deflect creative power into destructive channels.

Practically all the destructive forces at work in the industrial world today, which are manifesting in organized efforts to reduce production, are the results of this autocratic domination of the wills of the workmen by forcing them into an environment where free self-expression is an impossibility.

By destructive forces, I mean the sabotage methods exhibited by certain aspects of the I. W. W. and Bolsheviki movements. We cannot repress the creative process in the individual; we can only deflect it into useless channels, or what is worse still, into destructive channels.

For example: Let us liken the individual to a steam power plant, into the boilers of which fuel (food) and water are constantly being fed to keep up the internal energy. This power plant can do useful work by allowing the result of this internal combustion (digestion and respiration), the steam, to pass through the cylinders of the engine, thereby making the energy in the fuel available for useful work. If, however, the steam pipe to the engine is plugged and the boilers are still being fired, by properly bringing together fuel, air and water, we must allow the steam (energy) to escape through the safety valve, and so dissipate it into the surrounding atmosphere.

¶ —UNLESS THERE IS AN OPPORTUNITY FOR EXPRESSION

The word dissipate is significant when applied to man. If this relief is not provided, the accumulated pressure will build up until the whole plant will explode and destroy itself, and in so doing may destroy and injure many other useful devices which have been laboriously created by man.

The employer who dams up the channels to useful constructive work by preventing intelligent (conscious) self-expression of the individual workman, is just as sensible as the engineer who shuts off his main steam valve to the engine and then sits on the safety valve of the boiler. The laws of nature are destined to operate always in the same way, and if a man wilfully disobeys them, they will break him. "Ignorance of the law is no excuse," for an all-wise Providence (the universal principle of unity) gave to man the power to work with or against the natural law, and therefore was compelled to predetermine the exact operation of this law, which science designates as the law of evolution.

All of this is for man's benefit, however, for nature serves him in proportion to his knowledge and intelligent use of her laws. If they change from day to day, he could not increase his knowledge, and then, indeed, our condition would be hopeless.

As previously indicated, the higher creative power in man is a mental process and lies in his intelligent adaptation of means to ends; he does not create matter or force, the universal energies so graphically depicted by Dr. Dushman (quoted above), but he does by study or conscious observation of the laws underlying these natural phenomena, learn how nature works.

Through the use of his memory—the faculty of recalling past experience for the purpose of solving the problem immediately confronting—he can tell what to do if he wants to produce (create) combinations of natural elements that do not occur spontaneously in nature—this is what the horticulturist does. He studies nature's laws in action and then works with them. It is the specializing power of the will of man that literally created the wonderful, juicy apple of today. The uncultivated apple orchard, however, reverts to its original wild state, when this originating, choosing, and adapting faculty of man is removed. "Nature unaided fails" is a world old proverb, the proof of which modern science is bringing home to us today.

¶ HOW THE MEN FOUND AN ANSWER TO ONE PROBLEM

Take a different kind of illustration from the wood pulp industry. Some years ago the men who cooked our digesters, in which the wood is disintegrated, observed the natural law that if we increased the strength of the cooking acid, we would be able to decrease the cooking time. This information, because of the unity of our plant organization, came to the attention of the men in the acid plant, who began to study the operation of the laws governing the absorption of sulphur dioxide gas in water.

The acid makers, who had records of past experience before them, recalled the fact that in winter the acid was stronger than in summer. From this we reasoned that if we could create, by artificial means, the low temperatures in our acid-absorbing systems that we had in winter, we would be able to maintain a uniformly strong acid all the year around. Knowing that natural laws never change, we were able to prophesy ahead what would happen if we reduced these temperatures, and, what is more important, we were able to figure out just what size refrigerating plant to install to reproduce the winter conditions.

What we actually did because of this knowledge of natural law, was to re-create the whole acid-making process, and the refrigerating plant we installed—while it cost us nearly $60,000—was paid for by the increased productiveness of the pulp mill in a period of less than 90 days!

These illustrations will show what I mean by the creative power of the intellect, and how, while man does not create material substance, he does actually create combinations of material substances which did not exist and which could not exist without the aid of his powers of observation and selection. Unless we accept the illogical premise that man's only mission in life is to reproduce his kind, we cannot fail to see that his creative power must have another outlet. What other outlet is there than

that of mental creation—just described?

Before leaving the diagram to give more specific illustrations as to how creative power can be released in the individual workman, look at the striking analogy to the whole human body. I am well aware that direct comparisons to the human body are apt to be "far-fetched," but this is not the case when we compare principles only.

The whole supply division refers to what is taken in by the aid of the special senses. Purchasing corresponds to the complete digestive apparatus; transporting to the blood stream and its attendant vascular system which transports the food to the place where it is finally stored up in the cells which form the body—the storing function.

¶ PRODUCTION—HOW IT CORRESPONDS TO HUMAN FUNCTIONS

The production aspect of the organization refers to the arrangement or organization of these body cells into differentiated parts. Equipping, which has to do with plant structure or design, corresponds to the main body structure, such as head, arms, legs, skeleton; fabrication, which has to do with internal arrangements within the buildings, such as boilers, engines, digesters, machine tools, corresponds with the internal body organs, such as stomach, lungs, heart, kidneys, whose functionings form the internal individualized activities of the body; and evaluation to the whole glandular system, the secretions from which give vitality to the individual. Without these vitalizing and humanizing glandular secretions it would be impossible for the man to produce that which it is his particular mission in life to produce.

Referring now to administration which, of course, corresponds to the nervous system in its entirety, we see that compensation corresponds to the sympathetic system which permeates the entire body. It is concentric with evaluation, and because of this fact is enabled to adjudge values in accordance with actual performance. In a very real sense it keeps a proper evaluation or balancing of body activities.

Similarly, if we are to keep a vital flow of creative fluid in our industrial organization we must, after a proper evaluation of work performed by the individuals of which it is composed, see to the determination of the proper financial compensation for services rendered. When men feel they are not being treated fairly they cannot be expected to put enthusiasm into their work. Naturally then, under conditions of improper evaluation of performance (for the purpose of arriving at just compensation) the amount of constructive, creative power will be automatically reduced.

The next branch of administration, finance, whose function has been previously described, of course corresponds to the brain or cortical system, where all resultant records are kept. The conscious contact of man (the individual life) with the universal life is through the brain; so also is the conscious contact of the industrial organization with the world of commerce and industry through the financial department.

Finally, the planning function of the administration nervous system corresponds to the central or spinal nerves whose particular function is the control of internal individualized operations. The reason for its connection with the purchasing function of the supply division is obvious.

Now, to return to man's place in the organization into which he must consciously fit himself if he is to cooperate in its perfection. We must first remember that the whole diagram symbolizes humanity in action. And while all the activities are human, we are concerned mostly with the production division, as here is where the least opportunity for creative work exists as industry today is in the main constituted. The executives as a rule have plenty of opportunity to express their individuality in creative work, as do those in charge of the supply division, although in a lesser degree. But in the production divisions, where by far the larger number of men are employed, the creative work is largely confined to the superintendents and department heads, and even these men are in all too many cases limited in their activities by the red tape imposed by those higher up.

¶ HOW "RED TAPE" ORIGINATED—AND THE HARM IT MAY DO

In any individual plant red tape is usually the result of the over-development of administrative power, which makes rules and regulations preventing the spontaneous self-expression of the individual.

It may also result—in fact often does result—from over-emphasizing the power of the supply division, especially the purchasing department section, which frequently fails to recognize that efficient operation depends on the operating departments receiving those materials which they know from experience to give the best results.

Or, if the production divisions are given too much authority, and have not sufficient intelligent information about the relative value of the materials, they may through mere prejudice tie the hands of the supply division, so that it cannot properly serve the organization. Red tape from this latter source, however, is much less apt to cause trouble than the over-development of the administration or supply divisions, for the practical operator being close to the work of conversion has more first-hand information as to his material requirements, and he, of all others, should be given the greatest freedom of choice and selection.

Obviously, the remedy for red tape lies in increasing each man's consciousness of his place in the organization, so that instead of selfishly reaching out for more power to rule or exploit others he will direct his energies to creating a department which will render the greatest possible amount of service to the organization. We might call this enlightened self-interest, for naturally the greater the service the greater the reward.

¶ THE GREATEST LEADER IS THE GREATEST SERVANT

This fact can not be too strongly emphasized. The greatest man in the organization is undoubtedly the one to whom the greatest number of men look for intelligent leadership. He is therefore the greatest servant.

The organization having the greatest creative power is the one in which administration, supply, and production are all equally developed functions, as represented by the equilateral triangle within the circle, pictured on page 36, which symbolizes the unified field of activity of the whole organization.

Now proceed to the actual illustrations of how in our mills we were able to work out with our men the kind of progress records which enabled them to know what they were accomplishing. This work was done in direct cooperation with our men, and it is significant that their sympathetic interest in the work came from a realization that it meant greater opportunity to use their brain power, and more chance, therefore, for individual development.

While we have many other progress records, the one which I will illustrate is typical, and will serve to show the methods.* For those who may feel that such records are applicable only to a continuous process, let me say that in the maintenance and construction department, where we had about 300 men at work, we kept everyone informed as to his progress by giving cost records of all jobs done, not only labor costs, but complete material costs, as well.

These records were furnished daily, and while we did not pay bonuses of any kind, not even to superintendents or department heads, we actually cut the maintenance material costs in two by the greater thought of economy released in the organization. We are installing these job costs and department cost sheets now in our mills in Canada, for we know that the only way to produce the greatest possible amount of the finest quality of paper at the lowest cost a ton is to give the maximum amount of intelligent information to the largest number of men.

(To be concluded in February)

*The best example of this type of organization in the country is in the mill of the Fletcher Paper Company, at Alpena, Michigan. The clear vision and fine spirit of Mr. Henry E. Fletcher, the general manager and treasurer, is responsible for its development. It has been my privilege to be associated with Mr. Fletcher in some work for the United States government recently, and I wish to take this opportunity to acknowledge his assistance in presenting this subject, especially in the classification of the three divisions of organization.

SYSTEM

THE MAGAZINE OF BUSINESS

What Made Our Business Grow

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Rubbing Elbows with My Men

And in addition the plans of 107 executives for meeting the problems arising from changing business conditions

25 cents a copy

February 1919

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THIS *sign hangs in the shop of the Packard Piano Company, whose policy toward its workers is detailed by the president, Albert S. Bond, in the February issue of* FACTORY. *That the men in this shop well deserve to be called "efficiency engineers" you will agree if you read the article, which is entitled, "Why We Are All 'Managers' in Our Plant"*

SYSTEM
THE MAGAZINE OF BUSINESS

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IN *January* SYSTEM *a British business man told what opportunities the American business man now has for trade in England. Next month a South American business man, Jorge A. Mitre, shown here, will tell what fields for American goods are open in South America. Mr. Mitre is the editor and owner of La Nación, a daily newspaper of Buenos Aires*

WHY THEIR BUSINESS GREW

"SEVERAL months ago," Tom G. Moore, of the Moore-Summers Hardware Company of Welch, W. Va., writes, "we wrote and asked you for information on ways of changing from a credit to a cash basis.

"You referred us to a number of articles which proved very helpful. As a result of reading them, we sent out, 15 days apart, three circulars explaining our new policy to our customers. The first circular announced the passing away of 'Mr. Credit,' and enumerated the 'complications causing his death'—too many accounts lost, fees paid attorneys for collecting, too much capital tied up in accounts, taxes on accounts, and others.

"The second circular showed the customer why he can be given lower prices when everyone pays cash. The third mailing was a short announcement of the new cash system.

"During two of the three months that we have had the plan in operation, our volume of sales has been greater than formerly; its failure to come up during the third month we attribute to the influenza epidemic."

IDEAS THAT MAKE FRIENDS

"THE 'What I Would Do' columns in SYSTEM advance many ideas which I change to suit my business," wrote Abe Kaufman, president of Kaufman Specials, Memphis, Tenn., to the editors recently.

"There are many ideas, too, that I clip and send to my friends. Those for bankers particularly bring me good will.

"Then, of course, many suggestions come to me from the longer articles. I used, for instance, the five collection letters quoted in an article by Norman Lewis, 'How Can We Collect that Money?' which appeared in the December, 1917, issue of SYSTEM. They brought me very good results."

FOR SERVICE RECEIVED

"I HAVE been a regular reader of SYSTEM for a number of years, and a subscriber for over a year," wrote Chris M. Anderson of The Flagler Lumber Company of Flagler, Colorado, when he sent in a contribution recently.

"Although there are not many articles dealing especially with our line of business—lumber—it is possible to apply the same principles to this business. In fact, the principles of business are much the same in any line of endeavor, regardless of the difference in methods and material handled.

"I certainly get a lot of good from SYSTEM, and I have been thinking that it was no more than right that I should contribute something to this store from which I have received so much good. The essence of cooperation is 'giving to get.'"

IT COULDN'T BE TRUE!

A NUMBER of readers have called attention to an obvious error on page 823 of December SYSTEM. The statement was that by eliminating one of three fender clips formerly considered necessary on certain kinds of bicycles, the manufacturers would be able to save 250,000,000 tons of steel the coming year. Through error, the saving was multiplied by a million: it should have read "250 tons."

"WHY NOT?"

G. W. GREENWOOD, manager of the United Firebrick Company of Uniontown, Pennsylvania, told one of the editors the other day how he introduced a SYSTEM executive to a friend.

Mr. Greenwood had just been reading one of the "V. W." fiction articles that appeared in July and August of last year when he met a friend, a state senator of Pennsylvania. He told the senator about "V. W.," advising him to read the stories and adding that he "wouldn't stop until he had finished."

Several days later Mr. Greenwood met the senator, who told him he was going right out to see the manager of his farm and say to him: "Why not? Now go ahead and make some money." "Why not" were "V. W's" encouraging words to executives who wanted to try out new plans.

MAKING MEN LIKE THEIR JOBS

By ROBERT B. WOLF, M. E.

CHARLES M. SCHWAB said in a recent interview:

"I know something about making steel, but I don't know any where near as much as the millions of steel workers know. No man can know as much as the crowd knows. No one can do as much as the crowd can do. The real leader is not the man who substitutes his own will and his own brain for the will and intelligence of the crowd, but the one who releases the energies within the crowd so that the will of the crowd can be expressed."

When Mr. Schwab used the word "crowd" he did not mean an unorganized mob. He recognizes that the crowd is composed of individuals, and that the problem of management is therefore how to release through organized effort the greatest possible amount of individual intelligence. The mass man can find expression only through the unit man, and just as the intelligence of an organization is but the sum of the intelligences of its individual members, so is the intelligence of humanity as a whole but the sum of the intelligences of the individuals composing it.

I will now illustrate the method of keeping progress records on our paper machines. The publishers are very particular about the weight of the paper. A ream to be satisfactory should weigh exactly 32 pounds. Paper that is lighter is apt to cause breaks in the press room. If it runs heavier, the paper cost for each edition will be high. Furthermore, if the paper is very dry it becomes brittle, and is apt to break.

The dryness, too, prevents the paper from taking a good finish. As a result, the surface will "fuzz" up and fine particles will come off on the printing press and cause trouble by filling up the type and meshes in the cuts.

In the ordinary course of events the publisher sends his complaint in to the sales office, where it is passed on to the manager's office. The matter is then taken up with the superintendent, and he passes the "kick" along to the boss machine tender. It finally reaches the machine tender, or backtender, or any member of the machine crew who is responsible. This process has to be repeated constantly in order to maintain a uniform quality of paper.

Obviously, therefore, the trouble was due to lack of interest upon the part of the men operating the machines in keeping the operating conditions where they should be. This lack of interest came largely from a lack of knowledge as to what the conditions actually were. We determined, therefore, that more samples should be taken, to give the machine crews more continuous information.

The usual method is for the backtender to take a sample of paper every time a reel is changed, weigh it, and let the machine tender know the result. The machine tender then turns on or shuts off stock, according to whether the sample is heavy or light. A sample from the front, middle, and back of the sheet is taken occasionally, but, as a rule, not as often as it should be, largely because the men have not the time.

This article describes specific methods developed and used successfully to get men to take a real interest in their work. These methods have had far-reaching results, which the author describes. The editors feel that Mr. Wolf presents an extremely important message for all employers. In the first instalment of his article, published last month, he outlined the fundamental laws and principles on which the methods described here are based. - Mr. Wolf is manager of the Spanish River Pulp and Paper Mills, Ltd., of Sault Ste. Marie, Ontario, Canada

From previous experience we knew that the problem was to produce a desire upon the part of the machine crew to get the required results, so we put on each shift a man (one for every two paper machines) to take samples every time a reel was changed from the front, middle and back of the sheet, these three samples being weighed and recorded, as shown in the reel record on page 223.

These forms are kept in the machine room at the end of the paper machine. While the sample testers are instructed in the work by the Research Department, they are controlled by the boss machine tender and are largely recruited from the machine crews. In our mills they are members of the labor unions.

HOW EMPLOYERS CAN INTEREST EMPLOYEES IN THEIR WORK

There is no thought in the minds of our men, therefore, that this is a follow-up system designed to enable the management to find fault with the workmen. They recognize it as a system to help them to get information which they have not had time to get for themselves, and which they must have in order to do their work intelligently. In other words, we were recording the facts which enabled the operators to recognize the natural laws underlying the process.

The notes on the reel record shown explain fully how this record is kept, so no further explanation is necessary, except to say that the suggestions regarding the moisture test in addition to the weight came from one of the international officers of the Paper Makers' Union. It has proven to be a great help, for previously the only way the backtender could tell anything about the moisture content of the sheet was to "feel" it as it passed from the calendar stack to the reel.

Of course, no record of this "feel" could be made to enable the backtender to tell how well his work was being done, so there was no particular reason why he should be interested in this part of his work. It is only the exceptional man who has imagination enough to create within himself a consciousness of his progress.

The intelligent interest that men in all departments take in creating better operating conditions, when encouraged through the progress records to do so, it seems to me demonstrates conclusively that the employer has everything to gain and nothing to lose by making his industry thoroughly democratic. The attitude of secrecy is repugnant to a free people, for it savors too much of exploitation. With everything open and aboveboard there can be no feeling of mutual suspicion and distrust.

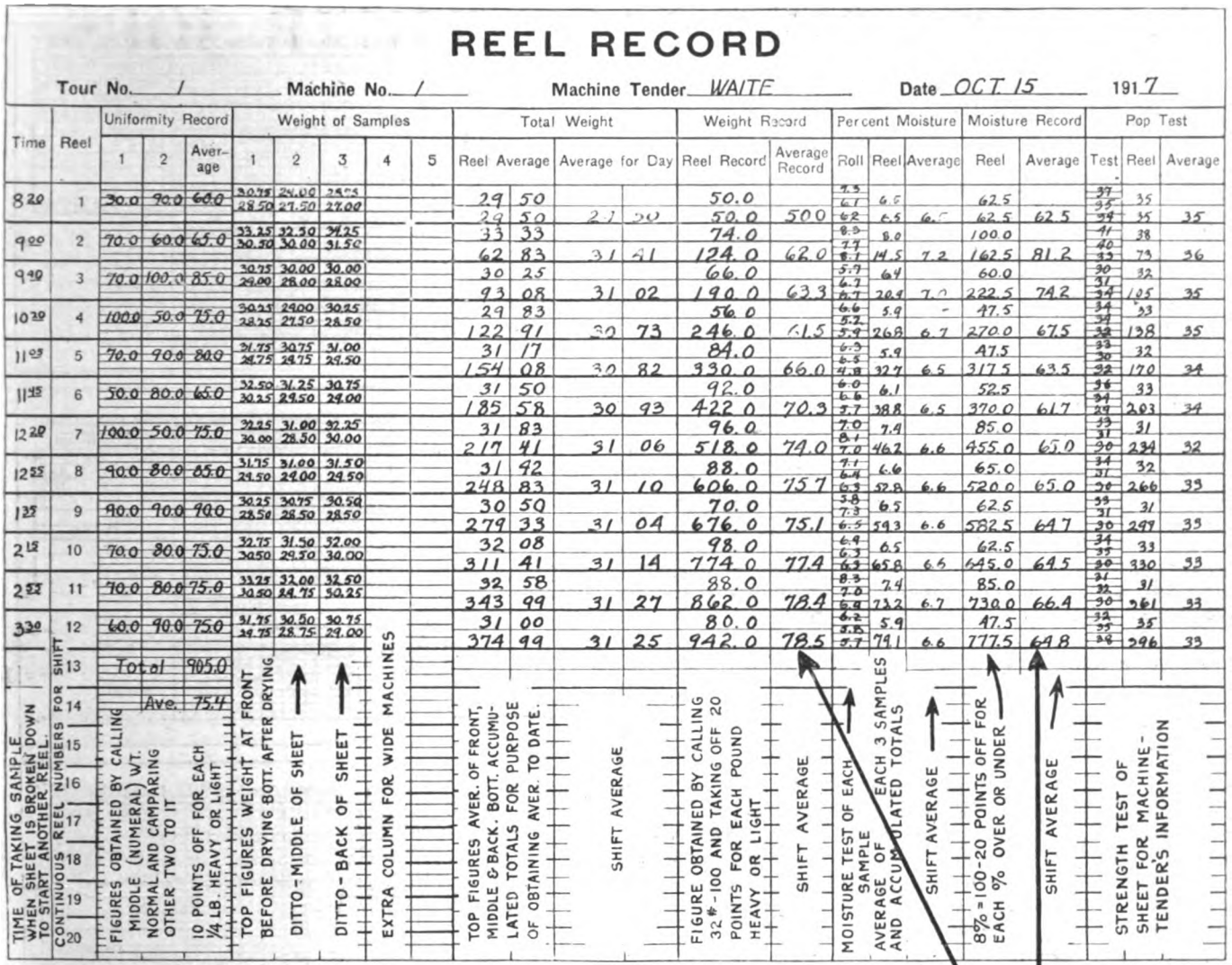
I believe we have failed to recognize the curative properties of knowledge and truth. Just as darkness cannot exist in the presence of light, so ignorance and prejudice cannot exist when met by frankness and cooperation.

The employer is an individual, generally a very strong character. I believe, however, that his usual disregard for the individuality of the workman comes largely from the fact that he has been so engrossed in the task of creating an efficient organization to express his own individuality that he has entirely overlooked the fact that in the creation of this thing he has forgotten to extend the same privilege to his employees. If he only stops to think of it he will recognize at once that he cannot hope to get the initiative of the workman except by giving him a similar privilege of seeing his own creations grow, either by leaving the impress of his personality upon the article produced or upon the progress record of his work.

The workman has combined against the employer in order to obtain the freedom which he sees steadily being taken away from him, as industry tends more and more to make automatons of men; and the unfortunate part of it all is that he has accepted in all too many cases the premise that this tendency is logical and, therefore, inevitable.

Probably the reason the average employer is opposed to labor unions is that he is afraid that the restrictions which he thinks the unions seek to impose will take away his own opportunity for self-expression by preventing him from working out his problems in his own way.

Furthermore, if the unions can demonstrate, as they have in our plants, that this fear is unfounded, but that on the contrary their united cooperative effort



REEL RECORD

Tour No. 1 Machine No. 1 Machine Tender WAITE Date OCT. 15 1917

Time	Reel	Uniformity Record 1	2	Average	Weight of Samples 1	2	3	4	5	Total Weight Reel Average	Average for Day	Weight Record Reel Record	Average Record	Percent Moisture Roll	Reel	Average	Moisture Record Reel	Average	Pop Test Test	Reel	Average
8 20	1	30.0	90.0	60.0	30.75 / 28.50	24.00 / 27.50	25.75 / 27.00			29 50		50.0		6.5 / 6.7	6.6		62.5		37 / 35	35	
										29 50	21 50	50.0	50.0	6.2	6.5	6.6	62.5	62.5	34	35	35
9 00	2	70.0	60.0	65.0	33.25 / 30.50	32.50 / 30.00	34.25 / 31.50			33 33		74.0		8.3	8.0		100.0		41	38	
										62 83	31 41	124.0	62.0	7.7 / 8.1	14.5	7.2	162.5	81.2	40 / 33	73	36
9 40	3	70.0	100.0	85.0	30.75 / 29.00	30.00 / 28.00	30.00 / 28.00			30 25		66.0		5.9	6.4		60.0		30	32	
										93 08	31 02	190.0	63.3	6.7 / 6.7	20.4	7.0	222.5	74.2	37 / 34	105	35
10 20	4	100.0	50.0	75.0	30.25 / 28.25	29.00 / 27.50	30.25 / 28.50			29 83		56.0		6.6 / 5.7	5.9	-	47.5		34	33	
										122 91	30 73	246.0	61.5	5.9	26.8	6.7	270.0	67.5	38	138	35
11 00	5	70.0	90.0	80.0	31.75 / 28.75	30.75 / 28.75	31.00 / 29.50			31 17		84.0		6.3 / 6.6	5.9		47.5		33 / 30	32	
										154 08	30 82	330.0	66.0	4.8	32.7	6.5	317.5	63.5	32	170	34
11 40	6	50.0	80.0	65.0	32.50 / 30.25	31.25 / 29.50	30.75 / 29.00			31 50		92.0		6.0 / 6.6	6.1		52.5		36 / 34	33	
										185 58	30 93	422.0	70.3	7.7	38.8	6.5	370.0	61.7	29	203	34
12 20	7	100.0	50.0	75.0	32.25 / 30.00	31.00 / 28.50	32.25 / 30.00			31 83		96.0		7.0	7.4		85.0		33 / 31	31	
										217 41	31 06	518.0	74.0	8.1 / 7.0	46.2	6.6	455.0	65.0	30	234	32
12 55	8	90.0	80.0	85.0	31.75 / 29.50	31.00 / 29.00	31.50 / 29.50			31 92		88.0		7.1	6.6		65.0		34 / 31	32	
										248 83	31 10	606.0	75.7	6.4 / 6.3	52.8	6.6	520.0	65.0	29	266	33
1 25	9	90.0	90.0	90.0	30.25 / 28.50	30.75 / 28.50	30.50 / 28.50			30 50		70.0		5.8 / 7.3	6.5		62.5		33 / 31	31	
										279 33	31 04	676.0	75.1	6.5	59.3	6.6	582.5	64.7	30	297	33
2 15	10	70.0	80.0	75.0	32.75 / 30.50	31.50 / 29.50	32.00 / 30.00			32 08		98.0		6.9 / 6.3	6.5		62.5		34 / 33	33	
										311 41	31 14	774.0	77.4	6.3	65.8	6.5	645.0	64.5	30	330	33
2 55	11	70.0	80.0	75.0	33.25 / 30.50	32.00 / 29.75	32.50 / 30.25			32 58		88.0		8.3 / 7.0	7.4		85.0		31 / 32	31	
										343 99	31 27	862.0	78.4	6.4	73.2	6.7	730.0	66.4	30	361	33
3 30	12	60.0	90.0	75.0	31.75 / 29.75	30.50 / 28.75	30.75 / 29.00			31 00		80.0		6.2 / 5.85	5.9		47.5		34 / 33	35	
										374 99	31 25	942.0	78.5	9.7	79.1	6.6	777.5	64.8	36	396	33
	13	Total		905.0																	
	14	Ave.		75.4																	

TIME OF TAKING SAMPLE WHEN SHEET IS BROKEN DOWN TO START ANOTHER REEL.

CONTINUOUS REEL NUMBERS FOR SHIFT

FIGURES OBTAINED BY CALLING MIDDLE (NUMERAL) WT. NORMAL AND CAMPARING OTHER TWO TO IT

10 POINTS OFF FOR EACH ¼ LB. HEAVY OR LIGHT

TOP FIGURES WEIGHT AT FRONT BEFORE DRYING BOTT. AFTER DRYING

DITTO - MIDDLE OF SHEET

DITTO - BACK OF SHEET

EXTRA COLUMN FOR WIDE MACHINES

TOP FIGURES AVER. OF FRONT, MIDDLE & BACK. BOTT. ACCUMULATED TOTALS FOR PURPOSE OF OBTAINING AVER. TO DATE.

SHIFT AVERAGE

FIGURE OBTAINED BY CALLING 32#-100 AND TAKING OFF 20 POINTS FOR EACH POUND HEAVY OR LIGHT

SHIFT AVERAGE

MOISTURE TEST OF EACH SAMPLE

AVERAGE OF EACH 3 SAMPLES AND ACCUMULATED TOTALS

SHIFT AVERAGE

8% = 100 - 20 POINTS OFF FOR EACH % OVER OR UNDER

SHIFT AVERAGE

STRENGTH TEST OF SHEET FOR MACHINE-TENDER'S INFORMATION

Tour No. 1 Machine No. 1 Machine Tender WAITE Date OCT 6 1917

Basis Weight

36 35 34 33 32 31 30 29 28 27

Moisture Test

Hours 9 10 11 12 1 2 3

10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0

Progress Record		
Items	Day	Period
Weight	78.5	79.3
Moisture	64.8	68.6
Total	71.7	73.7

GRAPHICAL CHARTS OF WEIGHT AND MOISTURE TESTS - THESE ARE TORN OFF AND AFTER CHECKING ARE POSTED ON BULLETIN BOARD

A CHECK THAT HELPS

Constant records of variations in the product enabled the men to discover the means of making both product and process more uniform. These forms were used in paper making, and the principles apply in other lines of manufacturing

helps to develop *esprit de corps*, would not this antagonism on the part of the employer disappear?

The progressive improvements shown in the charts on this page and the following indicate clearly the increasing interest in the work, and how completely the man has become master of the machine. That this improvement is due to increasing interest alone is borne out by the fact that we do not pay a man more money for a good record, but pay the prevailing union scale for all positions in our plants. These are adjusted each spring by joint conferences with our men. In this way we keep a proper wage balance between the different classes of work in proportion to the skill required, and as a consequence avoid all the innumerable difficulties which confront the piecework system, task and bonus plan, and other direct payment methods.

It is often argued that it is not right to pay a good man the same rate as a poor man and to this I absolutely agree; but the fact is that when these progress records are furnished to men, all men in a certain operating class finally come to be practically equal in performance and the differences will be only between the amount of skill required in each different class of work. And in these classes there is a difference in compensation.

Invariably the competition is keen enough on all quality records to bring nearly all the men (who have been at the work a sufficient length of time to become expert) practically to the same degree of proficiency.

The period is four weeks and the average to date begins all over again at the end of each four weeks' period. The reason for indicating the standing of the men on a period average rather than the day's average is that it tends toward greater continuity of effort, which in

itself is a source of much greater satisfaction to the workman.

It is the steady progress that really counts and not the spasmodic, spectacular high record for any one day. The record, to give joy to the worker, must reflect the constant, steady inner urge which indicates the degree of his mastery of the forces he controls in the day's work.

The "uniformity" record shown first in the three charts to the right of the page came as the result of suggestions from our men after the weight and moisture records had been in use for some time, and we purposely left other spaces in the progress records attached to the charts. We knew that we would be sure to have requests from our men for other factors which they would like recorded. While we have not had time to work them out as yet, we have already had a number of suggestions. We find that the greater number of factors or laws that we record, the greater is the interest in the work, because it brings to bear upon the problem a greater amount of thought.

WHAT KINDS OF RECORDS PRODUCE GREATEST EFFORT

The "basis weight" and "moisture test" records had been operating only a short time when the machine tenders called our attention to the fact that they could get better results if the stock thickness or density furnished them by the beater room was more uniform. They asked us to find a way to measure the thickness of the stock so that the beater engineer could do his work better.

As a result of this suggestion, and after discussing the matter with the beater engineer, our research department has tackled the problem of measuring this stock thickness and it is now practically solved. The beater engineer immediately suggested to us that the variation in the stock thickness which was furnished him by the sulphite pulp mill and groundwood pulp mill was not uniform, and that we should find some way of recording the thickness at these points.

We found that to do this we had to increase the amount of agitation in the pulp-storage tanks, and as a result are making some radical improvements which will tend to produce greater uniformity throughout the entire process.

Right here it might be well to call attention to the fact that our experience has been that men do not have to be stimulated to make suggestions by offering prizes. They are glad to suggest improvements, for in this way they are helping to create conditions in the plant which help them to get better results (the results being indicated by their progress records). Then, too, they are sure to receive recognition for their suggestions, for the foreman knows our judgment of his ability depends largely upon how he succeeds in getting his men to use their brains. He naturally hastens to give credit for all suggestions made.

Of course, it goes without saying that this greater uniformity is bound to result not only in a better quality of paper, but in increased output as well; in fact one of our mills, without making any changes in the speed of the paper machines, has already increased its output over 5% because of the uniform operating conditions.

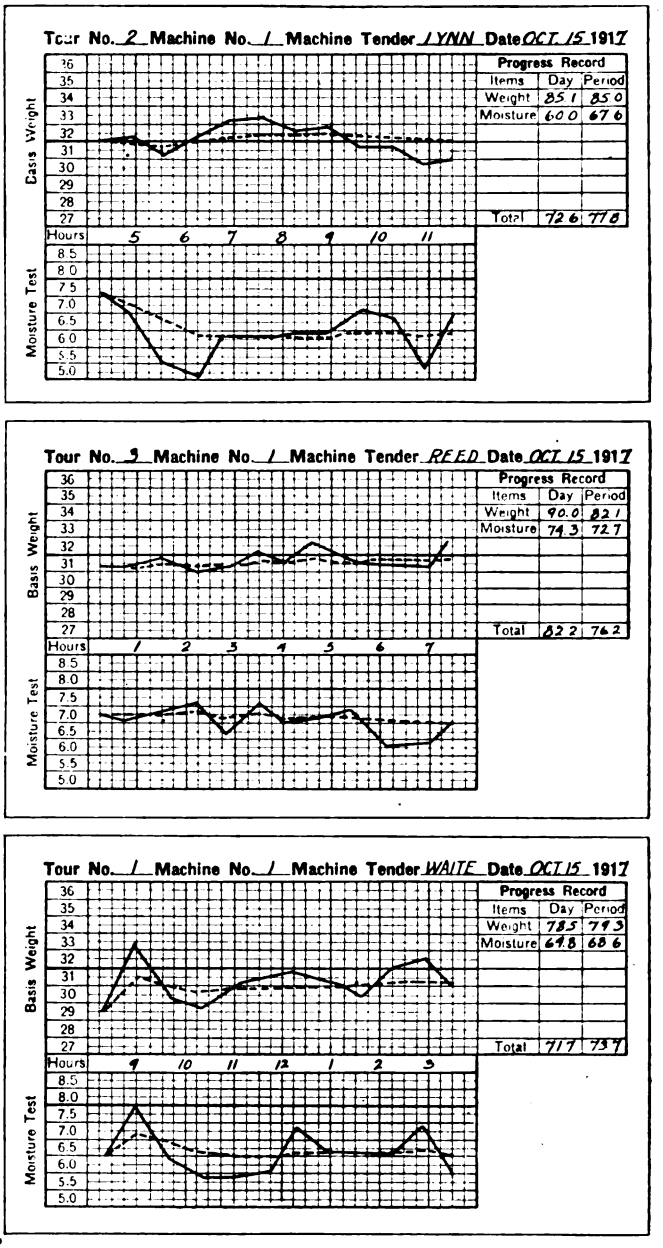
We have further made the discovery that what we call the slowness or freeness of the stock has quite a bearing on the quality of the paper as it comes off the paper machines, and as a result we adopted a method which would record this slowness and freeness. By free stock I mean stock that the water leaves rapidly and by slow stock a stock which the water leaves slowly. We found incidentally that this slowness and freeness is one of the best indexes of the quality of the groundwood pulp, and we are now working upon a series of factors which will record the operations of the grinders upon which the wood blocks are reduced to pulp.

This work has always been one of the most uninteresting and monotonous jobs in the plant, but from the small amount of work we have already been able to do, we find increasing interest upon the part of the worker, and I feel free to prophesy that when these several factors have been recorded, we will convert this into one of the most interesting jobs in the plant. I base this prophecy on my previous experience in another plant where we recorded hundreds of operations. These records we found to be grouped under three general classes: quantity records, quality records, and economy records.

Quality records (which occupy the middle position) are, perhaps, of the greatest importance, for they bring the individual's intelligence (brain power) to bear upon the problem and as a consequence, by removing the obstacles to uniformity of quality, remove at the same time the obstructions to increased output. The creative power of the human mind is, however, not content simply to produce the best quality under existing conditions of plant operation. So the desire to create new conditions for the more highly specialized working out of the natural laws of the process demands expression, and this expression at once takes the form of suggestions for improvements in mechanical devices.

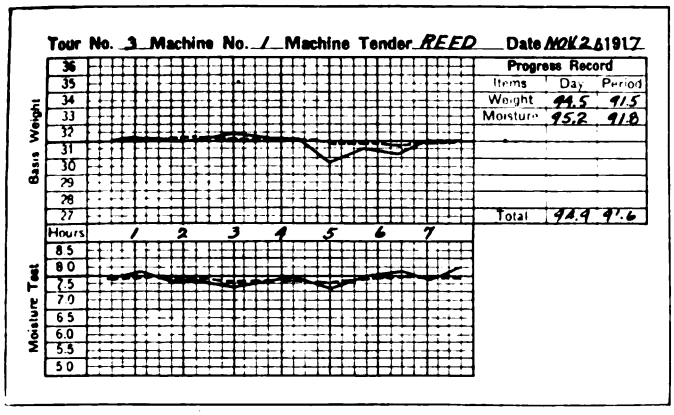
This desire contains within it the germ of economic thought which will unfold and express itself eventually in a request for cost records, and the organization that neglects its opportunity to satisfy this desire is overlooking one of the great avenues leading toward intelligent productive effort.

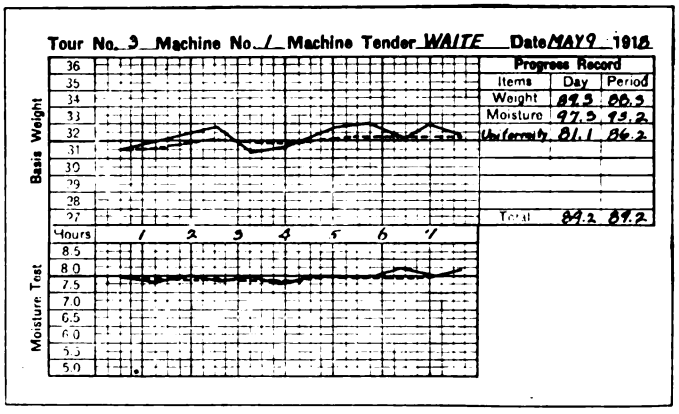
Because of the interrelation of quality, quantity, and economy records, any complete record of individual progress must, of course, take them all into account. However, as this is not always practical,

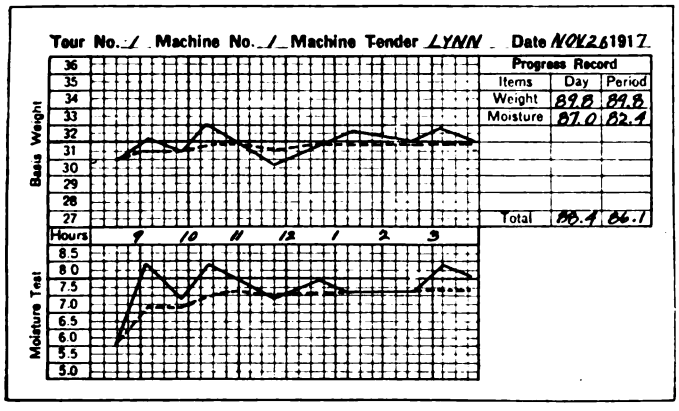


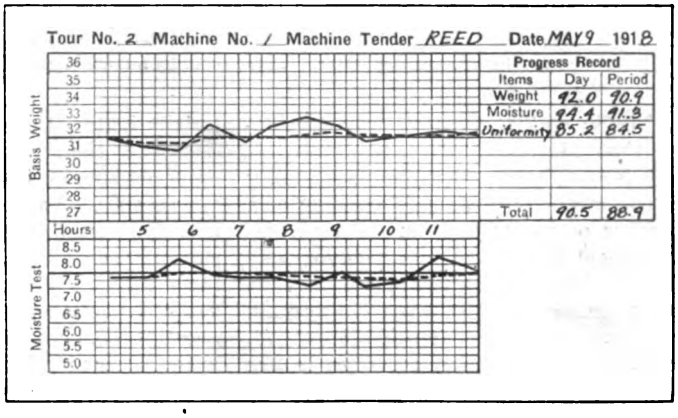
MASTERS: MEN OR MACHINES?

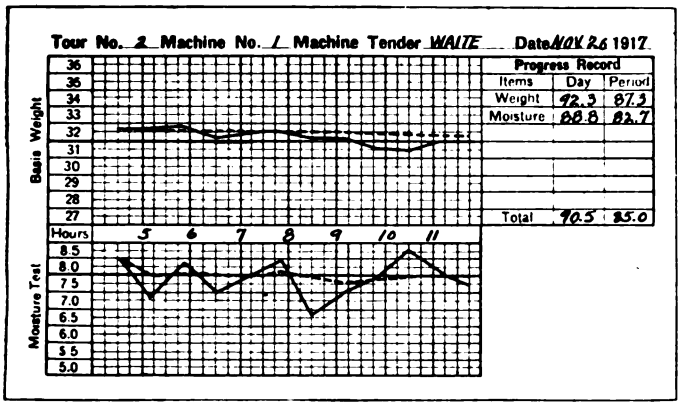
Machine records like these used to be typical in a paper mill. Now they are like those shown on the next page

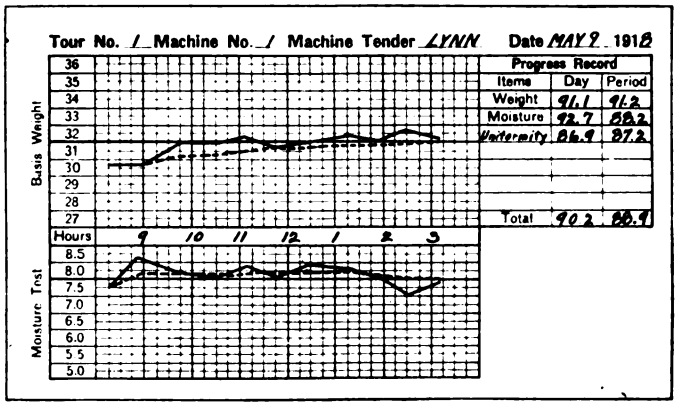












BY MAKING THE MEN MASTERS OF THEIR MACHINES

When the machine was master of the three workers whose October records are shown on the opposite page, the highest average attained was 77.8. Introducing the worker's individuality moved all the averages above 88 by May

we have at least one of three ways of measuring progress always open to us.

As further illustrating the necessity for giving individual records to the men, we discovered that the backtenders who sometimes work on other shifts than their regular ones lost interest in their records to a certain extent when on a different shift. Therefore, a request came to keep the backtenders' records separately, so that no matter what machine tender he worked for, his record would follow him.

This was done, and the two records of November 26 and May 9, reproduced on this page, show clearly not only the gains made but the increasing competiton for a good record. Other factors under control of the backtenders have been already suggested for recording, and these we are planning to work upon as soon as our Research department has had time to develop a plan.

We had an interesting experience with one of our backtenders which illustrates how men appreciate these progress records. At one plant we have two small 120-inch machines. At another our narrowest machine is 164-inch and the widest 198-inch. Whenever we have openings on these wide machines, which pay more money for backtenders, we like to advance our own men.

One of our men went from the former mill to the latter. His machine tender, who told me the story, said he noticed this man ran his paper much more uniformly than any backtender he had ever had as regards moisture test. Upon inquiring where he had learned to run paper so uniformly, he explained our plan for letting backtenders know just what the moisture was every time a reel was changed. He said the scheme was "great" and he hoped they would start it at this plant.

Mistakes in records cause a lack of confidence. We overcame this trouble by giving "accuracy" records to the "sample tester." We had the Research department check over the number of mistakes made each day in the "reel record" sheets. A perfect score with no mistakes we call 100; 2½ points were taken off for every mistake. An average of eight or ten mistakes a day was a common occurrence and almost immediately this changed so that today a mistake is decidedly the exception.

Now to go back to our original premise that it is necessary to teach man his place in the organization. These paper-machine records enabled the machine tender to become a conscious participator in the entire process of production. The individuality of the plant, it must be remembered, is increased by developing the individuality of the men in the plant and, conversely, the individuality of the man

BACK TENDERS MOISTURE RECORD

Date NOV 29.1917

No. 1 Machine					No. 2 Machine				
Name	Moisture		Progress Record		Name	Moisture		Progress Record	
	Day	Period	Day	Period		Day	Period	Day	Period
RAOUL	7.9	7.7	94.1	94.2	FRYON	7.7	7.8	92.7	93.1
CLELAND	8.3	7.8	82.7	83.8	DREW	7.4	7.5	81.8	80.2
DOANE	7.9	7.6	89.3	83.5	ALLEN	7.4	7.2	84.2	78.9

BACK TENDERS MOISTURE RECORD

Date MAY 9. 1918

No. 1 Machine					No. 2 Machine				
Name	Moisture		Progress Record		Name	Moisture		Progress Record	
	Day	Period	Day	Period		Day	Period	Day	Period
WOOD	8.0	8.0	97.3	95.5	RAOUL	8.0	7.9	97.5	92.1
CLELAND	8.1	7.9	92.7	92.0	DREW	7.9	7.8	95.0	91.9
JONES	8.0	7.8	94.4	90.2	FRYON	8.0	7.8	95.6	91.8

A CONTRAST IN RESULTS

"Invariably the competition is keen enough on all quality records to bring all the men to practically the same degree of proficiency," says Mr. Wolf. These records, made six months apart, show a great difference in the degree of variation

will be increased by consciously developing the individuality of the plant.

It is equally true that the individuality of the corporation which is made up of a number of plants is increased by a development of the individualities of these plants. The unit of the corporation is the plant; the unit of the plant is the man. Because of this fact the administrative, supply, and production activities in the larger organization should be confined to policies. It should be a "policies organization" only. If it attempts to control actual manufacturing operations in detail, it at once interferes with the individuality of the unit plant. And consequently with its creative power.

One often hears it said that it is impossible to manufacture either as cheaply or as well in a plant which is part of a larger organization as it is in an individually owned plant where those with whom rest the final decisions are right on the job. This is true. But we cannot go back to the old order with all its wastes of competition; therefore, we must solve the problem of uniting men without, at the same time, crushing them. And this solution cannot be reached without a knowledge of the philosophy of individuality.

The paper maker is in the fabricating department of the production division and I will now again trace his knowledge of each division through administration, supply, and back again to production. This will complete the analogy.

By proper evaluation, of course, he is furnished with knowledge of his own definite relationship to the whole process of manufacturing. The knowledge of individual performance as related to the work done by others he sees leads to just compensation. The quality of the paper enables him to be conscious of the selling side of financing—he knows that the customer's satisfaction with the output depends upon its quality, over which he has very definite control—the quality being reflected in the progress record.

He also knows that better quality brings a higher price. He is further conscious of his contact with the receiving side of financing by knowing that increasing the moisture test (which also very materially betters the quality of the paper) decreases the shrinkage, so that the same amount of raw material will make more paper. An increase of 1% in the moisture test decreases the cost of our paper 50 cents a ton. Planning, he contacts through his constantly expressed desire for improvements in process suggested by his knowledge of needed changes in the paper machine. As he obtains better results, the improvements reflect themselves in the quality record.

The supply of material needed to make these changes in apparatus (or manufacturing raw material) must be purchased, transported and stored ready for use in the new equipment to be created by the plant engineer, who is responsible for the maintenance and construction work. The paper maker's many relationships to the fabricating department of the production division have been previously described in considerable detail. The important point to remember is that the conscious knowledge of his relationships to the entire production process comes through the progress records which accurately record his mastery of the natural forces he is using.

The paper machine becomes an instrument through which he can express the art of paper making, and the records become organized facts available to all and gradually accumulate to form the basis of a real science of paper making.

IS THIS THE WAY TO ELIMINATE INDUSTRIAL UNREST?

We must not forget we can only have a great art where the organized facts which record the science are so complete and comprehensive that the individual who wishes to express the art can master the natural laws recorded in the science.

In conclusion, does not the problem after all resolve itself into a conscious realization of man's part in the great universal creative plan?

As has been previously indicated, industry has to do with three great fields.

On the one hand we have the field of natural or universal activity, which functions according to pre-determined law. The so called exact sciences, such as chemistry, physics, and mechanics, record the operations in this field. It has to do with our raw materials.

On the other hand we have the field of plant unity—that "spirit of the whole," which reflects itself as *esprit de corps*. It is this that we must develop if the plant is to become a creative center for consciously specializing nature's laws.

Between the field of natural or universal activity and the field of plant unity we have that great field which we may call The Will of Man. For man considered generically forms the one connecting link between these two fields. As an individual, he is free to work with or against the great law of natural evolution; that is, constructively or destructively, and this fact emancipates him from the operation of the exact sciences. If the employer attempts to confine or repress this free spirit in the individual workman by exploitive methods, he will rebel and work against him. On the other hand, if the employer stimulates free self expression by encouraging conscious, i. e. thoughtful, participation, he will release such powerful creative forces within the organization that no obstacles will be too great to be overcome.

When most industrial institutions are organized along these lines, men will begin to realize that they are free only when they conform to natural law.

The main function of the administration division is to provide an environment in which the greatest possible number of men in the production divisions have the very best opportunity to express their individual creative power in constructive work. And it is the main function of the supply division to provide a sufficient quantity of the most suitable materials in order to develop the highest type of organized creative power.

There is no other way to eliminate industrial unrest, for man is not an animal, but a free, self-determining, mental center of consciousness, who exists that the universal life can deal with a particular situation in time and space, and thereby be enabled to evolve a material universe organized to express the one great individual life of which we all are a part.