cent to our labor costs. The figures given previously, however, indicate that this was by no means the case. As a matter of fact the labor cost per ton of product invariably decreased.

Fourth. The problem of shortage of labor was one which we felt to be quite serious, but this was easily overcome by distributing our key men throughout the plant and, while there was a slight amount of confusion to start with, this was soon over.

The advantages given to promote employees to better positions are obvious and the better spirit which soon develops quickly offsets the small temporary losses occasioned by the change. I cannot help making the observation right here that with the present curtailment in industry all over the country, the time is ideal for putting all two-shift industries on a three-shift basis.

Fifth. Greater demand for housing facilities was an objection which seemed, at first sight, to be a very serious one, especially in one particular instance where the plant was located in a small community. This, however, did not prove to be serious, as the actual percentage increase in the number of men was really small and the temporary congestion was quickly relieved.

In this connection, it should always be borne in mind that the change from two shifts to three shifts never means an increase of fifty per cent in labor, but always a very much smaller percentage, owing to the fact that the number of men in each operation can be reduced because of the shorter hours and also from the fact that in all industries a large percentage of the men are on day work.

Sixth. I have heard the argument put up in the paper industry, when the three-shift movement first gained headway, that it would make it impossible for us to compete with foreign mills. This argument really no longer holds, because most foreign mills are on a three-shift basis at the present time, and I am informed that the English Steel industry is entirely on three shifts.

General Conclusions

It seems to me that the most obvious reason for the three-shift basis is that the day naturally divides itself into three equal parts. The principle is as old as the hills and has been enunciated from time to time by the world's greatest thinkers. Eight hours of actual application to the performance of the daily work, by which we earn our living, is generally sufficient. By actual work, I mean the close application of men to their daily tasks. It makes very little difference whether this is operating a bolt cutting machine, digging a ditch, or attending to the direction of a corporation's affairs from a desk. I know that some men boast that they work sixteen hours a day and then wish the day were longer. If these men would stop to analyze their work, however, they would find that an average of eight, out of the sixteen hours, is devoted to a different *kind* of work. It consists largely of coming into contact with new individuals and with different lines of thought. In other words, this second period of the day is devoted to mental activities of a more or less recreational nature,—not to close application to work for the execution of which they are directly responsible. Finally, a third period of eight hours rest,—it may not be actual sleep, but complete relaxation,—is necessary, otherwise man would so deplete his vitality that he would wear out before his time.

The logical division of the day, it seems to me, is eight hours of work, eight hours of recreation and eight hours of sleep. In any case, my experience of twenty-two or twenty-three years in a continuous-process industry has demonstrated to me that this grouping produces the best results from the standpoint of increased production, better quality and decreased cost.

Finally, let me state that the result of our experience in humanizing work in the pulp and paper industry has been to make us realize that after all industry is for service rather than for profit. We were obliged to render a greater service to our customers, by making a better product; to obtain the better product we had to serve our men, by thinking of their human needs and cease classing them with our raw materials.

The human need is to release the creative power which resides in man's faculty; first, to observe the operation of natural law; second, reflect upon the observed operation until he has thought out the principle involved; third, plan the ways to use this knowledge to obtain better results than before; and, fourth, create the necessary conditions to make this possible.

It is the deadly monotony of repetitive work that is the curse of modern industry and unless this is changed (as we are successfully changing it in the pulp and paper industry) we can look forward to continued agitation for shorter and shorter hours. Even eight hours will not satisfy.

One of the great troubles with the business man today is that he is confusing cause and effect. It is because we are thinking only in terms of profits, which are the *effect* of service, that we are automatically cutting off the service, which is the *cause* of the profit. The service, however, must not only be to the customer, but also to the employee. An industry which renders service to society is bound to be rewarded by society and, therefore, cannot help being a profitable business.

A tremendous responsibility rests upon the Engineer because he is perhaps more conscious of the operation of the law of cause and effect than any other of our professional men.

Many of our big industries are today managed by members of the engineering profession, so it augurs well for the future when the constitution of the Federated American Engineering Societies begins with the following preamble:

> Engineering is the science of controlling the forces and of utilizing the materials of nature for the benefit of man, and the art of organizing and of directing human activities in connection therewith.
>
> As service to others is the expression of the highest motive to which men respond and as duty to contribute to the public welfare demands the best efforts men can put forth, NOW, THEREFORE, the engineering and allied technical societies of the United States of America, through the formation of The Federated Engineering Societies, realize a long cherished ideal,—a comprehensive organization dedicated to the service of the community, state and nation.

3. By C. L. Patterson[1]

The Association which I have the honor to represent is an association of manufacturers of sheet steel and tin plate, and these plants are largely on an eight hour basis, but few, if any of the employees, working more than ten hours per day at the most. But many of these plants also have steel plants, open hearth and blast furnaces, in connection with them; and some of them at least, are still working twelve hours a day and seven days a week, and it is with these plants in mind that I venture to discuss Mr. Drury's able presentation of this subject.

I have listened with interest to this address and what has perhaps impressed me most has been the absence of unfairness, misrepresentation and ignorance of the problems of the steel manufacturing industry which usually characterizes discussions of this subject. I failed to hear it even inferred that the twelve-hour day and the seven-day week in the steel mills was due to the capitalistic system or the greed of the employers which is the stock basis for criticisms of the long day in the steel mills. I wonder if it has ever occurred to thinking men and women who have interested themselves in promoting better working conditions in the steel mills that the seeming antagonism on the part of the manufacturers of steel to the substitution of the three-shift system for the twelve-hour day has been due to the manner in which they have been approached on this subject by well-meaning but impractical and uninformed theorists who seem to be under the impression that the only question involved in changing from the two to the three-shift system is a question of dollars and cents and that the manufacturing industry is one in which profits should have no consideration.

I know that the substitution of the eight-hour day for the long day is receiving the serious consideration of the leading men in the industry today; that they will welcome suggestions and a thorough and detailed discussion of the problems such as we have listened to this evening; and in my opinion, the day is very near when the twelve-hour day in at least the larger plants will be a thing of the past.

Mr. Drury has given us the most illuminating and thorough analysis of this subject that I have ever heard or read, and I have every reason to believe that his effort will meet with not only earnest consideration but approval on the part of manufacturers of steel and it is my intention to place a copy of this address in the hands of every member of our association.

I can think of but one phase of this subject which might have been discussed at greater length, and that is perhaps superfluous before an audience such as we have here this evening. I think the seven-day week is perhaps productive of greater dissatisfaction among the employees, greater bodily fatigue, and greater interference with the development of American home life, than is the long working day, and this emphasizes the necessity of a further explanation of what we mean by a "continuous operation." I am not familiar with any industry where continuous operation is more economically necessary than in the steel industry. To reduce solid ore to liquid iron in the blast furnaces and solid iron to molten steel in the open hearths, is a process requiring hours of time and a high degree of heat, and the process, once started, must be continued to the end. It is impossible to temporarily interfere with the process without destroying the composition in a blast furnace and to close down the open hearth furnaces for twenty-four hours would so greatly reduce the output, even after the furnaces were recharged and reheated, that the seven-day week, that is, seven days operation, is vitally necessary to the success of the industry. I am advised that a

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