We have seen no advertising of stop watches which presents the truth in the quotation above.

And what is worse, we have seen stop-watch advertising which appeals to what in our judgment are base motives. The stop watch has been featured as a device for selecting and firing the less competent men (good management strives to make the less competent more competent by instruction and proper placement); as a whip for driving men to greater effort (good management may on occasion prescribe lesser effort and periods of rest); and as a device which lends itself to secret observations (good management works above board, and time-studies only cooperating workers).

With the prevalence of such merchandising, we do not wonder that workers continue to be prejudiced against the use of the stop watch. Such merchandising and the consequent prejudice are the greatest obstacle to the more general acceptance by workers of a valuable fact-finding device.

PRODUCERS AND NON-PRODUCERS

WE have received the following inquiry from one of our members:

> The writer has been in discussion lately concerning the matter of producers versus non-producers in various types of business. This, naturally, brings up the point of what is considered a producer and what is considered a non-producer.
>
> As you know, in our business here, the making of (the product) includes stamping, and we wonder how you would classify a tool setter who does no productive work when the definition of productive work is the advancing of a piece one step nearer completion. He merely sets the tool for the actual producer.
>
> Second—What would be the status of a die man repairing dies which had in the first instance been in good shape and through use had a punch broken and thus had to be repaired?
>
> What interpretation is usually placed upon an engineer and type fitters, or even a repair gang, who have to repair machines, keep line shafting in order, etc.?
>
> Such information as you have on this, or such information as you can get from members, would indeed be appreciated.

We believe that one of the worth-while services of the Society to its membership is to make available to all through the BULLETIN, the reply to an inquiry concerning a subject of such fundamental importance—not alone because of the reply and its possible influence on management policy, but also because of the constructive controversial correspondence which may be induced.

A Serious Fallacy

In the inquiry as phrased there appears to be a serious fallacy. It is the confusion of "productive or non-productive" with "direct or indirect" application of effort; the assumption that the productivity of an effort varies directly with the measurable directness of the effort in relation to the physical product or the service resulting. This is specifically suggested in the definition of productive work as "the advancing of a piece one step nearer completion."

Definition of Productive

Etymologically, anything is productive which has the quality or power of causing something to be or happen. But this definition, although useful as a starting point, is not sufficient for reply to the question.

The inquiry being from an industrial executive, let us turn to the economist for a definition. He would probably say "that production consists essentially of so changing matter in composition, in form and size, in place, in time and possession as to render it capable of satisfying the wants of the persons who eventually use it;" or, in short, "production consists in the creation of utility—of form, place, time and possession utilities." He might then go on to say that wants are limitless and changeable, and that resources in space, time, materials, equipment and energy are limited; "the problem of production, then, is to organize, plan and control the application of the limited available energy to the limited available material in the limited available space, at our disposal, so correlated in time with reference to the occurrence of our wants, as to make the greatest possible provision for the satisfaction of those wants. And this application of energy to material in space and time—these productive processes—assembles materials into the right combinations, puts them into the right forms and sizes, moves them to the right places and makes them available at the right time to satisfy these wants."[1] Any effort which contributes to this end is productive; the only unproductive effort is that which is wasted.

This definition clears the way, but we believe a still more restricted definition would be helpful. The inquiry is from a representative executive in the present industrial regime; he secures in the open market the energies (labor, mechanical, material, etc.), which he combines in the production process, and these have individual market values which are expressed in the prices he pays for them; he turns out a line of products for which there is a demand and which have market values expressed by the selling prices; he has a high ideal of social service, but at the same time his business is operated for profit; his production processes are complicated by the use of materials in various forms, machines and tools in various forms, and labor energy represented by different craft skills; in his processing there is specialization and division of labor, and the product represents a large variety of items; his product

[1] T. W. Mitchell, in *The Annals*, September, 1920, p. 69.

is not only economically demanded, but is socially useful and desirable. From his point of view—that of the manager of an individual enterprise under the conditions specified above—for the purpose of considering what elemental operations are productive and what are not, the following may serve as a useful definition: Any unit of energy (manual effort, mental effort, material, machine, tool, device, etc.) is productive which in combination with other units of energy contributes to the joint product an increment of utility with a market value greater than the market value (cost) of that unit of energy before the combination.

Illustrations

Case 1. A shop consists of fifty workers at $4.00 per day turning out by hand labor 5,000 units of product having a market value of $500. The minimum essential overhead represents a cost of $50. No better method of production is known than the hand method employed, and the workers represent the highest grade of skill. The aggregate cost of a day's product is $250; the value of the product is $500; the new value created by the combined efforts is $250, or $1 per dollar of energy applied. All elements of the productive operation are productive.

Case 2. A machine is invented which, tended by one of the above men at $4 per day, turns out 500 units of product per day. The essential overhead remains $50. The cost per machine per day (not including labor, but including power, oil, upkeep, interest, depreciation, etc.) is $10. Ten men operating ten machines now turn out the 5,000 units of product worth $500. The cost of the combined energies is $190 (10 men at $4, 10 machines at $10, overhead $50). The new value created by the combined energies of men and machines is $319 ($500—$190), or $1.63 per dollar of energy applied.

Obviously the combined energies of men and machines are more productive than the energies of men alone, measured in output per dollar of cost. *Therefore any element essential to the combination is productive.*

Case 3. In Case 2 the operatives were responsible for keeping their machines and tools in condition, and for bringing material to be worked upon to the machines. An investigation disclosed that the assignment of an expert mechanic to the keeping of machines and tools in condition (at a cost of $8 per day) increased the output (because of the better condition of machines) to 5,500; also the assignment of a tote man (at $3 per day) to bring material to the machines (thereby increasing the actual machining time) brought the output up to 6,000 units per day. The value of the 6,000 units is $600 and the new cost $201. The new value created by this combination of energies is $399, or $1.98 per dollar of energy applied.

Obviously this new combination of energies of men and machines is more productive than the combination in Case 2, and *therefore every element essential to the new combination is productive.*

Case 4. An investigation of Case 3 disclosed the fact that there were times of the day when men and machines were idle because jobs had not been assigned or because materials were short. A dispatch clerk and a balance of stores clerk were appointed at $4 per day each. This brought the costs up to $209 per day. But the elimination of lost time increased the output of all machines to 6,500 units per day with a value of $650. The new value created by the new combination of energies was $441, or $2.11 per dollar of energy applied.

The new combination of energies was more productive than the old and *every element essential to the new combination was productive.*

Case 5. Assume the conditions of Case 4, but modified with the assumption that a variety of products is turned out (as is more frequently the case in industry), and a cost-statistical clerk is appointed and his records soon show that different products show different profits and some even show losses. As a result of his work the items showing losses and small profits are eliminated and all efforts directed to the production of the more profitable lines. The new value added by the new combination of energies and the new application of the combination to selected products is increased 20 per cent, while the cost is increased about 2 per cent. The new combination is more productive than the old, and therefore every element essential to the combination, *including the cost-statistical clerk,* whose work made its new application possible, is productive.

Case 6. An intensive analysis of the operations of a plant over a period discloses irregularity in orders and in operations; discloses periods of loss due to the continuation of maintenance and other indirect costs when the plant is not running. These costs represent an item which must be subtracted from the long-time productivity of the plant. A sales research unit is established which establishes schedules of operation which regularize operations. Records show that the net productivity of the plant over a period is increased by an amount considerably greater than the cost of the re-