labor. *There* lie the principal resources for more efficient management of which relatively few have taken advantage. Taylor was one of the first to draw heavily upon those resources; yet he was confused in his identification of indirect with non-productive. In "Shop Management" (p. 122) he wrote: "No manager need feel alarmed then when he sees the number of non-producers increasing in proportion to producers, providing the non-producers are busy all of their time, and providing, of course, that in each case they are doing efficient work." What he meant to say in these sentences (and what he practiced) was: "No manager need feel alarmed then when he sees the number of indirect workers increasing in proportion to direct workers, providing the indirect workers are productive." Their productivity can be determined only by measurement of their contribution.

IN these days of large scale industry, specialization among enterprises and specialization and division of labor within an enterprise, it is not difficult to determine what labor is direct and what is indirect, for that is largely an arbitrary classification; but it is not easy to determine what labor is productive and what is not, for that depends upon actual results, and these, for a given kind of labor, may be different under different circumstances. The mechanism for measuring results—chiefly cost accounting and statistics—is so inadequate that in many instances it is not really demonstrable that a given application of labor is or is not productive. It should be borne in mind that an industrial or commercial enterprise aims to satisfy a consumer's want through a commodity or service which is demanded by the consumer, and that the cycle of productive efforts includes everything essential to that purpose, from the first step of the manager in ascertaining the demand and deciding to satisfy it until the commodity or service is delivered and the payment received. Every act within that range *essential* to consummation of the purpose is in general productive, from the point of view of the consumer and the manager, and in particular is productive in proportion as it is efficient and not wasteful of energy. Many of these acts, such as analyzing demand, scheduling processing and sales, planning and supervising operations, keeping cost and progress accounts, correspondence, packing and shipping, providing adequate light, heat and ventilation, oiling machinery, tote service, messenger service, and a score of others, are highly indirect, but they may be essential parts of the cycle and highly productive.

THE various industries present different combinations of acts in their different production cycles—for instance, one combination for the fabrication and sale of shoes, another for the fabrication and sale of automobiles, another for retail merchandising, another for banking, another for transportation. A given kind of application of labor may be productive in one of these combinations and not in another. That makes the problem of the executive who would develop for his particular enterprise the highest type of management, one of determining the particular combination of acts for his enterprise which *in combination* will be most productive. Some of these will be obvious to him—lathe and grinding operations are obviously essential in a machine shop, and press work in a printing establishment. But there are a great many possible acts which are not so obvious. The productivity and desirability of these the executive must determine by investigation and experiment. He must experiment with them in combination, and he must have a dependable instrument for measuring their separate productive contributions in combination—adequate cost accounting. And above all he must approach the problem with an open mind, without such false assumptions as the belief that an indirect application of labor effort is *per se* non-productive, and a direct application of labor effort is *per se* productive.

WE knew many years ago a boy who spent hours in the shop of an old-school, skilled cabinet maker. (We spoiled a skilled bench worker when we later became an indifferent publicist!) What beautiful cabinet work we saw take form in that little shop! The range of acts performed by that cabinet maker was great; we went with him to the lumber yard to select prime mahogany, walnut and white pine; we helped mix and heat his glue; we watched him sharpen his tools; we helped him saw stock to rough dimensions; we did a lot of sand-papering—and so on. Now every one of those acts was considered productive, because directly concerned with the physical handling of materials. Later that same cabinet maker was employed by a big manufacturer. He did but one thing—applied his skill at the bench. Lumber was ordered by a general office clerk on specification; glue was brought ready-prepared to the bench; tools were sharpened by a specialist. These "auxiliary" operations in the plant were looked upon as non-productive—an undesirable expense—because they were indirect. Will those among our readers who are still possessed by the idea that indirect acts are *per se* non-productive, please explain how the procuring of stock when ordered by a clerk in the plant became a non-productive operation, when it had been a productive operation of the skilled cabinet maker who personally went to the lumber yard to order it?

STOP-WATCH DEPENDABILITY

IN the September issue of *Industrial Management* (p. 173) is an article by Adolf A. Hamburger entitled "Verification of Merrick's[1] Formula for 'Allowed Time'" which is of more than passing interest.

Mr. Hamburger's studies were made for the purpose of establishing piecework rates in the cloth-cutting department of a union shop. "The most difficult part of the task was to obtain a curve showing what percentage allowance was to be added to the time taken on the operations in order to arrive at a proper 'allowed time.' We are frankly skeptical to the claim that Merrick's chart would be of any assistance to us in computing the percentage to be added as our kinds of jobs were so different from his. We, therefore, absolutely disregarded it in constructing our curve. In finding an algebraic expression for it, however, the one representing Mr. Merrick's was followed when it was seen that the two curves had the same contour . . . The (slight) difference is no doubt due to the fact that our observations were made in a textile rather than a metal-working industry and so the item of fatigue was not as important. Except for this the curves are so much alike that the difference may quite possibly be due to the inaccuracies of making and interpreting time studies."

Mr. Hamburger's article is illustrated by a cut in which the two curves are plotted upon the same field. At many points they coincide absolutely, and at the points of divergence the difference is so slight as to give the effect of a double hair line.

It is interesting to note that, notwithstanding minor inaccuracies of time study, these independent studies, one in the textile and one in metal-working industries, should have resulted in practically identical allowance-time curves. The Merrick curves represent "thousands of carefully-taken production studies carefully and systematically recorded and analyzed," and apparently present generally usable ratios between the total operation time, handling time, machine time and fatigue allowance.

[1] Cf. Merrick, "Time Studies as a Basis for Rate Setting," p. 63. Carl G. Barth computed the algebraic formula for Merrick's curve.

STOP-WATCH BUNCOMBE

THE usefulness of the stop watch as an instrument of investigation has been amply demonstrated, and its position as a mechanical aid is as secure as is that of the engineer's slide rule, the chemist's retort or the electrician's ammeter.

Who would expect dependable results from a slide rule in the hands of a person who knows nothing of mathematics or the principles of engineering; or from a retort in the hands of one who knows nothing about chemistry; or from an ammeter in the hands of one who knows nothing about electricity?

And why should one expect dependable results from a stop watch or any other time-measuring device in the hands of one inexperienced in mechanical operations and in the conditions surrounding mechanical operations? Yet some merchandisers of stop watches are advertising their wares as though any one is competent to use a stop watch. They seem to offer the stop watch as a substitute for brains, science and experience.

A stop watch has about the same relation to a set of standard times and rates as a slide rule has to the construction of a Woolworth building. The slide rule is a useful mechanical device in computing the formula for the specifications of the building, but the specifications are the product primarily of the application of engineering science, experience and sound judgments. The stop watch is a useful mechanical device in securing the data from which standard times and rates may be derived, but the times and rates are primarily the product of the application of mechanical and other sciences, experience in machine and manual operations, and sound judgments.

The stop watch is not a substitute for science, experience and good judgment.

Time study involves a great deal more than making observations. "The preliminary step of explaining the purpose and methods of time study, and winning confidence and cooperation; the primary step of establishing standardization of equipment and methods and developing a smooth flow of work through a department; the detail steps of studying every machine and determining the correct method of manipulating and operating each; the prompt and accurate sizing up of operators with respect to their individual abilities and skills; the analysis and interpretation of time-study observations and the computation of usable times and rates; these are the important phases of time-study work, and *these demand professional experience and judgment.*"