

on an incentive basis. The mandrels, which were stored at a distant point, were subdivided according to sizes, identified by proper markings and stored in convenient racks. A rack was also located alongside the press to accommodate the most active mandrels. Instead of working on a single job, several jobs were worked upon simultaneously, hence eliminating a large amount of waiting time. The operators on standard time performed other work while the presses were heating and cooling. The material was placed close to the machine. Girls were substituted for men on certain operations.

On a day-work basis, twelve men were required to get out the load, while on the incentive basis, after these improvements were made, six operators were able to handle it without difficulty.

Another example is the case of "line starter relays" which were formerly assembled on an ordinary work bench. Due to irregularity in the flow of material, certain parts were not matched or on hand when needed. This resulted in apparatus being in various stages of completion. At times when a part was received it was assembled to another part and then stored on top of, or under, the bench until more material was available.

In observing this job as the activity increased, it was evident that the method used could be considerably improved. It was decided that the job would lend itself to progressive assembly on a belt conveyor. This meant, of course, that the various elementary operations would have to be balanced. In other words, a smooth flow of the work was arranged involving the securing of additional equipment for the elements requiring the greater amount of time. Hand-automatic screw drivers were replaced by power-driven ones. Material racks were located in the most advantageous positions. The spraying of paint was formerly done in one central place for the whole department. One of the spray booths was moved to the end of the belt conveyor and after the parts were sprayed they were placed on specially constructed trays and racks to dry. After drying they were set on the belt conveyor and removed by the assembler. A larger turn-table than was previously in use was made. This permitted the spraying of a loaded rack at one time. A new method of testing for open circuits was arranged. The end of the bench was cut out to admit a tote skid which received the finished apparatus at the end of the conveyor belt.

The packing of all apparatus in the department was formerly done at one central point. This operation is now being done on the belt conveyor, which eliminates transportation. Numerous other small changes, including a more efficient method in the final testing, were made, which in the aggregate netted a considerable reduction in time.

Having established the proper method, time studies were made and a time based on the new method was established. The changes made cost about \$1000.00, while the yearly labor savings amount to \$10,000.00.

The results of a study on the assembly of another piece of apparatus, composed of a circuit breaker, a motor-operated mechanism, a network master relay and a network phasing relay, amounted to a time reduction of from 64.50, to 35.17 hours.

The assembly of paper-mill and arc-welding sets was performed as day work prior to April 1, 1929, when it was placed on an incentive basis. When studying the group for standard time, the location of floor plates and material was found to be inefficient. The operators had to hunt for material due to a lack of system and planning. The material was not placed near assembly so that the operator could keep a check on it. Handling facilities were not provided and this meant that the operators had to make use of a large traveling crane. Much lost time of the operator was due to waiting on lifts, since the traveling cranes were not always available. Furnaces and special small equipment for hand operations were not available. The operators had to cart some of the armatures and rotors to various parts of the section, which meant lost time. It was decided to relocate the assembly floor plates and material. The floor plates were placed in a location near the windows, about eighteen inches above the floor, to make working conditions as good as possible, and the material was placed close at hand in proper storage racks. The proper handling facilities were provided, i.e., jib cranes, mono rails, furnace and small shears. The operation was then time studied with the result that the time required to perform the necessary work was reduced from twenty-five to thirty hours per piece on day work to ten and twelve hours per piece on standard time.

An intensive study of the various operations performed on commutator bars again brought about favorable results. The layout of equipment was

changed from a haphazard arrangement, in which a great deal of hand trucking between machines was required, to a roller conveyor layout which was arranged in the shape of a horseshoe. The new set-up so facilitated production that a time reduction of nearly 50 per cent was made.

These examples are typical of a number of cases reported monthly and illustrate what may be accomplished by a close study of methods on the part of a well-qualified analyst.

That part of Mr. Hathaway's paper which dealt with the classifying and tabulating of elementary time units, from which time allowances for similar jobs might be synthetically ascertained, is to me extremely important.

It is true that scarcely two operators will give the same reaction under observation, nor will the same operator always duplicate his performance on different occasions.

Recognizing the inconsistency of human nature, I am convinced that the construction of standard data, or formulae, as we call them, is sound. Such formulae must, however, be based upon representative time studies taken on different operators engaged in the same activity.

Once the operator is convinced of the accuracy and fairness of a formula over the entire range of work, his suspicions (if he had any) are overcome and he proceeds with that peace of mind which is prerequisite to maximum production with a minimum of effort.

Aside from the many advantages to the workmen, formulae enable the analyst to set many more allowances than he could establish by time study, and, what is more, the values are more consistent and may be set before the job goes into work.

At the East Pittsburgh Works of the Westinghouse Electric and Manufacturing Company in the neighborhood of 100,000 time allowances are set monthly, and of this number, 80 per cent are established by formula.

I might say, in conclusion, that we have accomplished in our works that which is recommended in the latter part of Mr. Hathaway's paper; namely, proper dissemination and exchange of information. We have prevented the duplication of effort by "broadcasting," so to speak, all information which is found to be acceptable and apparently of general application. What is more, we have instructed all time-study supervisors to consult the Central Office

before starting to collect data on an activity, in order that they may be given the benefit of the experience of others.

Unemployment¹

An Individual Problem Which Has Become a Social Problem

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UNEMPLOYMENT has long since ceased to be the problem of the unemployed person alone. The inevitable social disruption which it brings has become so familiar that unemployment is now definitely recognized as a community problem. In recent years it is also recognized that the regularization of operation is a legitimate obligation upon industrial management which is increasingly aware of its stake in the maintenance of the purchasing power of wage-earners.

The difficulties in dealing with unemployment are complicated by the vagueness of existing knowledge concerning it. The number of unemployed cannot be estimated with a satisfying degree of confidence in terms of existing data. Estimates vary widely with the method of measurement used and with the definition of unemployment. An attempt to measure unemployment is faced by two alternatives: (1) indirect measurement—estimating the margin between the total supply of labor and actual employment; (2) direct measurement—counting the unemployed by means of a special census or by direct registration. In the United States, where there is no adequate continued registration of the unemployed, measures of unemployment have been derived in one way or another from statistics of employment. Although statisticians tend to confine their efforts to measuring changes in the volume of employment, this is by no means a substitute for unemployment measurement. A sharp falling off of employment in one industry may be offset by an increase of employment in another, the result being that there is no net decrease of employment when both industries are considered together. Reasonably exact measure-

¹From advance proof of *The Social Work Year Book for 1929* about to be published by the Russell Sage Foundation, 130 E. 22nd Street, New York. This article is typical of the wide field of information covered by this book. It should be of interest to those engaged in all phases of management.