

to its smaller size requires only two wires. The same organization is employed in folding these shingles but because they are smaller and have a lower covering factor, the amount of work required to fold and pack one-half square of these shingles is approximately equal to that required in producing one square of the 16 x 16-in. latite shingles (square meaning the number of shingles required to cover 100 square feet of roof.) With the above in consideration, one box of one-half square of the 12-in. consisting of 86 shingles and a package of one square of the 16-in. requiring 82 shingles were placed on the same basis.

Changes in the Shipping Department

Having developed the methods of folding latites to a satisfactory degree our attention was turned to the shipping problem.

In case of shipment by freight cars the work may be divided into two major operations, namely, loading the product, and bracing it so it will reach its destination undamaged.

One man of each loading crew was found to be doing the work which a curved section might do, transferring the product from a conveyor, which received it from a chute, to a conveyor leading to the inside end of the car. After experiment with the various types of gravity conveyor curves, the solution of the problem was effected by the installation of a special 3 rail, 2 roller curve with its outer end elevated to give a 5-in. banking. Both ends of the curve are of the same height, making it reversible for the purpose of loading both ends of the car with the same unit. The chute end of the curve is connected by an 8 foot section of roller conveyor and the discharge end by a 12-foot roller conveyor unit made up of three 4 foot sections capable of being disconnected as the car is loaded.

Beside the elimination of one man from each crew another benefit has been secured, an increase in elasticity between dropping the product inside the chute on the upper floor and receiving it in the car, which results in an increase in tonnage loaded per hour. The men feeding the loaders can now drop the product down the chute at a varying rate of speed, while by the old method the flow down the chute was governed wholly by the man at the turn. Our records show that the new curve enables the crew to do better in spite of the fact that it has been reduced by one man.

The second item considered was the standardization of the method of bracing cars; an analysis of this phase of the work yielded the fact that the car bracer spent more than one-half of his time sawing lumber to make braces and cleats of the desired lengths, thus decreasing the loading ability of the crew. With the aim of using ready cut lumber, the widths of approximately sixty cars were measured in order to arrive at some common lengths for braces. The standards of lengths were set at 102-in. and 103-in. for braces with a tolerance of ± 2 -in. Next followed an investigation of the relative holding ability of 2-in. x 4-in. and 2-in. x 6-in. lumber. It was found that the chief cause for defective bracing was not the weakness of the braces nor an improper number of them, but the way in which they were fastened to the sides of the car. The 2-in. x 4-in. ready cut braces and cleats have replaced the 2-in. x 6-in. lumber length for length, thus cutting the consumption of bracing lumber 33 per cent from that point of view alone, while maintaining the former strength and quality standards. Of course the ready cut lumber is more expensive, but the additional cost is practically negligible when compared with the saving.

Standing orders have been made effective to facilitate the work of the loading crews in every way possible. One of them keeps an aisle open through a particular section of the roofing plant warehouse, making it possible to convey finished products to cars or trucks with the shortest haul practicable. Another keeps clear at all times a definite portion of the floor area around the chute openings on the upper floor of the warehouse, thus saving the time generally lost by the crew in cleaning the floor about the chute openings.

The equipment and tools required in every phase of the shipping work have been standardized. To make sure of their availability at all times and to avoid unnecessary transportation each crew has been supplied with a steel cabinet located as near as practicable to their places of use.

Standardization of these items, methods, materials and tools has contributed towards an ample reduction in the unit cost of shipping.

Aside from the problems and solutions which I have described, motion studies were made of other operations, such as cutting and packing 10-in., 12½-in. and extra heavy strip shingles; cutting 12-in.

and 16-in. latite shingles; cutting and packing regular and extra heavy individual shingles. In each case we did not fail to effect economies in production, primarily by reducing the waste of labor effort.

It would indeed be a waste of effort on my part to attempt to give a lengthy description of each of these studies, when a simpler method may be successfully employed. I will then resort to the visual method of putting across information. Some of the slides² I have selected will also throw more light on the problems which I have already discussed.

Results of Improvements Effected

Figure 1 shows the rates of production at 12-in. and 16-in. latite shingles at our plant compared to those at the Madison plant.

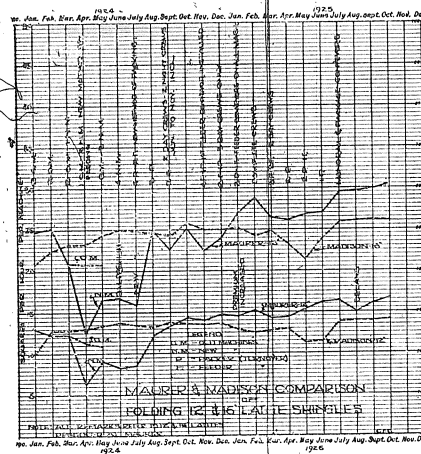


Figure 1

Please note that the first of the new machines was installed in March, 1924—the point for that month representing the average rate of output for both the old and the new type although the latter was operated only a few days during that month. From that time on, however, the rates were plotted separately in order to show just how much each

²It is impracticable to reproduce here all of Mr. Piace-telli's slides. The graph presented shows the results obtained by the work he described.—Editor.

type of machine contributed to the average rate of production for each month.

Let us now analyze the graph representing the rates of folding the 16-in. shingles and see what effect our work has had on production.

In April, 1924, one of the new type of machines was operated and its rate of output during that month is shown to be very low, approximately 12.5. Our work began at this time and during the latter part of the month we established the new method of feeding, the result of which is shown by the rise in the graph to a higher level which was maintained until August, 1924, when the new method of packing was made effective. The solution of the packing phase of the process contributed more than any other towards the increased rate of production, as is shown also by the graph made for the 12-in. shingles, which is, with few exceptions, quite similar to that for the 16-in. shingles.

Having installed the new methods of feeding and packing, our problem became primarily one of fatigue reduction. You will note that a "feeder conveyor" was installed on one of the machines in November, 1924. This was done with the aim of minimizing the transportation of shingles by the man supplying the feeder who approximately every minute carried a stack of shingle squares, weighing from 50 to 75 pounds, from the heater to the feeder, an average distance of 8 feet.

Two months later this type of conveyor (gravity carrier) was installed on all machines; these have reduced the transportation to approximately two steps. The good effect of fatigue reduction in this sub-operation is evident in the rise in the rate of output to a new level (January, 1925) which was maintained until July, 1925, when the next step was taken towards fatigue reduction.

Perhaps one of the most interesting points in this plane of production rate is that of February, 1925, which, when compared with rates of output for the months of January, March, April, May and June of the same year, indicates the importance of reducing the labor turnover on this work. The labor turnover for each month is indicated by the abbreviations 3P, 2F, etc., (3 packers, 2 feeders, etc.) and the absence of turnover during the month of February, 1925, explains, to our satisfaction, the comparatively high mark reached during that month. You will note also that during this period the number of packers replaced is more than two