The business of the Commonwealth Steel Company is the making of steel castings. As foundry work is rarely carried on as a continuous operation,[1] the only department of this company with which we need concern ourselves is the open-hearth department, which contains 4 open-hearth furnaces—though some mention will be made of the boiler room. The Commonwealth Steel Company put its open-hearth department and boiler room on three shifts in 1911. Table IV shows the results of making the change from two to three shifts on the labor efficiency of steel making, in particular as regards the quality of the product, the conservation of fuel and materials, and the efficiency with which the furnaces were regulated. The figures upon which this chart is based were obtained by Mr. Bull by the use of very accurate instruments and tests, and it happened that the study was made under conditions which were unusually favorable for keeping the efficiencies due to the shorter day distinct from those due to other influences.

Most of the open-hearth furnaces now on three shifts have made the change during the last year or two when labor efficiency has been a most variable quantity, due to such disturbing factors as the shortage of labor, the steel strike, and the general demoralization of operation which accompanied the railroad strike. But at the time when the Commonwealth Steel Company made its change there was no wage dispute existing or pending in the Commonwealth plant, or apparently in neighboring plants. There had been no demand for three shifts on the part of the men; in making the change no inducement was offered by the company for the performance of better work; in fact the men did not know that these records were being compiled. Any gain in efficiency shown in the table was, therefore, due almost entirely to the automatic increase in the quality of work which takes place when men work 8 hours instead of 12. In order the more completely to shut out all disturbing factors, Mr. Bull limited his study to the four weeks immediately preceding and the four weeks immediately following the change in shift systems, because in this period no change was made in other conditions about the plant.

By this time those in the audience who are steel men will have observed the nature and amount of the improvement during the later period when the three shift system was in operation. Per cents or points "under" and "over" mean under or over the desired standard, a "point" being one per cent, except in cases of analysis, where it is one-hundreth of one per cent. Those of us who are not steel foundry experts will have to take Mr. Bull's word for it that on examining these figures the management of the Commonwealth Steel Company were greatly gratified to find that on all the essential points the figures showed an improvement.

It was not to be expected, of course, that anything like the full benefits of the shorter hours would be realized at the very start, particularly in advance of any special effort to get better efficiency. Mr. Bull found that on those points where it was possible and fair to extend the comparison another four weeks, the second four weeks of three-shift operation showed a marked gain over the first. Thus in the amount of extra pig iron charged, the weight before the change in shifts was 556 pounds; the first four weeks after the change it was 424 pounds; and the second four weeks 137 pounds.

Mr. Bull's figures deal chiefly with the quality of the product. With Mr. C. M. Cooke, the present open-hearth superintendent of the Commonwealth plant, a man of wide experience in open-hearth work, not only in the Commonwealth plant but in twelve-hour plants in many places—with Mr. Cooke I took up the question as to the way in which the men regarded the three-shift system and also its effect on open-hearth output. Mr. Cooke testified that when once the men get accustomed to the three-shift system they are very much in favor of it and will not go back to two shifts even though tempted by much larger wages. The 12-hour day keeps a man away from his home and family too long. Also on the matter of output, Mr. Cooke testified that while the Commonwealth plant had been on three-shifts since before he went with them, he felt sure, as a result of his experience with both methods of operation, that the output of an open-hearth furnace could be increased 10 per cent within six months of going on three-shift operation. One has to go about it in the right way, however. The men tend, on three shift operation, to run along in much the same manner of working as under two-shift operation, talking, reading the newspaper, sleeping, and in general conducting themselves much as they would at home. As long as all this is allowed the results will not be radically different from what they were before. But by putting an end to these habits and developing in the plant a condition of alertness

[1]The Commonwealth Steel Company tried the three-shift system in their foundry, but found that the large amount of cleaning-up necessary about a foundry made continuous operation undesirable. So they now operate the foundry on two shifts of 8 hours each.

during the 8 hours while the men are on duty, great changes can be accomplished.

Many of the steel men, with whom I have talked, both in two-shift and three-shift plants, have maintained that there is no way of labor's increasing the output of an open-hearth furnace. This would be true, of course, if the furnace were actually running at maximum capacity under two shifts. But Mr. Cook's observation is that the furnaces in 12-hour plants do not really do this. Charging is one operation which can proceed rapidly or slowly; also in the melting process it is possible for the men through negligence or willfulness to cause the process to take longer than it should. So there is a possibility of some increase in output if the management, taking advantage of the shorter day, develops among the men a more effective spirit of cooperation. After about nine years of three-shift management, the Commonwealth Steel Company now has an open-hearth department in which the men are constantly on their toes, by day and by night, watching the furnaces so carefully that the heats are obtained on schedule. Not only is output better, larger, and more regular, but there is a saving of materials, of wear and tear on the furnaces, and a prolongation of the life of the furnaces.

In going from two to three shifts the Commonwealth Steel Company increased the hourly wage rates paid in its open-hearth department by from 16 to 22 per cent.

In the boiler room it was found possible slightly to reduce the number of men on duty at any one time, so that the total wage cost per 24 hours was a few cents lower on three shifts than it had been on two, after allowing for advances in hourly rates of 14 and 19 per cent. Table V shows the way in which this worked out, and also the improvement in the evenness of steam pressure.

TABLE V. COMPARATIVE EFFICIENCY TWO-SHIFT AND THREE-SHIFT SYSTEMS BOILER ROOM[1]

(Commonwealth Steel Company)

	12-hour shift	8-hour shift
Steam pressure		
No. of times when steam pressure fell below 110 pounds	77	42
" " " " " " " " 105 "	9	3
" " " " " " " " 100 "	1	0
Manning		
No. of head firemen required for 24-hour day	2	3
" " second firemen " " " "	3	3
" " coal passers " " " "	3	4
Total no. of men required for 24-hour day	8	10
Total man-hours per 24-hour day	96	80
Increases in hourly wage rates		
Firemen		19%
Coal passers		14%
Labor cost per 24-hour day	$19.50	$19.12

[1]The facts on which this chart is based were also published by Mr. Bull along with the figures quoted in Chart V.

2. The National Enameling & Stamping Company

Located in the same city with the works of the Commonwealth Steel Company is another three-shift plant which includes not only open-hearth furnaces—ten in number—but bar, plate, and sheet mills. The