

special jigs and tools as may be deemed necessary. When the order is a special one, that is, unusual, or rare enough not to warrant making standards for further use, a summary estimate is made up for each operation by the production department, in order that a daily check may be kept on the job. The duty of the cost clerk is to call the attention of the foreman, or party concerned, when the cost exceeds the allowance up to the point in the progress the order has reached. We thus have a means of keeping our foreman posted up to date on the cost of each job, at all points of its progress, not when it is done and too late for him to do something.

**Major Account Expenditure—Example 4** is a form that we use to show us graphically our unit and summary expenditures on major accounts. It was developed by the late H. L. Gantt and used effectively to record progress of airplane and munition manufacture, also many other items in his work for the U.S. Government during the war. We want to know how our daily expenditure on each account compares with the allowance for the day, also how our total expenditure to date compares with the total allowance to date on each account. The chart, fig. 5, contains one vertical column for each day of the month, over which the date is inserted. On the left hand side the name of each account is inserted. We then calculate the allowance for each working day of the month and enter it for reference on the right hand side of the chart. Now in making up the chart it must be understood that the distance horizontally between each date column represents 100%, or the allowance figure for the day, on the right, and as your actual expense figures are received, you make a line across that space equal to the amount actually expended. If less than the allowance, this line will not cover the space, if more than the allowance, an extra line over the one covering the space shows how much. Directly under this line, representing the daily expenditure, is a thicker line, that represents summary cost to date. This line is merely extended daily, by the same amount as entered under the daily cost column, except that it, being no respecter of dates, it shows by its total length, whether the account is over or under expended to date, the comparative point being always the line of the date up to which the chart is entered.

While this sounds somewhat complex, it really is extremely simple in operation and we have a complete record on each account of how much, when, and on what account we have over or under expended. The chart is soon readable by anyone and shows immediately how close instructions are being attended to. As may be seen, the idea is one of vast possibilities outside of costs, where unit and summary data are required.

**Building New Equipment—Example 5** covers the manufacturing of new equipment, such as locomotives, passenger cars or freight equipment of any description. Here a new element demands first consideration, and that is raw material, the source of which we do not control. It goes without saying that the shops can make no progress without material and drawings. Therefore, we require practically all the items that are not stores stock to be included on our schedule for erection. Material that is regular stores stock requires to be checked at definitely determined periods, before it is required for erection, but by

reason of the number of items it is usually followed on a special chart. It is essential, however, that all castings and all purchased material be listed on our erecting schedule. Our object is to complete so much equipment at a certain date. On the master schedule chart, we list all these parts on the left hand side, and head all our vertical columns, which cover a period of three months, with the date. We insert the completion date at the point, the first unit is required completed, and, working back from that date for each item, we then insert the date each item is required completely machined, ready for erection. Then, from each of these dates, we compute the necessary time for machining each item, which gives us the date raw material must be

resent whether item is "on time," "shop late," "material late" or "drawings late." Black represents "on time" in every case, and green, red and yellow, respectively, represent late on the other items. This color scheme is standard on all charts and a clear indication at all times is available of the general condition of the order. A permanent record is incidentally available, showing reasons for delays, which places the responsibility where it belongs. It also shows much good matter for consideration when future orders are being placed. Its chief value to the shop is that it shows what is due to be done each day, and shows at a glance how the material is coming along, and how dates are being maintained so that the shops can be organized

		SHOP CONTROL BOARD																										
MACHINE	DATE	DEC																										
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
<b>TURBINES</b>																												
JL 102																												
JL 205																												
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QL 142																												
<b>LATHES</b>																												
LE 309	TOILE																											
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QC 810																												
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GS 722																												
GS 750	TOILE																											
<b>DRILLS</b>																												
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DR 790																												
<b>MISC.</b>																												
PL 910																												
PL 840																												
SH 220																												
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WISE 5																												

Fig. 7.

available. After this we take into account the necessary time to deliver patterns, and to obtain material from brass, steel or grey iron foundry or other source from which material is obtained, and thus we arrive at the date drawings must be completed. All these dates are marked plainly on the chart and the parties concerned are given a copy of the schedule. The whole form represents what must be done in order that the final completion date be made. It does not matter if material arrives before that date, but a certain time before each item becomes due, our schedule tracers commence to trace the party concerned, in order to prevent avoidable delays. Each day, as it passes, one date column is filled in with the proper color, to rep-

representing whether item is "on time," "shop late," "material late" or "drawings late." Black represents "on time" in every case, and green, red and yellow, respectively, represent late on the other items. This color scheme is standard on all charts and a clear indication at all times is available of the general condition of the order. A permanent record is incidentally available, showing reasons for delays, which places the responsibility where it belongs. It also shows much good matter for consideration when future orders are being placed. Its chief value to the shop is that it shows what is due to be done each day, and shows at a glance how the material is coming along, and how dates are being maintained so that the shops can be organized

accordingly. We are able very definitely to advise the management months ahead, that, for the reasons shown, a change in programme may be necessary. The necessity of prompt action is also shown vividly when delays in initial stages have occurred. We use this system on all our new equipment programmes with very good results.

**Detail Operation Schedule—Example 6** is a method used by the author to plan the work for every productive man and machine in a department. The object is to provide the shop foremen with information as to the "next job" for every man. Fig. 7 is a photograph of a shop control board, which consists of a board containing a separate slot for every man or machine, the identification being down the