

ELECTRIC DRIVE FOR MACHINE TOOLS WITH METHODS OF VARIABLE SPEED CONTROL.

The question of whether or not in machine shops power shall be distributed by means of electricity is to-day hardly considered, as the advantages obtained by this method have been so successfully proven that there is little room left for doubt. The subject, therefore, which is given attention is what method of elec-

greatly increased first cost, provided that cost will directly bring about a reduction in the labor bill.

Besides eliminating the disadvantages of line shafting, belting and the inflexibility of location, the individual drive of machine tools by electric motors increases the efficiency and output of machine shops.

It is not necessary, therefore, to lay down any specific line of demarkation as to the size of the tool on which it would

If we fail to find that the advantages just mentioned offset the only objection claimed, before dismissing the problem there must be credited against the first cost of the individually driven tool the cost of countershafts, hangers and belts, also the cost of the increased power to overcome friction losses due to the shafts getting out of line and the tool operator's time lost in lacing and repairing the belts, to say nothing of the unhandy methods which are required for the start-

ing and stopping, and shifting from one speed to another. Upon giving all of these points careful consideration we will find that the first cost of the individually equipped shop is not much if any greater than one arranged for group drive, particularly so in the face of the advantages obtained by the former method of drive.

The practice of using portable tools and bringing the tools to the work rather than the work to the tools, which is becoming so popular to-day, is only a further development of the individually driven motor tool idea. The portable tool which cannot be operated unless it is driven with an individual electric motor serves as an excellent ex-

ample of what we should endeavor to accomplish in our efforts to make all our machine tools as simple and useful as possible. They should not be so arranged that they must always be in one particular location in a shop, for it may be desirable to use this portion of the shop, as time goes on, for other purposes, or possibly it will become necessary to crowd in additional machines of the same type as those already in use, and it is not every shop that is so arranged as to permit of the installation of additional tools without necessitating very awkward

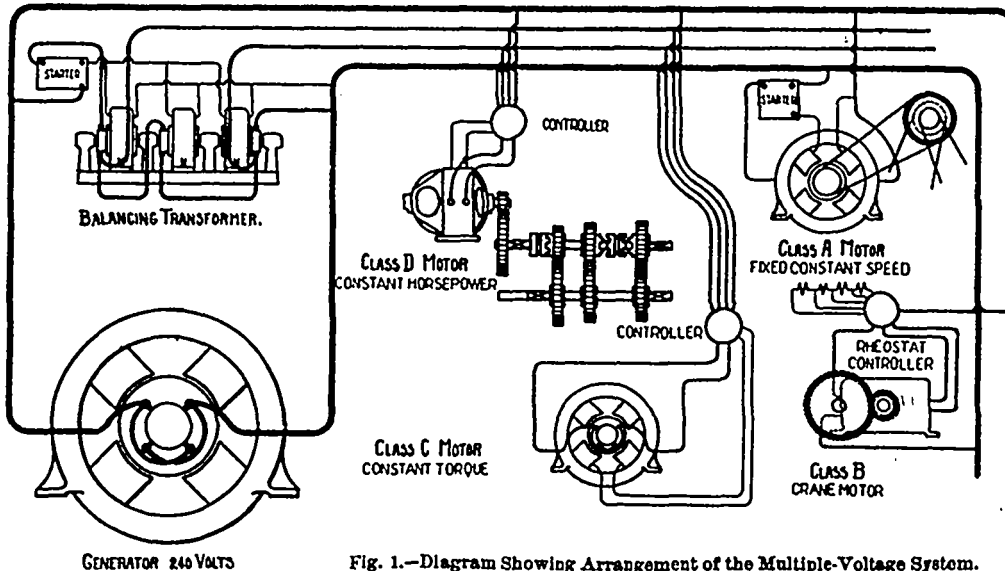


Fig. 1.—Diagram Showing Arrangement of the Multiple-Voltage System.

tric distribution shall be adopted and in what manner shall we arrange the electric motors with respect to the work which they have to accomplish.

In considering the subject of individual driving, some have said, "that while considered alone and for the individual tool, this method is ideal, yet the objection will occur that the enormous multiplication of small motors means increased complication and greatly increased cost and that if this method is employed, it should be limited to tools requiring from 5 to 10 h.p. and upwards, and that group driving should be used where the tools require less than these amounts."

If the saving in our coal bill due to the decreased losses in transmission obtained by individual drive throughout in a machine shop or factory only is to be considered, the objection above referred to might in a measure be correct, but as a matter of fact the coal bill in a year amounts to such a small percentage of the total operating expenses of any manufacturing establishment that a small variation in this one way or the other hardly merits more than passing consideration.

The element in our factory costs which requires our most careful consideration is that of the labor cost involved in turning out a given piece of work.

A very small percentage of decrease in our total labor bill will as a rule justify a

be advisable to apply an individual motor, but rather to determine in the case of each particular tool the class of work which is to be done and the character of the shop in which the system is to be installed, as to whether or not the increased facilities which the individual motor driven tool affords in the direction of variable speeds under instant control over any range with every speed constant, regardless of the load, and the horse-power of the motor but slightly in excess of that required by the tool, as well as the ability to maintain high cutting



Fig. 2.—Balancing Transformer for MV System, Subdividing Generator Voltage and automatically Balancing any Differences in Loads between the Circuits.

speeds due to superior facilities for manipulation and the absence of shut-downs due to belt troubles will not offset the objection claimed against the individual method of tool drive, which is "greatly increased first cost."

connections to the line shafting.

If the tools are all individually driven, this difficulty does not exist. While the individual method of electric drive provides a material reduction in the cost of power, this factor is not its greatest re-