May 5, 1936. W. W. McBANE 2,039,914

REDUCTION INDICATOR FOR ROLLING MILLS

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Fig. 1.

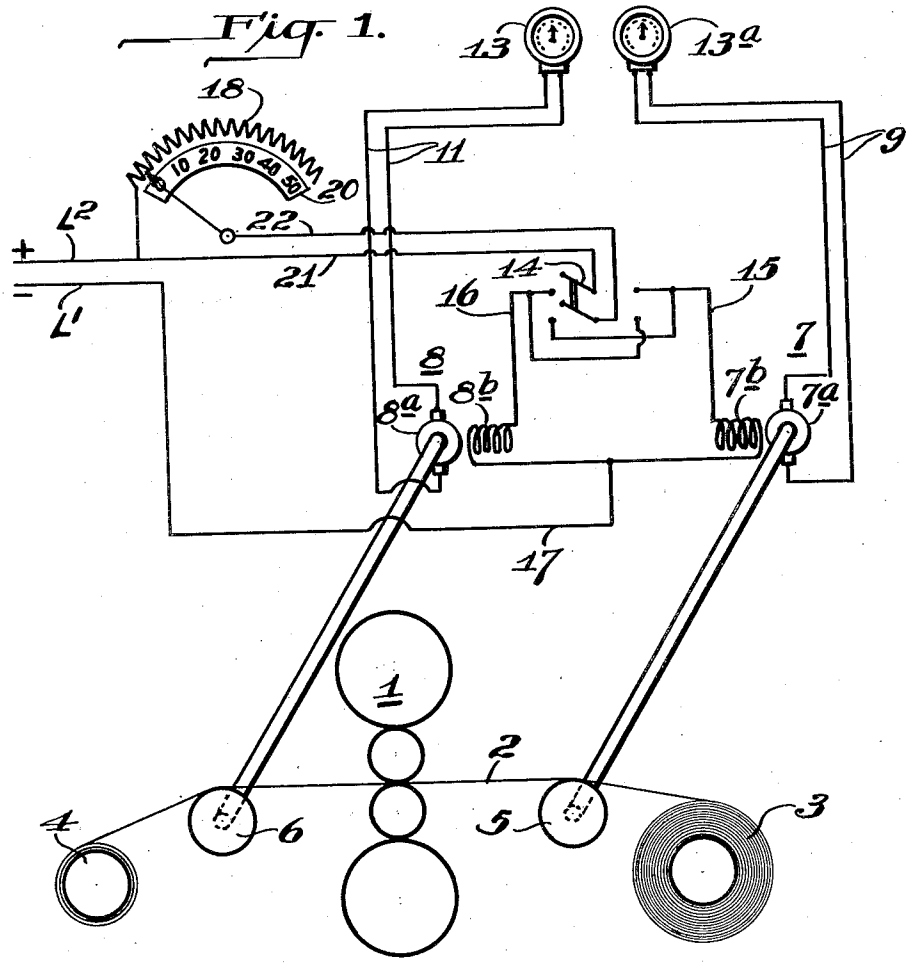
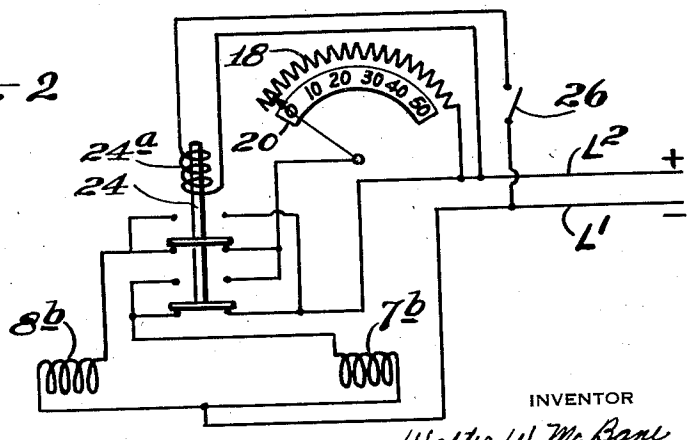


Fig. 2



WITNESSES

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REDUCTION INDICATOR FOR ROLLING MILLS

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6 Claims. (Cl. 80—32)

This invention relates to the rolling of elongate metal stock such as strips, sheets, and the like, and more particularly to means for indicating the reduction being made upon stock by a rolling mill as the stock is passed through the mill.

One object of the invention is to provide apparatus for this purpose which is relatively simple and inexpensive to manufacture and install, and both easy to operate and dependable in operation.

Another object is to provide an apparatus of this character which is adapted to effectively and accurately indicate at a point or points spaced from a mill, such as in a pilot house, or the like, the actual reductions which the mill is taking.

A further object is to provide in such apparatus for applying it to a reversing mill and for rendering it capable of operating properly when the mill is running in either direction.

These and various other objects, as well as the various novel features and advantages of the invention, will be apparent when the following detailed description is read in conjunction with the accompanying drawing, in which Fig. 1 is a schematic diagram of an embodiment of the invention applied to a strip mill; and Fig. 2 a similar diagram of an alternative reversing switch which may be used in the field circuits of the speed-indicating generators shown in Fig. 1.

As is well known, the reduction which rolling mills, such as strip mills, and the like, make upon the stock being rolled is directly proportional to the amount which the stock is elongated by such mills as the stock is expanded substantially only in a lengthwise direction. Because of this, the reduction taken is also directly proportional to the increase in the speed of the stock as it is discharged from the mill over its speed on entering the mill. With this in mind, in accordance with this invention, provision is made for indicating the reductions taken by a mill through the use of apparatus adapted to compare the relative speeds of the stock on the two sides of the mill.

By way of illustrating the invention, reference will be had to the drawing wherein the numeral 1 designates a rolling mill, which, although shown as a reversing strip mill of the four-high type, may be any kind of a mill, the numeral 2 a piece of stock being passed through the mill, and the numerals 3 and 4 a pair of reels for handling the stock.

Adjacent the opposite sides of the mill there is provided a pair of rolls 5 and 6 which are so arranged as to be operated by the stock as it is passed thereover. In other words, they are adapted to be directly responsive to the speeds of the stock on the entrance and discharge sides of the mill respectively. Coupled to these rolls in any suitable fashion is a pair of identically constructed generators 7 and 8. The armatures 7a and 8a of these generators which are mechanically connected to the stock-driven rolls 5 and 6 are in turn electrically connected by conductors 9 and 11 to a pair of instruments such as voltmeters for indicating the outputs of the two generators which may be located at any suitable place such as in the pilot station of the mill and may be calibrated if desired in terms of the speed of the stock.

For exciting such generators they are equipped with the customary field windings 7b and 8b, one side of each of which is connected by a common conductor 17 with one side L^1 of a source of current supply L^1 and L^2, and the other sides by a pair of conductors 15 and 16, respectively, to the contacts of a double pole double throw reversing switch 14. The poles of this switch are in turn connected to the other line conductor L^2 by a pair of line conductors 21 and 22. In the latter of these conductors there is provided a variable resistor or rheostat 18 which is utilized when properly adjusted to indicate the reduction which the mill is making, and is connected to the reversing switch so that it may be connected to either generator and thereby accommodate reverse operation of the mill.

The use of the rheostat in this fashion is made possible by the fact that the generators 7 and 8 are both so constructed that their outputs vary directly, as both their field strength and their speed. Hence by including the rheostat 18 in the field circuit of one of the generators, for example, as shown in the one disposed to be driven by the stock on the discharge side of the mill, and adjusting it so that the output of the generator to which it is connected is just equal to that of the other, the resistance so included in that field circuit will be directly proportional to the reduction being made by the mill. Consequently by properly calibrating a suitable dial 20, which is done, and applying it to the face of the rheostat, the rheostat is adapted to indicate directly the reduction which the mill is taking whenever the rheostat 18 is so adjusted that the generator to which it is connected gives the same reading as the other generator. For convenience, this rheostat, like the instruments 13 and 13a, may if desired be placed in the pilot station for the mill.

In order to further facilitate the operation of the apparatus a magnetically operated re-

versing switch 24 may be substituted for the manually operable reversing switch 14 illustrated in Fig. 1. With such switch a small control switch 26 may be provided for controlling the operation of the actuating coil 24a and this also arranged in the pilot station so that the operator can reverse the rheostat connections at will when the mill is reversed.

According to the provisions of the patent statutes, I have explained the principle and mode of operation of my invention, and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. In combination with a rolling mill, a pair of electric generators, means disposed on opposite sides of the mill for operating said generators at speeds corresponding with the speeds of the stock being passed through the mill at such points, means for measuring the respective outputs of said generators, and means calibrated in terms of the reduction being taken by the mill for modifying the output of the generator disposed on the discharge side of the mill.

2. A reduction indicator according to claim 1 including means for applying said calibrated means to either generator to permit reverse operations of the mill.

3. In combination with a rolling mill, a pair of electric generators, means disposed to operate said generators at speeds corresponding with the speeds of the stock on the two sides of the mill, means for indicating the respective outputs of said generators, and a rheostat for computing the reduction being made on the stock by the mill connected in the field circuit of one of said generators to equalize its output with the output of the other generator.

4. In combination with a rolling mill, a pair of electric generators, means responsive to the speed of the stock at the two sides of a mill for operating said generators, means for measuring the respective outputs of said generators, and means calibrated in terms of the reductions made on the stock by the mill for making the generator to which it is connected produce the same output as the other generator to thereby render said calibrated means capable of indicating the exact reduction being made by the mill.

5. In combination with a rolling mill, a pair of electric generators disposed for operation in response to the stock on the opposite sides of the mill, means for indicating the outputs of said generators, a rheostat calibrated in terms of the reduction being taken by the mill disposed to be connected in the field circuit of one of said generators, being adapted to alter the output of the generator to which it is connected so that it will produce the same output as the other generator and under such conditions give a correct reduction reading on the rheostat, and means for connecting said rheostat in the field circuit of either generator thereby permitting reverse operation of the mill.

6. In combination with a rolling mill, a pair of rolls disposed on opposite sides of the mill to be operated by the stock passing through the mill as it is passed thereover, a pair of electric generators operably coupled to said stock-driven rolls, a pair of devices for indicating the outputs of said generators, a rheostat arranged to be connected in the field circuit of either of said generators, reversing means for effecting such connections, and a scale applied to said rheostat for indicating the reduction being taken by the mill when said rheostat is adjusted so that the generator to which it is connected produces the same output as the other generator.

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