

April 6, 1943.

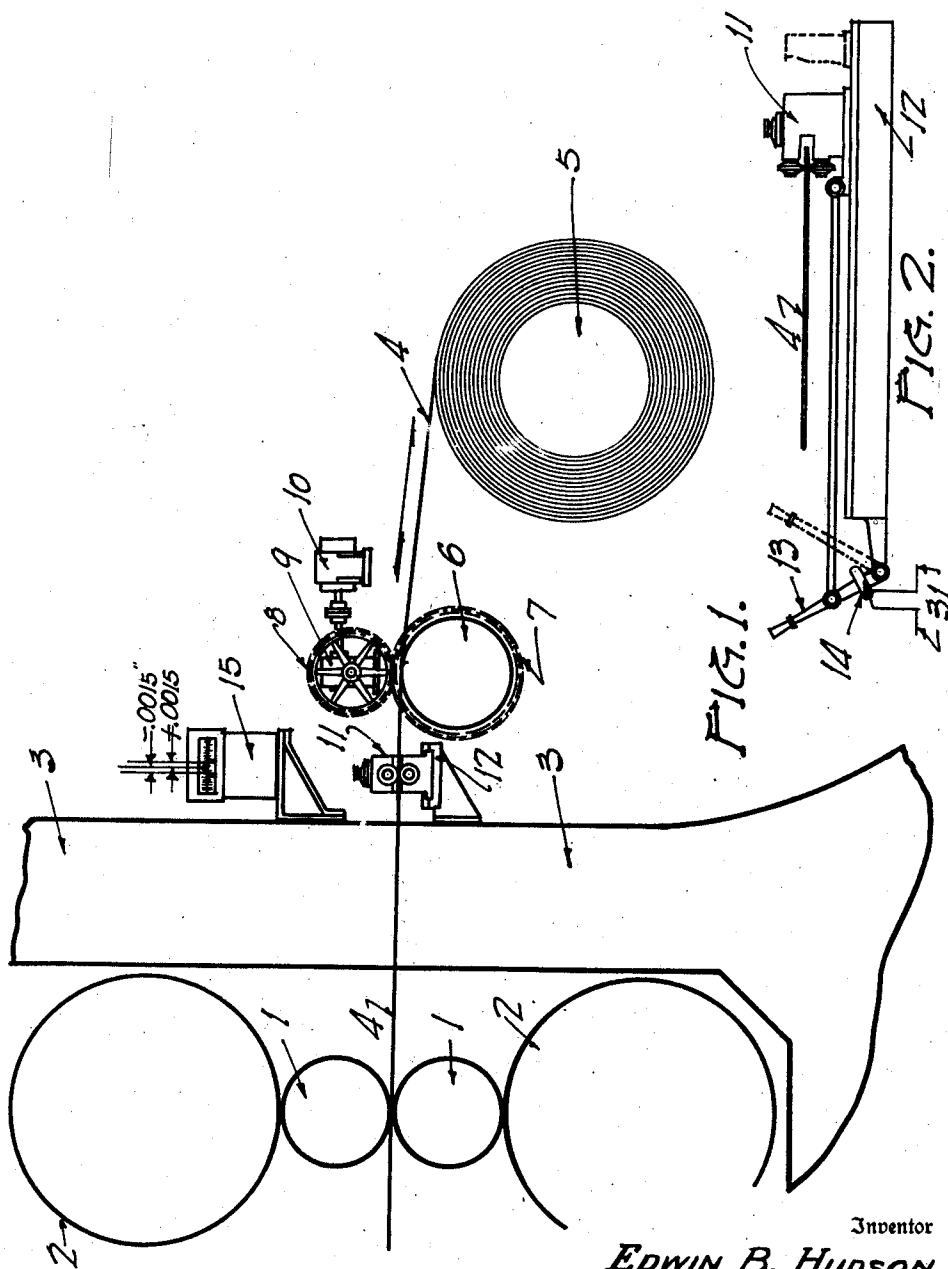
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2,315,709

OFF-GAUGE TOTALIZER

Filed May 10, 1940

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

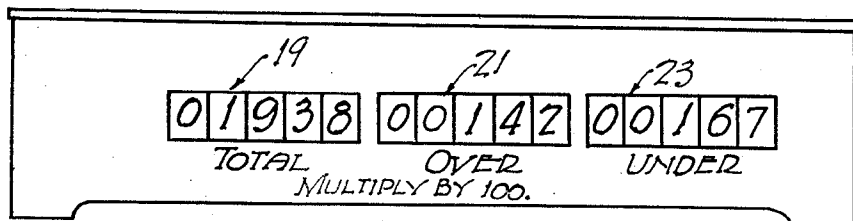


FIG. 3.

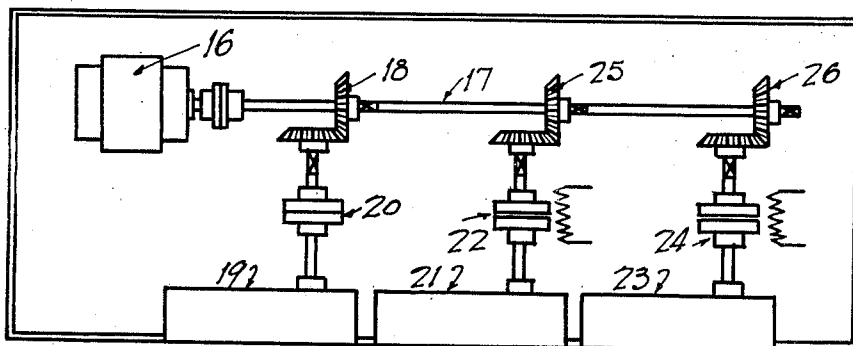


FIG. 4.

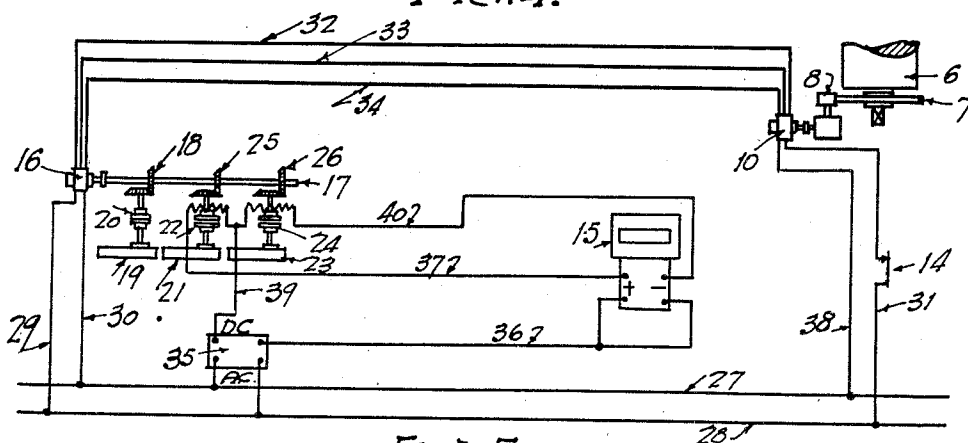


FIG. 5.

COLD MILL					
DATE:					
TURN	FOREMAN	TOTAL LIN FEET.	OFF.	OVER	UNDER
1.	JOHN DOE	104320	81%	11%	8%
2.	RICHARD DOE	107600	76%	13%	11%
3.	JOHN JONES	92140	84%	7%	9%

FIG. 6.

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UNITED STATES PATENT OFFICE

2,315,709

OFF-GAUGE TOTALIZER

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Application May 10, 1940, Serial No. 334,428

12 Claims. (Cl. 33—129)

This invention relates to a device for showing the over-all performance of an operating crew insofar as the maintenance of a predetermined gauge of strip in a rolling mill is concerned.

It is of considerable importance to the operators of a mill to know immediately the percentage of material which is being rolled within the pre-established tolerance limits. If this information is instantly available, it is valuable in comparing the skill of the various crews operating the equipment, and of course it is desirable to know the actual length of strip which is being rolled below and above the predetermined range of gauge.

Recording devices are available which record the performance of an operating crew on a continuous record. Such records, although they are complete, are of little value in the practical operation of the mill, for in rolling practice the metal is rolled at a fixed tolerance above and below the predetermined gauge and it is primarily the amount of metal rolled within the tolerance limits with which the operators are concerned. While this information can be determined from a paper record, it requires considerable effort and a great deal of time, and of course involves considerable expense in the provision of printed paper tape for the recorders.

In the light of the above considerations, it is an object of my invention to provide a device of relatively simple construction which will instantly indicate not only the total length of strip rolled, but also the actual length of the strip which exceeds the tolerance which has been established and the actual length of strip which is below the established tolerance. From these figures, of course, it is possible to determine the percentage of strip which is within the tolerance limits. This and other objects of my invention which will be described hereinafter or which will more clearly appear to one skilled in the art upon reading these specifications, I accomplish by that certain construction and arrangement of parts of which I shall now describe an exemplary embodiment.

Reference is made to the drawings forming a part hereof and in which:

Figure 1 is a partial elevational view of a rolling mill showing the general arrangement of the equipment.

Figure 2 is an elevational view showing a transverse section of the strip and illustrating the mounting of the flashing micrometer.

Figure 3 is an elevational view showing the counters.

Figure 4 is a schematic diagram showing how the counters are driven.

Figure 5 is a wiring diagram.

Figure 6 shows a suitable arrangement for a blackboard upon which may be entered the performance of the various crews.

In Figure 1 I have shown work rolls 1 and backing rolls 2 mounted in a mill housing 3 through which the strip 4 passes and by which the strip is being reduced. The strip passes from the mill in the direction shown by the arrow, over a roll 6 to a coiler 5. The roll 6 is provided with a gear 7 which is arranged to drive a Selsyn transmitting device through a gear 8 meshing with the gear 7 and a gear box 9. The Selsyn transmitter 10 is electrically connected in known manner to the Selsyn receiver 16 whose operation will be described hereinafter.

I have indicated at 11 a conventional flying micrometer gauge which is mounted as shown most clearly in Figure 2 to engage the strip 4. This gauge 11 may be of the type known as an Electro-limit gauge similar to that shown and described in patent to Terry 2,007,840, granted July 9, 1935. The micrometer is mounted upon a slide support 12 and is moved into or out of engagement with the strip by means of the lever 13 acting through a conventional linkage. The lever 13 is provided with a mercury switch 14 which is arranged to be closed when the micrometer gauge 11 is in engagement with the strip 4. The switch 14, as will be described hereinafter, is in the circuit of the Selsyn device.

The indicator 15 of the flying micrometer may be mounted on the mill housing 3 as shown and is provided with adjustable contactors which can be set at any desired point above and below the predetermined gauge. For example, the indicators may be set at +.0015 inch or -.0015 inch respectively. The flying micrometer and its indicator described herein form no part of this invention and will not be described in detail since they are readily available on the market.

The Selsyn receiver 16 may be located at any suitable point remote from the mill and is electrically connected to the Selsyn transmitter to be actuated thereby. The Selsyn receiver 16 drives a shaft 17 which is provided with three sets of miter gears 18, 25, and 26 which are arranged to drive conventional counters 19, 21, and 23. The counter 19 is driven through a suitable coupling 20 while the counters 21 and 23 are driven through magnetic clutches 22 and 24 respectively.

The counter 19 which is thus always driven

when the Selsyn receiver 16 is running, will, if proper gearing has been utilized, indicate in feet or hundreds of feet, or in any desired manner, the total number of feet of strip rolled. In the particular embodiment illustrated, the gearing has been chosen so that the indicator 19 will indicate total strip rolled in hundreds of feet.

As will be described hereinafter, the magnetic clutches 22 and 24 are arranged to be engaged to operate the respective indicators 21 and 23 only during such period as the strip is being rolled over or under the tolerance limits respectively.

Referring now more particularly to the wiring diagram of Figure 5, the A. C. power supply is shown by lines 27 and 28. These are connected to the Selsyn transmitter by the lines 31 and 38 and to the Selsyn receiver by the lines 29 and 30. As will be observed, the mercury switch 14 is in the line 31 to close the Selsyn circuit and put it in operation when the flying micrometer 11 is in contact with the strip. The Selsyn transmitter and receiver are interconnected in known manner by the lines 32, 33 and 34. The magnetic clutches 22 and 24 are provided with D. C. power through a rectifier 35. The rectifier 35 is connected with the indicator 15 and the clutches 22 and 24 as shown. Thus if the minimum limit of tolerance is not being achieved a circuit will be established through the lines 36, the negative side of the indicator, the line 40, the clutch 24, and the line 39. When this happens the magnetic clutch 24 will close and the indicator 23 will indicate and continue to do so, so long as the strip being rolled is below the minimum tolerance. As soon as strip gauge is increased to within the tolerance range, the clutch 24 will of course be disengaged and the counter 23 will cease to indicate. Similarly if the maximum tolerance limit is being exceeded, a circuit will be established through lines 36, the positive side of the indicator 15 and the line 37, the clutch 22 and the line 39, whereby the clutch 22 will be closed, causing the indicator 21 to count the length in hundreds of feet of strip being rolled which is above the maximum tolerance limit.

It will thus be clear that a blackboard can be established as shown in Figure 6 and on this blackboard may be registered the designation of each operating crew (as for example by turn and foreman) and the total linear feet of strip as well as the percentage of strip which is within the range and the percentage which is over and under range can be noted. It will also be clear that anyone concerned may at any time by observing the indicators of Figure 3, tell immediately how the rolling procedure is going along.

Numerous modifications as to details can be made without departing from the spirit of my invention, and I therefore do not intend to limit myself except as pointed out in the following claims. Having now fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a device of the character described, means for continuously indicating the gauge of strip being rolled, means for pre-establishing tolerance limits in gauge variation, means driven in accordance with strip movement, means continuously driven by said last mentioned means for indicating the total length of strip being rolled, two means driven by said last mentioned means through clutches, and means controlled by said strip for producing engagement of said clutches alternatively upon an increase above 75

or a decrease below a tolerance limit respectively, to measure quantitatively as well as qualitatively off-gauge production.

2. In a device according to claim 1, in which the means driven in accordance with strip movement comprises a Selsyn receiver, and in which a Selsyn transmitter operatively connected to said Selsyn receiver is driven in accordance with strip movement.

3. In combination with a rolling mill, a number of counters arranged to be driven by the issuing strip through appropriate gearing to indicate length of strip being rolled, one of said counters being continuously driven to indicate total length of strip being rolled, two of said counters being selectively and alternatively drivable by said strip through clutches, means for indicating the gauge of the issuing strip, means for pre-establishing tolerance limits for said gauge, and means controlled by said strip for causing engagement of one or the other of said clutches respectively when one or the other tolerance limit is reached, to indicate the length of strip over, and length of strip under said tolerance limits.

4. In combination with a rolling mill, a Selsyn transmitter arranged to be driven by the issuing strip, a Selsyn receiver operatively connected to said transmitter, a number of counters arranged to be driven through appropriate gearing by said receiver to indicate the length of strip being rolled, one of said counters being continuously driven to indicate total length of strip being rolled, two of said counters being selectively and alternatively drivable by said receiver through clutches, means for measuring the gauge of issuing strip, including means for pre-establishing a range of tolerances for said gauge, and means for causing engagement of one or the other of said clutches respectively when one or the other limit of said tolerance is reached, to indicate length of strip over, and length of strip under said tolerance range.

5. In combination with a rolling mill, a Selsyn transmitter arranged to be driven by the issuing strip, a micrometer arranged to measure the gauge of the issuing strip, said micrometer having an indicator provided with means for pre-establishing a range of tolerances, a Selsyn receiver operatively connected to said Selsyn transmitter, an electric circuit including said transmitter and receiver, and a switch in said circuit arranged to close the same when said micrometer is in engagement with said strip, three counters arranged to be driven by said Selsyn receiver through appropriate gearing to register the length of strip being rolled, one of said counters being continuously coupled to said Selsyn receiver to indicate total length of strip being rolled, each of the other two counters being coupled to said Selsyn receiver through a magnetic clutch, an electric circuit including a source of direct current in which said magnetic clutches are arranged in parallel, means in connection with said indicator for completing a circuit through one or the other of said magnetic clutches respectively when the indicator attains the upper or lower limit of the pre-established tolerance.

6. In a device of the character described, means for continuously indicating the gauge of strip being rolled, means for pre-establishing tolerance limits in gauge variations, means for measuring the total length of strip rolled, means controlled by the strip when it exceeds a prede-

terminated gauge for measuring the length of strip rolled of excess gauge, and means controlled by the strip when it is less than said predetermined gauge for measuring the length of strip rolled of less than predetermined gauge.

7. In a device of the character described, means for continuously indicating the gauge of strip being rolled, means for pre-establishing tolerance limits in gauge variation, a number of means for measuring the length of strip being rolled, one of said means being continuously operative so as to measure total length of strip being rolled, and two of said means controlled by the strip and selectively and alternatively operative upon an increase above or a decrease below said tolerance limits, respectively, to measure quantitatively as well as qualitatively, off-gauge production.

8. In a device of the character described, a micrometer for continuously indicating the gauge of strip being rolled, said micrometer having a pointer provided with means for pre-establishing tolerance limits, a number of means for measuring the length of strip being rolled, one of said means being continuously operative so as to measure the total length of strip being rolled, and two of said means controlled by the strip and selectively and alternatively operative upon an increase above or a decrease below said tolerance, respectively, to measure quantitatively as well as qualitatively, off-gauge production.

9. In a device of the character described, means for continuously indicating the gauge of strip being rolled, means for pre-establishing an over-gauge tolerance limit, means for measuring the total length of strip being rolled, and means controlled by said strip and operative

only during such times as said tolerance limit is exceeded for measuring the length of over-gauge strip being rolled.

10. In a device of the character described, a micrometer for continuously indicating the gauge of strip being rolled, said micrometer having an indicator provided with means for pre-establishing an over-gauge tolerance limit, at least two means for measuring the length of strip being rolled, one of said means being continuously operative so as to measure total length of strip being rolled, and the other of said means being controlled by said strip and operable only upon an increase above said tolerance limit to measure over-gauge production.

11. In a device of the character described, means for continuously indicating the gauge of strip being rolled, means for pre-establishing a below-gauge tolerance limit, means for measuring the total length of strip being rolled, and means controlled by said strip and operative only during such times as said below-gauge tolerance is exceeded for measuring the length of below-gauge strip being rolled.

12. In a device of the character described, a micrometer for continuously indicating the gauge of strip being rolled, said micrometer having an indicator provided with means for pre-establishing a below-gauge tolerance limit, at least two means for measuring the length of strip being rolled, one of said means being continuously operative so as to measure total length of strip being rolled, and the other of said means being controlled by said strip and operable only upon a decrease below said tolerance limit to measure below-gauge production.

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