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2,366,508

GAUGE

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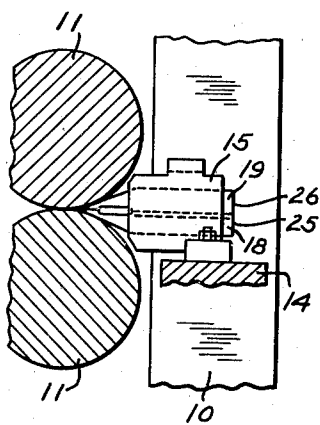


Fig. 1

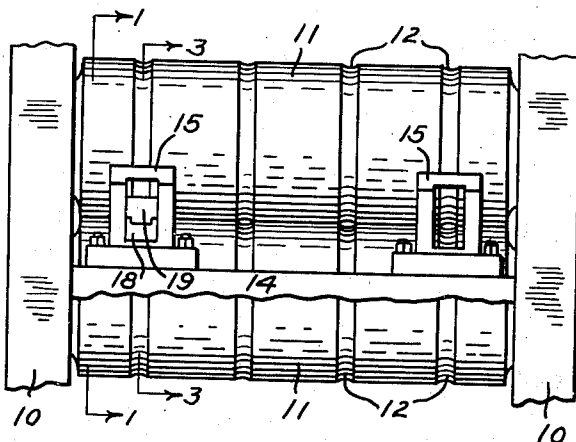


Fig. 2

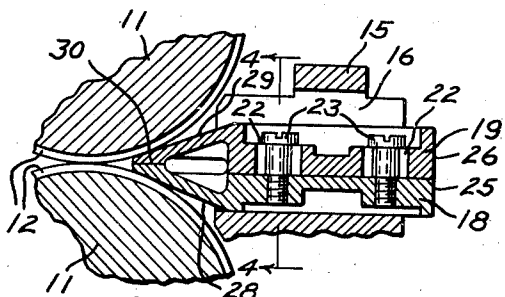


Fig. 3

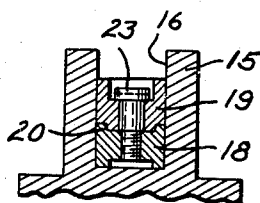


Fig. 4

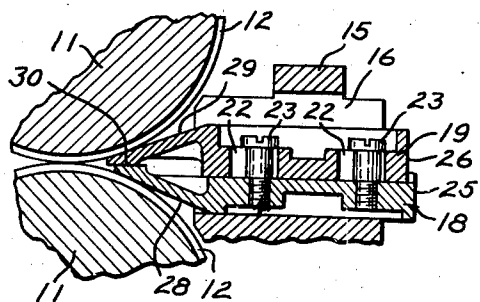


Fig. 6

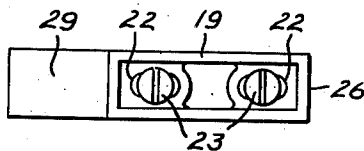


Fig. 5

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UNITED STATES PATENT OFFICE

2,366,508

GAUGE

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7 Claims. (Cl. 33—182)

This invention relates to gauges, and more particularly to a device for use in obtaining correct alignment of rolling mill rolls with the guides.

In the production of rolled metal products, such as bars, rods, strip, etc., it is the common practice to employ a pair of horizontal rolls, together with suitable guides to confine the stock in a definite horizontal path as it approaches and leaves the rolls. It is of great importance that the rolls be positioned at exactly the right height to bring the roll pass into accurate alignment with the guides, for otherwise there will be an excessive pressure between the stock and the guides, the stock will be scratched, the guides will wear rapidly, and the danger of cobbles will be greatly increased. Heretofore rolling mill operators have had to peer through the guides in a crude attempt to ascertain whether or not the rolls were at the correct height, and the results have been unsatisfactory unless the operators were highly skilled.

It is accordingly one object of the invention to provide a comparatively simple and inexpensive gauge which will enable a rolling mill operator to obtain correct alignment of the mill rolls with the guides.

It is a further object of the invention to provide a roll alignment gauge which can be utilized by a comparatively unskilled workman to obtain highly accurate alignment of the rolls with the guides.

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

Referring to the drawing illustrating one embodiment of the invention and in which like reference numerals indicate like parts,

Fig. 1 is a fragmentary sectional view through a rolling mill with a gauge in use thereon, the section being taken on the line 1—1 of Fig. 2;

Fig. 2 is a fragmentary elevation of the mill;

Fig. 3 is an enlarged section on the line 3—3 of Fig. 2, with the rolls positioned at the correct height;

Fig. 4 is a section on the line 4—4 of Fig. 3;

Fig. 5 is a top plan view of the gauge; and

Fig. 6 is a view similar to Fig. 3 but with the rolls positioned too high for correct alignment.

The embodiment illustrated comprises a pair of spaced upright housings 10, and two superimposed horizontal cylindrical rolls 11 of equal diameters, these parts being of the ordinary construction employed in the rolling of metal. Any suitable means may be provided for driving the

rolls and for adjusting them vertically, in accordance with the usual practice. When metal bars are to be produced, the rolls will be provided with circumferential grooves 12 of the required shape. A horizontal rest bar 14 extends between the housings 10 to provide a support for two guide boxes 15 of any suitable construction. As illustrated, each of these boxes is shaped to provide a horizontal groove or channel 16 of rectangular cross-section extending in the direction of stock travel at right angles with the rolls. It will be understood that each guide box 15 is adapted to receive a guide through which the stock will travel, many types of such guides being known. For an example of one desirable construction, reference may be had to the patent to O'Malley No. 2,264,218, granted November 25, 1941.

It will be apparent that the guides may be accurately constructed so that they will support the stock traveling therethrough at a predetermined height above the bottom surfaces of the channels 16 of the guide boxes. Consequently, if the rolls 11 can be adjusted to bring their pass line (the line of travel of the center line of the stock between them) at the correct height above these bottom surfaces, the guides will be accurately aligned with the rolls when the guides are mounted in the guide boxes. In accordance with the present invention this adjustment of the rolls is facilitated by means of an accurately constructed gauge adapted to be inserted in the guide box and to indicate the position of the rolls relative thereto.

In its preferred form the invention comprises an elongated lower block 18 and an elongated upper block 19 mounted on the lower block and slidable in a lengthwise direction thereon. Both of these blocks are placed within the channel 16 of the guide box 15, with the lower block 18 slidably supported on the bottom surface of this channel. The width of the blocks is substantially equal to that of the channel so that they are maintained at right angles with the rolls. Preferably the adjacent surfaces of the two blocks are shaped to provide a tongue-and-groove joint 20 (Fig. 4) to aid in keeping them in proper alignment. To prevent separation of the blocks, the upper block 19 is provided with two slots 22 through which vertical screws 23 extend into the lower block 18 therebeneath.

The blocks 18 and 19 are so constructed and arranged that their inner end portions project from the guide box and into the V-shaped opening formed by the converging cylindrical surfaces of the rolls. By pushing the blocks inwardly, the

upper block will be brought into contact with the upper roll, and the lower block will be brought into contact with the lower roll. Moreover, the final positions of the blocks, when contact is made with the rolls, will depend upon the height of the rolls relative to the guide box. Thus if the rolls are located at a higher position relative to the guide box, the upper block will be positioned further inwardly and the lower block will be positioned further outwardly, at the time the inner portions of the blocks touch the respective rolls. Consequently, the positions of the blocks relative to each other may be utilized as an indication of the height of the roll pass line relative to the guide box, and in order to employ this principle effectively means is provided to indicate with great accuracy that particular relative positioning of the blocks which corresponds to the correct position of the rolls. For this purpose the outer ends of the blocks 18 and 19 are provided with plane vertical indicating surfaces 25 and 26 respectively which become flush with one another when the rolls are located at the correct height and the blocks are pushed inwardly to engage the rolls.

The exact shape of the inner portions of the blocks may be varied considerably without departing from the spirit of the invention. Preferably however the inner portion of the lower block 18 is provided with a plane lower gauging surface 23 which slopes upwardly and inwardly at an acute angle with the horizontal, and the inner portion of the upper block 19 is provided with a plane upper gauging surface 29 which slopes downwardly and inwardly at an acute angle with the horizontal, these two acute angles being equal. The inner portions of the two blocks are in sliding contact with one another along a horizontal plane 30 which bisects the angle between the two inclined inwardly converging surfaces 28 and 29 when the two outer end surfaces 25 and 26 are aligned. The height of the plane 30 above the horizontal bottom surface of the lower block 18 is made exactly equal to the desired height of the pass line above the bottom of the channel 16 of the guide box. The inclined surfaces 28 and 29 are made somewhat wider than the roll grooves 12, so that the gauge blocks will make contact with the cylindrical surfaces of the rolls on opposite sides of these grooves.

It will now be apparent that in using the gauge the operator will slide the two blocks 18 and 19 inwardly through the guide box 15 until the inclined gauging surfaces 28 and 29 make contact with the respective rolls. If now the outer end indicating surfaces 25 and 26 of the blocks are flush, as shown in Fig. 3, the rolls will be at the correct height with relation to the guide box, for under these conditions the plane 30 will be aligned with the pass line of the rolls, and this plane is by the construction of the gauge located at the correct height above the bottom of the guide box channel 16. If the rolls are too high, as shown in Fig. 6, the surface 25 will be located outwardly with respect to the surface 26, which fact can readily be ascertained by the operator either by visual inspection or preferably by passing his finger over these surfaces. A very slight lack of alignment of the surfaces 25 and 26 will be noticeable to the operator. Furthermore, a very slight vertical displacement of the rolls will cause a considerably amplified change in the relative positions of the gauge blocks. Thus, if the plane surfaces 28 and 29 make an angle of say twenty degrees with the horizontal, and the rolls

are moved vertically .001", the change in the horizontal position of each wedge will be

$$.001'' \div \tan 20^\circ = .00274''$$

and the relative position of the two wedges will change $2 \times .00274'' = .00548''$. Since this is greater than a five-to-one ratio, and since an operator can by his sense of touch easily detect a misalignment between the surfaces 25 and 26 of less than one thousandth of an inch, it will be appreciated that the gauge makes it possible to adjust the rolls with great accuracy. In Fig. 2 two guide boxes are shown, near opposite ends of the rolls, and in such a mill the gauge will be applied to both boxes in succession to make sure that the rolls are level and properly aligned with the boxes at both ends. The gauge is relatively simple and inexpensive to manufacture, and it greatly facilitates accurate adjustment of the rolls even by comparatively unskilled operators.

In certain of the claims descriptive terms such as "horizontal," "upper," "lower" and the like have been employed, but it is not intended that such terms should be construed as limitations except as they define the relative positions of the various parts, it being apparent that the invention is applicable to vertical or inclined rolls as well as to the horizontal rolls illustrated.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A gauge for use in obtaining correct alignment of two parallel rolling mill rolls and an associated guide box comprising a pair of relatively slidable blocks adapted to be placed in the guide box and pushed inwardly toward the rolls to bring their inner end portions into the V-shaped opening formed by the converging surfaces of the rolls, and gauging surfaces formed on the inner end portions of the blocks arranged to make contact with the said surfaces of the respective rolls and thus limit the inward movement of the blocks, said blocks including means to indicate that particular relative positioning of the blocks which corresponds to the correct relative positioning of the rolls and the guide box.

2. A gauge for use in obtaining correct alignment of two parallel rolling mill rolls and an associated guide box comprising a pair of relatively slidable blocks adapted to be placed in the guide box and pushed inwardly toward the rolls to bring their inner end portions into the V-shaped opening formed by the converging surfaces of the rolls, gauging surfaces formed on the said inner end portions of the blocks arranged to make contact with the said surfaces of the respective rolls and thus limit the inward movement of the blocks, and indicating surfaces formed on the outer ends of the blocks and so related to the gauging surfaces that when the blocks are pushed inwardly as aforesaid, and the correct relationship of the rolls and guide box exists, the said indicating surfaces will be flush with one another.

3. A gauge for use in obtaining correct alignment of two parallel rolling mill rolls and an associated guide box comprising a pair of relatively slidable blocks adapted to be placed in the guide box and pushed inwardly toward the rolls to bring their inner end portions into the V-shaped opening formed by the converging surfaces of the rolls, and inwardly converging plane gauging surfaces formed on the respective inner end portions of the blocks arranged to make contact with the said surfaces of the respective rolls and thus

limit the inward movement of the blocks, said blocks including means to indicate that particular relative positioning of the blocks which corresponds to the correct relative positioning of the rolls and guide box.

4. A gauge for use in obtaining the correct height relationship between a pair of parallel substantially horizontal superimposed rolling mill rolls and an associated guide box having a horizontal channel therethrough comprising a lower block adapted to be placed in the said channel and while resting on the bottom thereof to be pushed inwardly toward the rolls, a gauging surface formed on the inner end portion of the said block arranged to make contact with the upwardly and inwardly curving surface of the lower roll, an upper block slidably supported on the lower block and adapted to be pushed inwardly toward the rolls, a gauging surface formed on the inner end portion of the upper block arranged to make contact with the downwardly and inwardly curving surface of the upper roll, and vertical indicating surfaces formed on the outer end portions of the respective blocks and so related to the gauging surfaces as to be flush with one another when the blocks are pushed inwardly as aforesaid and the roll pass line is at a desired height relative to the bottom of the guide box channel.

5. A gauge for use in obtaining the correct height relationship between a pair of parallel substantially horizontal superimposed rolling mill rolls of equal diameters and an associated guide box having a horizontal channel therethrough comprising a lower block adapted to be placed in the said channel and to be slidably supported on the bottom thereof, an upper block slidably supported on the lower block, the blocks having inner end portions shaped for sliding contact in a horizontal plane, inwardly converging upper and lower plane gauging surfaces formed on the inner end portions of the upper and lower blocks respectively and positioned at equal angles with the said horizontal plane, the said gauging surfaces being arranged to make contact with the inwardly converging surfaces of the upper and lower rolls respectively when the blocks are pushed inwardly, and upright plane indicating

surfaces formed on the outer ends of the respective blocks and so related to the gauging surfaces as to be flush with one another when the relative positions of the blocks are such that the said horizontal plane bisects the angle between the said converging upper and lower plane surfaces.

6. A gauge for use in obtaining the correct height relationship between a pair of parallel substantially horizontal superimposed rolls and an associated guide box comprising a pair of relatively slidable blocks adapted to be placed in the guide box and pushed inwardly towards the rolls to bring their inner ends into the V-shaped opening formed by the converging surfaces of the two rolls, a gauging surface formed on the inner portion of one block to engage the upper surface of the lower roll only to limit inward movement of the block, and a gauging surface formed on the inner portion of the other block to engage the lower surface of the upper roll only to limit inward movement of the block, said blocks including means to indicate that particular relative positioning of the blocks which corresponds to the correct height relationship between the rolls and the guide box.

7. A gauge for use in obtaining the correct height relationship between a pair of parallel substantially horizontal superimposed rolls and an associated guide box comprising a lower block adapted to be placed in the guide box and to be slidably supported therein, and an upper block slidably supported on the lower block, the inner portion of the lower block having an upwardly and inwardly sloping plane lower gauging surface for engagement with the upper surface of the lower roll when the lower block is pushed inwardly, the inner portion of the upper block having a downwardly and inwardly sloping plane upper gauging surface for engagement with the lower surface of the upper roll when the upper block is pushed inwardly, and said blocks including means to indicate that particular relative positioning of the blocks which corresponds to the correct height relationship between the rolls and the guide box.

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