Oct. 10, 1967 E. R. HENSCHKER 3,345,848

ROLLING MILL, IN PARTICULAR FOR RODS AND BARS

Filed April 20, 1965 5 Sheets-Sheet 1

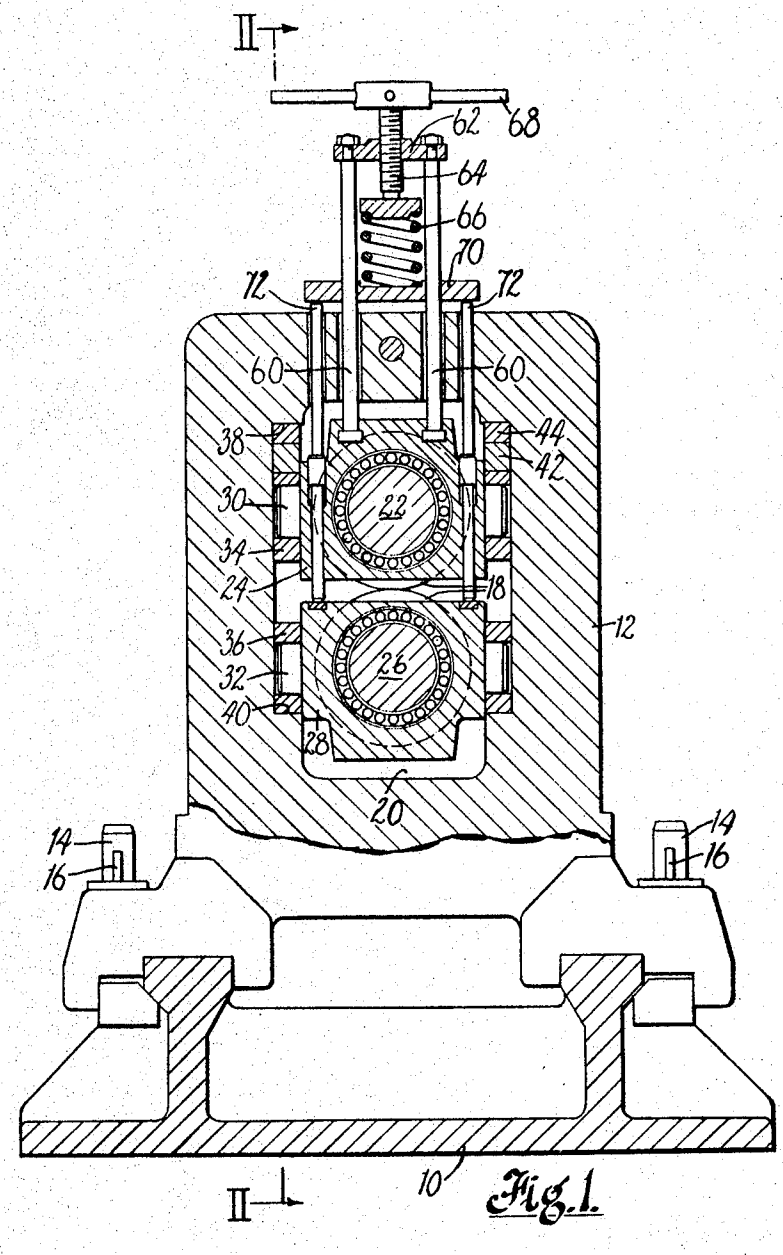


Fig. 1.

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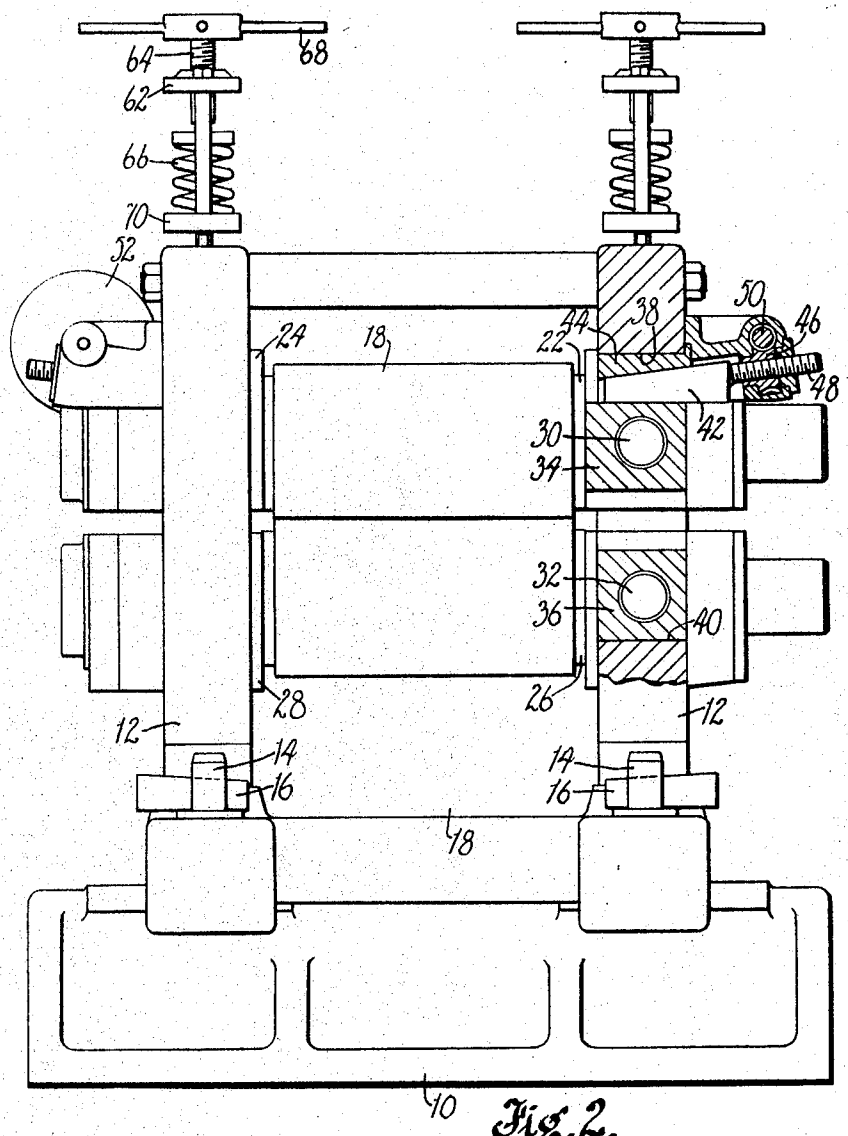


Fig. 2.

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ROLLING MILL, IN PARTICULAR FOR RODS AND BARS

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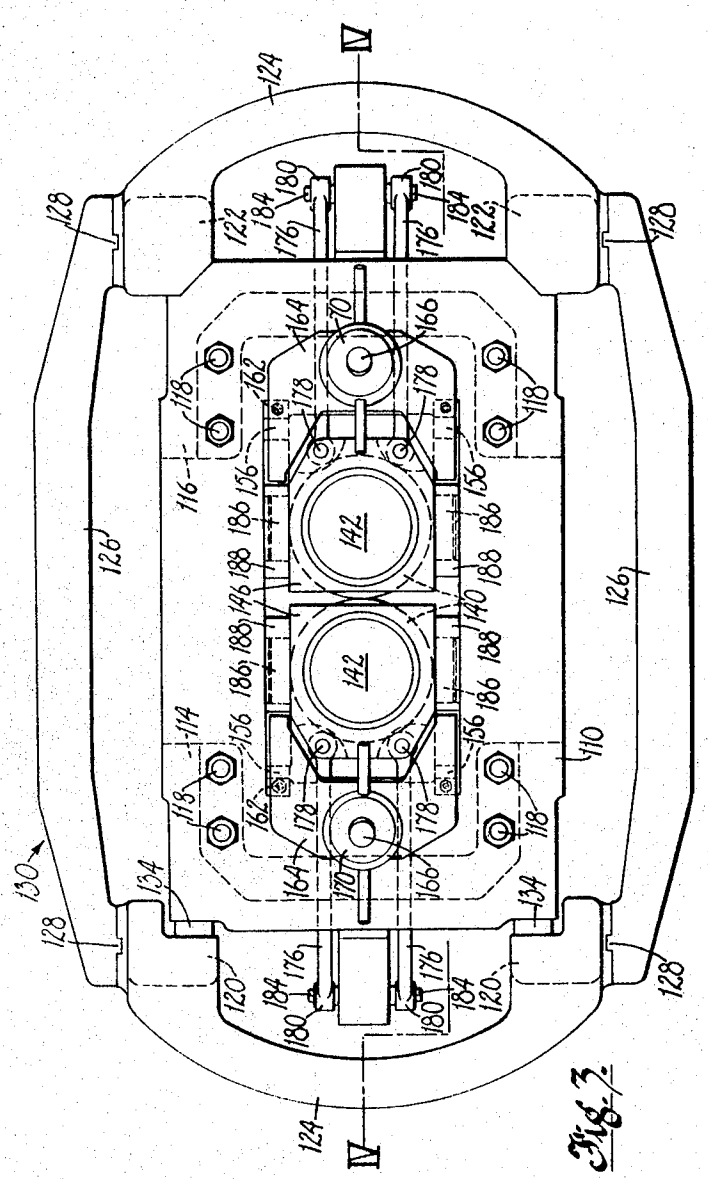


Fig. 2.

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ROLLING MILL, IN PARTICULAR FOR RODS AND BARS

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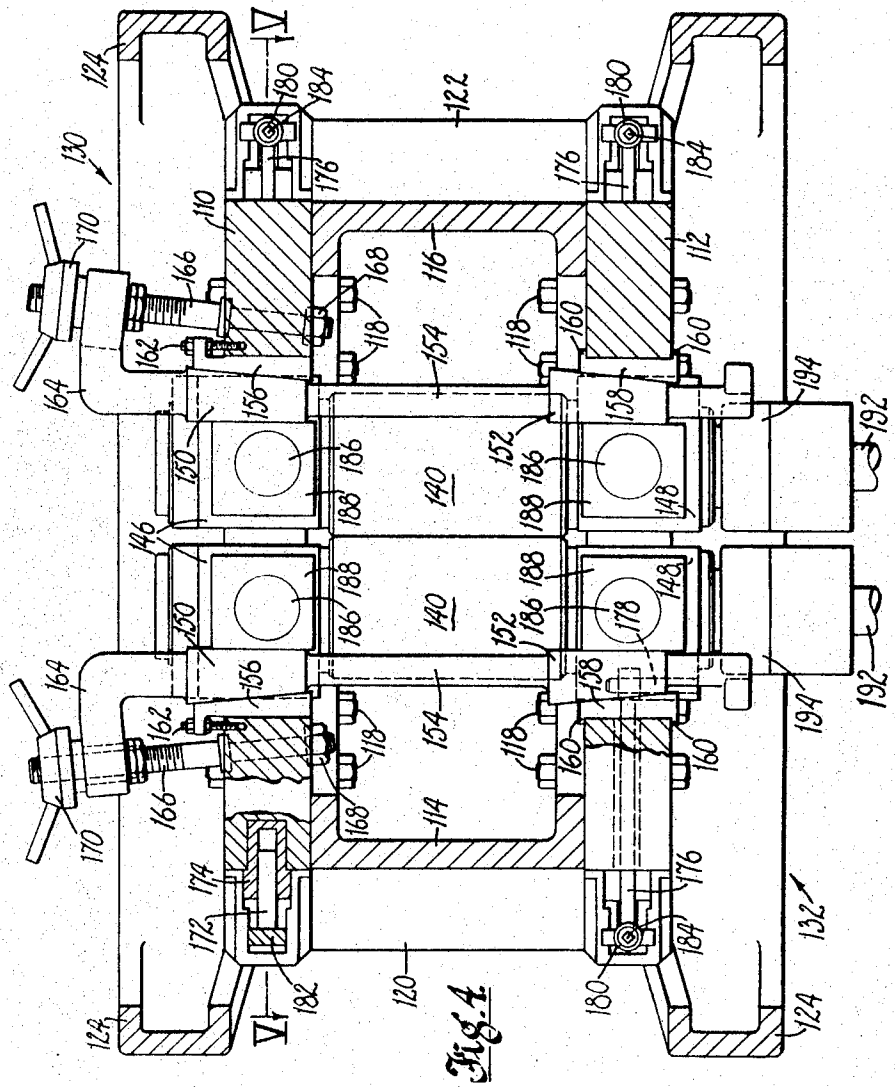


Fig. 4

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Fig. 6.

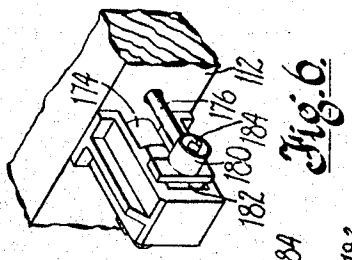
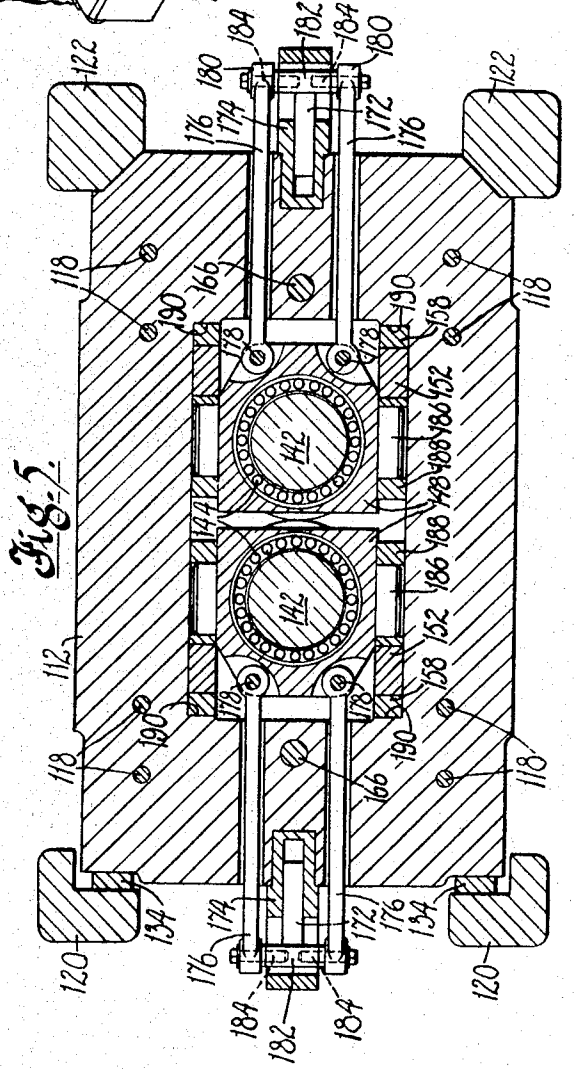


Fig. 5.



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ROLLING MILL, IN PARTICULAR FOR RODS AND BARS

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3 Claims. (Cl. 72—237)

ABSTRACT OF THE DISCLOSURE

A rolling mill of the horizontal or vertical type for bars and rods having housings, working rolls, means for mounting said working rolls in said housings, said housings having windows with recesses at their longer side, the shoulder of the said recesses serving as seats for the mounting means of one of the rolls and for the roll-adjustment means and means for urging the mounting means of both rolls toward said seats.

This invention relates to rolling mills, and, in particular, to rolling mills for bars or rods. The invention is especially concerned with the manner in which the rolls of such a mill are supported in the mill housings, and also with the means for adjusting the gap between the working rolls of the mill.

It is an object of the invention to provide a rolling mill for bars or rods which is of simple and rigid design and which, at the same time, affords rigid support for the rolls and the housings, together with means by which the settings of the rolls in the housings can be readily changed and adjusted.

In the mill according to the invention, the housings are formed with ledges or shoulders at opposite ends, which ledges or shoulders support the bearing chocks of the mill rolls. Roll adjustment means are interposed between the bearing chocks of at least one of the rolls and the shoulders at one end of the housings.

With this design, the roll-separating force which occurs while rolling is in progress is transmitted through the bearing chocks to these shoulders, so that only those parts of the housings which extend between the shoulders are subjected to a tensile load and stretched. The stretching of the housings is therefore greatly reduced, and the mill is consequently more rigid. Furthermore, the housings are entirely relieved from bending loads which exist, for instance, in rolling mills where the rolls are adjusted by screwed spindles mounted in the centre of the transverse parts of the housings.

Pressure means in the form of springs or hydraulic rams may be provided for urging the bearing chocks towards the shoulders in the housings, so that a firm contact between these bearing chocks and the parts supporting them in the housings is ensured. Separate pressure means may be provided for each roll, or, alternatively, the two rolls of a mill may have common pressure means which urge these rolls apart. This latter alternative is particularly suitable for horizontal mills where these pressure means may be incorporated into the suspension means for the top roll.

The roll-adjusting means provided between the shoulders and the bearing chocks may be in the form of wedges. In addition, further means may be provided to allow stepwise adjustment of the roll gap. The latter means may comprise trunions projecting from the bearing chocks and journalled eccentrically in blocks which support these bearing chocks on the shoulders. Stepwise adjustment of the roll gap can then be achieved by turning these blocks

about the trunnions, so that different sides of the blocks are used as supporting surfaces.

Two embodiments of the invention will now be described by way of example with reference to the accompanying drawings, in which:

FIG. 1 is a horizontal section through a horizontal rolling mill in accordance with the invention.

FIG. 2 is a front view of the same rolling mill, some parts being shown in section along the line II—II of FIG. 1.

FIG. 3 is a plan view of a vertical rolling mill according to the invention.

FIG. 4 is a vertical section along the line IV—IV of FIG. 3.

FIG. 5 is a horizotnal section along the line V—V of FIG. 4.

FIG. 6 is an isometric view of a detail.

The rolling mill illustrated in FIGS. 1 and 2 of the drawings is of the horizontal type and comprises a bedplate **10** to which are secured two housings **12** by such means as bolts **14** and wedges **16**. The rolling mill shown is intended for the rolling of rods and bars; it is of the two-high type and its two working rolls **18** are supported in windows **20** in the housings **12** in a manner presently to be described.

The journals **22** of the upper working roll are supported on bearing chocks **24**, and the journals **26** of the lower working roll on bearing chocks **28**. Projecting from opposite sides of each of the bearing chocks **24** and **28** and at right-angles to the axes of the rolls **18** are horizontal trunnions **30** and **32** respectively which are supported in square blocks **34** and **36** respectively. The trunnions **30** of the upper working roll are positioned eccentrically with respect to the centre of their blocks **34**, while the trunnions **32** of the lower working roll are positioned concentrically with respect to the centre of their blocks **36**.

Each of the four sides of a block **34** is therefore at a different distance from the axis of its trunnion **30**. By turning a block **34** about an angle of 90° or a multiple thereof, it is possible to alter the distance of the axes of the working rolls **18** from each other. In this way, the gap between these rolls can be altered, e.g., after a roll change, in steps determined by the differences in the distances of the trunnion axes from the various sides of the blocks **34**. Instead of one, both trunnions **30** and **32** may be eccentrically positioned in their respective blocks **34** and **36**, whereby the range of possible alterations in the roll setting is correspondingly increased. The blocks may also have more than four sides.

The vertical walls of the windows **20** are formed near their upper ends with shoulders **38** and near their lower ends with shoulders **40**. The blocks **36** of the lower bearing chocks **28** rest directly on the shoulders **40**. For accurate adjustment of the roll gap, pairs of wedges **42** and **44** respectively are interposed between the blocks **34** and the upper shoulders **38**. Each pair of wedges consists of a lower wedge **42** and an upper wedge **44**. The lower wedges can be displaced relative to the upper wedges by means of nuts **46** threaded on spindles **48** extending from the wedges **42**, the nuts being rotated through worm shafts **50**. In this way, the setting of the rolls **18** relative to each other can be readily and accurately adjusted. The afore-described roll-adjusting means are provided in respect of each of the housings **12**; they may be coupled together by means not shown, so that they can be operated in unison by such means as a hand-wheel **52**. The upper wedges **44** are provided with lugs **54** to prevent their displacement relative to the housings **12**. While the wedges **42** and **44** provide a continuous and close adjustment of the gap between the rolls **18**,

the truunnions 30 (or 30 and 32) and the blocks 34 (or 34 and 36) provide a preliminary adjustment for this gap.

The two bearing chocks 24 of the upper working roll 18 are each suspended by rods 60 from an upper crossbar 62 arranged above a housing 12 and at some distance from the latter. Each crossbar 62 is supported, by means of a threaded spindle 64, on a spring 66. The pressure of the springs can be adjusted by means of a handle 68 on spindle 64. The spring is supported in its turn on a lower crossbar 70 which rests on rods 72 abutting with their lower ends against the top of a lower bearing chock 28. The rods 60 and 72 pass freely through the upper transverse parts of the housings 12.

The above-described means serve to suspend the top roll in the mill housings, and, further, to keep the two rolls 18 spaced apart from each other. The springs 66 also urge the blocks 34 of the upper bearing chocks 24 towards the shoulders 38, and the blocks 36 of the lower bearing chocks 28 against the shoulders 40.

In the mill described, the roll-separating force which is developed during rolling is transmitted to the shoulders 38 and 40. Hence, only that part of the housings 12 extending between these shoulders is under tension when rolling is in progress, whereby the stretch of the housing is greatly reduced, while the other parts of the housings are unstressed.

Due to the absence of any spindles mounted in the transverse parts of the housings, the housings are free from any bending loads during rolling.

The support of the bearing chocks 24 and 28 on two widely spaced-apart shoulders 38 and 40 prevents "chatter" of the chocks and wear on the contact surfaces of the housing windows 20.

The rolling mill shown in FIGS. 3 to 6 of the drawings is of the vertical type. Its framework consists of an upper housing 110 and a lower housing 112; arranged between the housings 110 and 112 are two substantially U-shaped supports 114 and 116, having flanges which are secured by bolts 118 to the two housings. Two pairs of vertical posts 120 and 122 extend alongside the supports 114 and 116 and alongside the corners of the housings 110 and 112 and beyond. The two posts of each pair are joined at their top and bottom respectively by arched transverse beams 124, which may be in one piece with the posts. Longitudinal beams 126 join a post 120 of one pair to the opposite post 122 of the other pair, the longitudinal beams and the posts having groove nad tongue connections 128. The beams 124 and 126 thus form upper and lower closed frames 130 and 132, having openings slightly larger in size than the housings 110 and 112. The upper frame 130 is arranged somewhat above the upper housing 110, and the lower frame 132 somewhat below the lower housing 112, as is apparent from FIG. 4.

The posts 120 and 122 extend with their ends into the frames 130 and 132. Pads 134 are positioned between the posts 120 and the housings 110 and 112, while the posts 122 are in direct contact with the housing surfaces, which are at 45° inclined to the sides of the housings (FIG. 3).

The mill shown has two vertical working rolls 140, which are mounted in an identical manner in the aforedescribed framework of the mill. It suffices, therefore, to describe the mounting of one of these rolls only:

Each roll 140 has journals 142 at its two ends, which are supported by means of roller bearings 144 or any other suitable type of bearings in block-shaped upper and lower chocks 146 and 148 respectively. The adjustment of the gap between the rolls 140 is effected by sets of wedges, as will be presently described. The chocks 146 and 148 of each roll bear against wedges 150, 152 respectively, which are connected to each other by a strut 154. The inclined surface of wedge 150 is in contact with a correspondingly inclined surface of a companion wedge 156. The inclined surface of wedge 152 is in contact with a correspondingly inclined surface of a companion wedge 158, attached to lower housing 112 by noses 160. The wedges 156 can be adjusted relative to the upper housing 110, by means of set screws 162. The upper wedges 150 are extended into brackets 164 into which spindles 166 are threaded. The spindles are anchored to upper housing 110 by nuts 168 and can be rotated by handwheels 170. Rotation of the wheels 170 in one direction or the other will raise or lower the wedges 150, 152 and thereby move the chocks 146, 148 of one roll 140 either away or towards the chocks of the other roll 140, depending on the direction of rotation of the wheels 170. In this way, the gap between the rolls 140, which control the thickness of the material rolled, can be continuously and exactly adjusted.

In order to maintain the chocks 146 and 148 in close contact with the wedges 150, 152, and the latter in close contact with their companion wedges 156, 158, each chock is attached to a hydraulic ram 172 which is displaceable in a hydraulic cylinder 174, inserted in an upper housing 110 or lower housing 112. The connection between a chock 146 or 148 and its ram 172 consists of parallel rods 176, pivoted by pins 178 to the respective chock 146 or 148, and having heads 180 and a crossbar 182, secured by bolts 184 to those heads and formed in one piece with the ram 172, or otherwise secured to the latter (FIG. 6). Hydraulic pressure fluid in the cylinder 174 will cause the rams 172 to move in an outward direction, whereby the chocks of one roll 140 are urged towards the wedges 150, 152 and the latter in turn towards their companion wedges 156, 158.

In the embodiment shown in the drawings, the chocks 146, 148 do not bear directly against the wedges 150, 152, Instead, each chock has a trunnion 186 which is eccentrically received in a square block 188 (FIG. 5), the block being on the one side in contact with a wedge 150 or 152. Each of the four sides of a block 188 is therefore at a different distance from the axis of its trunnion 186. By turning block 188 about its trunnion 186, so that a different side of the block is moved into contact with a wedge 150 or 152, the distance between the centre of the trunnion (and, hence, the axis of the associated roll 140) and the wedge 150 or 152 can be varied in steps. While the wedges 150, 152 and their companions 156, 158 provide a continuous and close adjustment of the gap between the rolls 140, the trunnions 186 and the blocks 188 provide a preliminary adjustment for this gap.

The companion wedges 156, 158 are supported, as seen particularly in FIG. 5, on shoulders 190 formed in the windows of the upper and lower housings 110 and 112 respectively. As shown in FIG. 5, these shoulders do not have to be wider than the wedges 150, 152 and their companion wedges 156, 158, so that these shoulders can be comparatively narrow. It will, however, be clear from that figure that only that section of the housings 110 and 112 which extends between the shoulders 190 will be under strain during rolling, as distinct from conventional rolling mills in which the entire housings are under strain. This has the advantage of reducing materially the extent to which the housings stretch during rolling, whereby the accuracy and the tolerance of the rolled product is improved.

The rolls are shown in FIG. 4 as being driven from below by spindles 192 through couplings 194 in the conventional manner.

The invention is capable of various modifications and can be applied to rolling mills with and without backing rolls.

I claim:

1. A rolling mill having housings, working rolls, means for mounting said working rolls in said housings, said housings having windows comprising longer sides and shorter sides with recesses at their longer sides, said recesses being bordered by shoulders, means for urging said roll-mounting means towards said shoulders, and roll-

adjustment means acting on the mounting means of one roll and being arranged inside the recesses.

2. A rolling mill according to claim 1, in which said roll-mounting means comprise bearing chocks having horizontal trunnions, the axes of said trunnions being perpendicular to those of said rolls, and blocks arranged in the recesses of the housing windows and supporting the said trunnions, the blocks being urged towards the shoulders at the ends of said recesses.

3. A rolling mill according to claim 2, in which said trunnions are eccentrically received in said blocks, said blocks being adapted to be rotated about said trunnions and being of square configuration, the sides of said square being adapted to be selectively moved into a position in which they face the shoulders in the recesses of the windows.

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