

June 8, 1937.

J. W. SHEPERDSON ET AL

2,083,100

ROLLING MILL

Filed Aug. 4, 1933

5 Sheets-Sheet 1

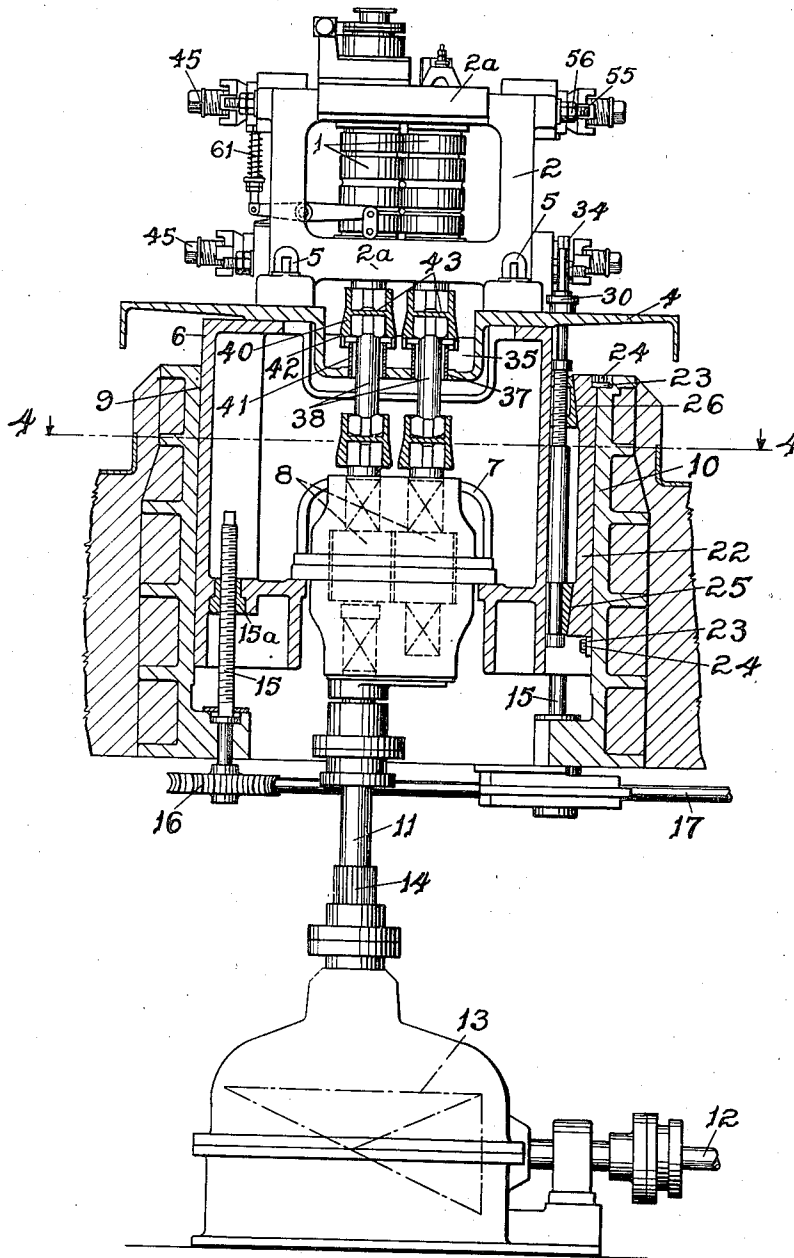


Fig. 1

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5 Sheets-Sheet 2

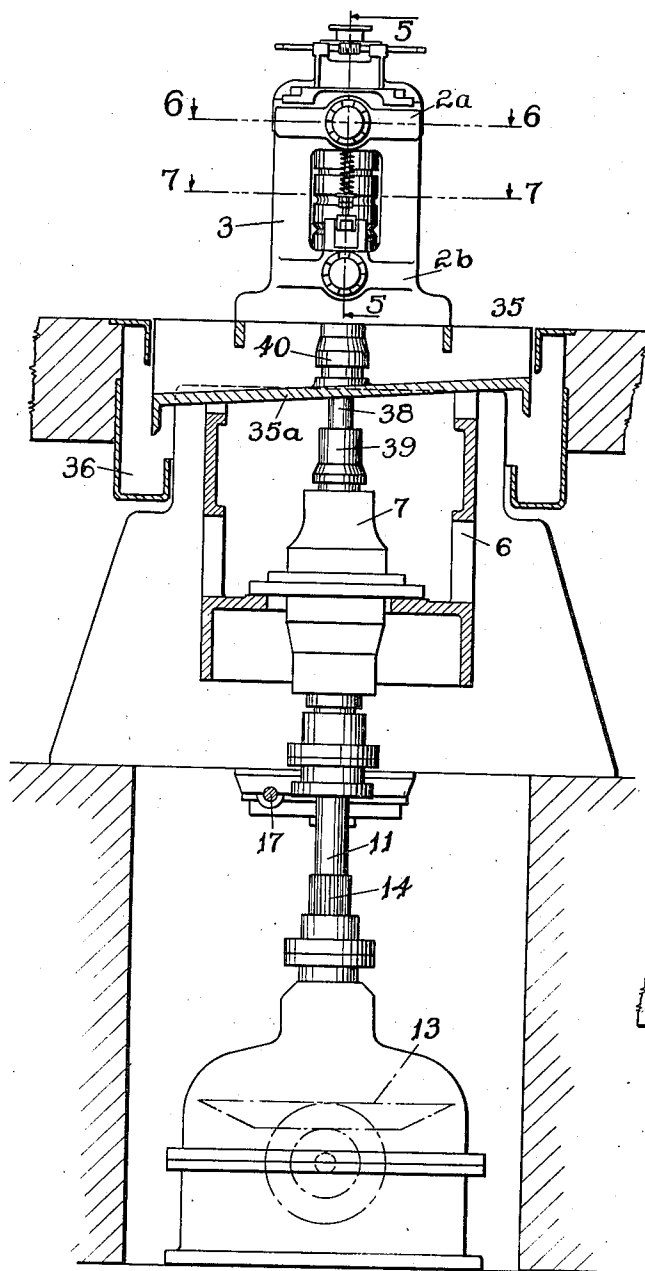


Fig. 2

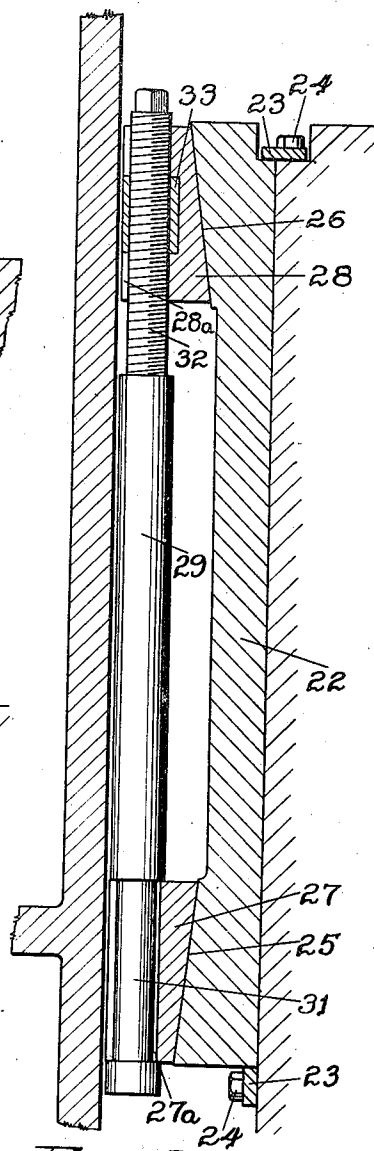


Fig. 3

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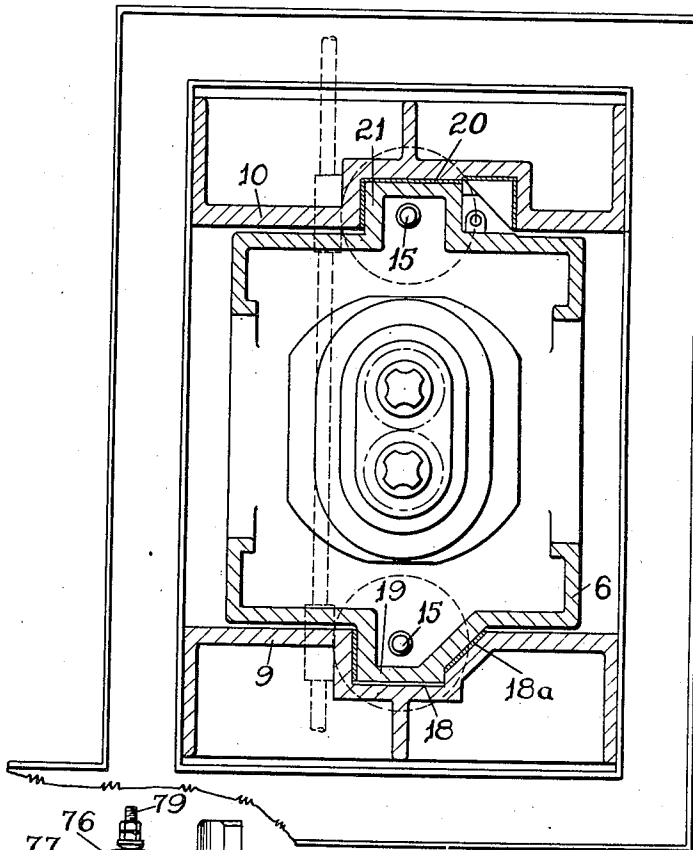


Fig. 4

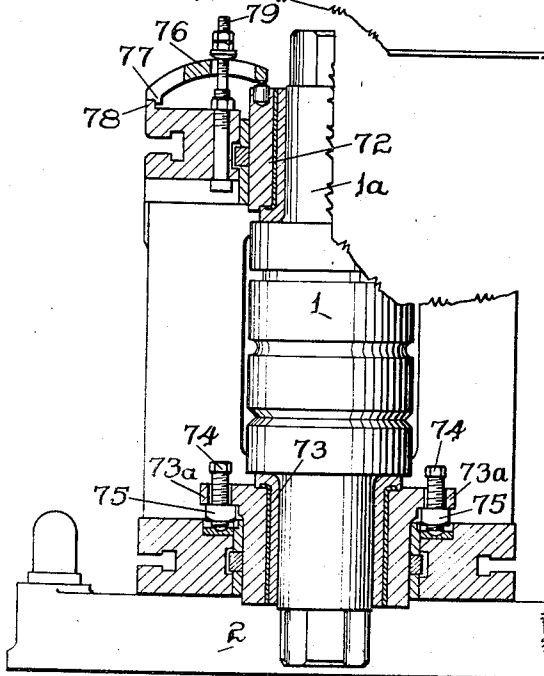


Fig. 8

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5 Sheets-Sheet 4

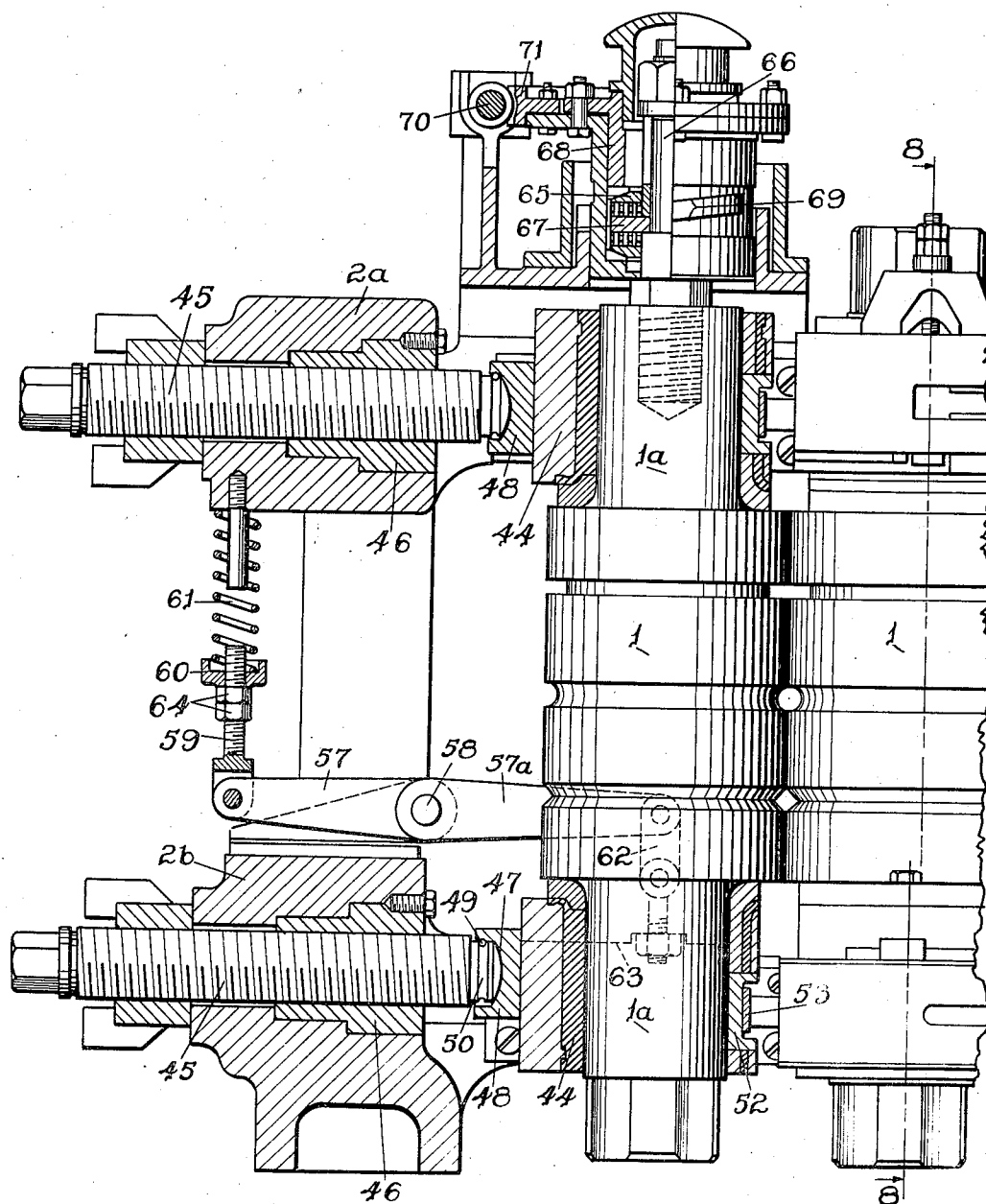


Fig. 5

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5 Sheets-Sheet 5

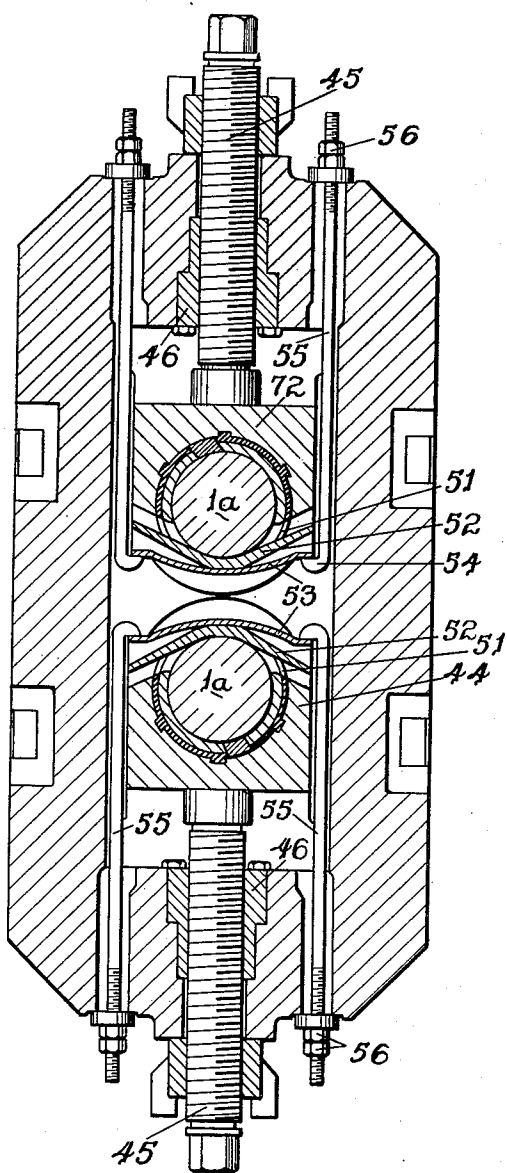


Fig. 6

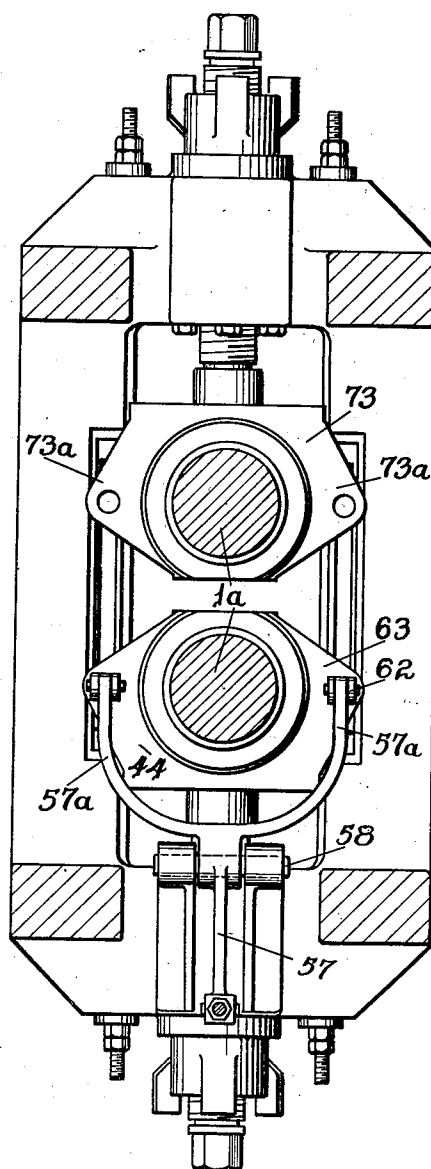


Fig. 7

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UNITED STATES PATENT OFFICE

2,083,100

ROLLING MILL

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Application August 4, 1933, Serial No. 683,664

6 Claims. (Cl. 80—55)

The present invention relates to rolling mills, and particularly to vertical mills adapted for rolling bars or like articles, either alone, or in conjunction with adjacent horizontal rolls.

5 In the copending application of David L. Mekeel and James H. Caylor, Serial No. 686,004, filed August 21, 1933, there is shown and described a rolling mill characterized by the provision of a vertical roll stand assembly movable as a unit
10 in a vertical plane, and one of the objects of the present invention is to provide an improved arrangement for maintaining the unit in adjusted position. Other and further objects of the present invention are to provide improved coupling boxes between the rolls and pinions, combined with means for preventing the entrance
15 of water and scale into the roll pinion housing, means for counterbalancing the rolls vertically, as well as means for adjusting and holding in place the roll neck bearings. The above and other advantageous features of the invention will hereinafter more fully appear from the following description with reference to the accompanying drawings, in which:—

25 Fig. 1 is a vertical sectional view of a complete vertical roll stand assembly embodying our improved means for positioning the same, as a unit.

Fig. 2 is a view partially in section and partially in side elevation of the parts shown in Fig. 1.

30 Fig. 3 is a fragmentary sectional view, on an enlarged scale, showing details of the wedging arrangement of Fig. 1.

Fig. 4 is a horizontal sectional view along the line 4—4 of Fig. 1, looking in the direction of the
35 arrows.

Fig. 5 is a vertical sectional view, on an enlarged scale, along the line 5—5 of Fig. 2.

40 Figs. 6 and 7 are fragmentary horizontal sectional views along the lines 6—6 and 7—7 of Fig. 2, respectively, looking in the direction of the arrows.

Fig. 8 is a fragmentary sectional view along the line 8—8 of Fig. 5, looking in the direction of the arrows.

45 Like reference characters refer to like parts in the different figures.

Referring first to Figs. 1 and 2, the rolls 1 of a vertical stand are mounted within a housing generally designated by the reference character 2, the housing consisting of closed yokes 2a and 2b embracing the upper and lower roll necks, respectively. The housing yokes 2a and 2b are connected at their corners by integral vertical columns 3, so that the housing 2, including the rolls and bearings, hereinafter described in detail, may be handled as a unit.

50 The roll housing 2 is secured to a platform 4 by bolts 5, and the platform 4 is in turn supported by a cage 6, within which is mounted a housing 7 enclosing the pinions 8 for driving the rolls 1.

As fully described and claimed in the aforesaid copending Mekeel and Caylor application Serial No. 686,004, the cage 6, carrying the roll and pinion housing assemblies, is movable vertically as a unit between ways 9 and 10, and a shaft 11 extending downwardly from one of the pinions 8 is connected to a motor driven horizontal shaft 12 through gearing 13 and a sliding key connection 14. In order to vertically move the cage 6 carrying the rolls and pinion housing assemblies, screw shafts 15 are provided on opposite sides of the cage, the shafts 15 being driven in unison through worm wheels 16 in mesh with suitable worms, not shown, carried on a motor driven shaft 17. As also pointed out in the aforesaid copending Mekeel and Caylor application, the present invention contemplates, among other things, the provision of an improved wedging arrangement for locking the vertically movable cage 6 between the ways 9 and 10 following vertical adjustment thereof, and this wedging arrangement will next be described.

As best shown in Fig. 4, one vertical way 9 provides a slot 18 having an inclined face 18a for receiving a correspondingly shaped rail 19 provided on one side of the cage 6, one screw shaft 15 being threaded into a nut 15a disposed within the rail 19, see Fig. 1. The other way 10 provides a slot 20 generally rectangular in form, the slot 20 being partially filled by a rail 21 provided on the cage 6 opposite and parallel to the rail 19, the other screw shaft 15 extending through the rail 21 and cooperating with a fixed nut, not shown, similar to the nut 15a.

As best shown in Figs. 1 and 3, the space within the slot 20, not occupied by the rail 21, is partially filled by a wedge shoe 22 vertically positioned within the slot 20 by blocks 23 secured by bolts 24, and the end portions of this shoe 22 are provided with oppositely inclined wedging surfaces 25 and 26. Cooperating with the spaced oppositely inclined shoe surfaces 25 and 26 are wedges 27 and 28 respectively, mounted on a vertical shaft 29 extending upwardly through the slot 18 and rotatably mounted in a bushing 30 carried by the platform 4. The lower portion of the shaft 29 is reduced in diameter at 31 for a distance substantially equal to the length of the lower wedge 27, the wedge 27 providing a slot 27a to fit over the reduced shaft portion 31. The upper portion of the shaft 29 is threaded at 32 and is loosely received in a slot 28a provided in the upper wedge 28. The slot 28a is enlarged intermediate its ends to receive a nut 33 suitably held against rotation by the wedge 28. Rotation of the shaft 29 by means of a squared tool receiving portion 34 extending above the platform 4 causes the wedges 27 and 28 to move in opposite directions with respect to the oppositely inclined shoe faces 25 and 26, rotation of the shaft 60

29 in one direction causing tightening of the wedges, while rotation in the other direction loosens the same. By reason of the fact that the cage rails 19 and 21 fit closely in the way slots 18 and 20, movement of the wedges 27 and 28 in opposite directions, as described above, results in an extremely effective locking of the cage 6 between the ways 9 and 10, particularly as the wedges cooperate with the oppositely inclined faces of the shoe 22 at both the top and bottom of the cage. On the other hand, loosening of the wedges by rotation of the shaft 29 in the opposite direction completely frees the cage rails from the slots 18 and 20, thereby permitting the cage to be moved as a whole, without restriction, to obtain desired vertical adjustment of the rolls 1.

For the purpose of preventing water and scale from the rolls 1 entering into the pinion housing 7, the platform 4 provides a centrally located depression 35, the bottom 35a of which is inclined from the horizontal, as shown in Fig. 2, with its edges overhanging a stationary trough 36 surrounding the cage 6. The bottom 35a of the depression 35 provides openings 37, through which pass vertical spindles 38 connecting the roll pinions 8 with the rolls 1 through aligned pairs of coupling boxes 39 and 40. The openings 37 are considerably larger in diameter than the spindles 38, and each opening receives a tube 41 loosely surrounding a spindle 38. The upper coupling boxes 40 each provide an apron 42 extending downwardly in surrounding relation to the upper end of a spindle tube 41, so that any water and scale flowing downwardly from the roll housing 2 during the operation of the mill is entirely excluded from the spindles 38, due to the telescopic relationship between the tubes 41 and the aprons 42. Such water and scale is deflected downwardly by the aprons 42 to the inclined bottom of the depression 35, the tubes 41 extending high enough above the bottom 35a to prevent any possibility of the water splashing over the tops of the tubes 41 and descending the spindles 38 into the pinion housing 7. Obviously, the inclination of the bottom 35a of the depression 35, as shown in Fig. 2, is such as to effectively prevent water and scale from accumulating to any appreciable depth in the depression, the water and scale flowing freely into the surrounding trough 36 from which it may be discharged in any suitable manner.

The coupling boxes 39 and 40 are each characterized by the provision of a solid partition 43, located substantially midway of the box. With the rolls 1, pinions 8 and spindles 38 vertically disposed, the ends of the roll necks and pinion shafts are in abutting relation with the partitions 43 of the coupling boxes, with the ends of the spindles 38 in direct engagement with the opposite sides of the partitions. This has the effect of giving substantially a solid connection between the rolls and the pinions, without the necessity of utilizing spacing blocks such as are usually employed with ordinary coupling sleeves used between horizontal rolls and pinions.

Referring now to Fig. 5, the mounting of one roll between the upper and lower housing yokes 2a and 2b is shown on an enlarged scale, with each roll neck 1a surrounded by a bearing 44. The position of each roll neck bearing 44 is adjustable with respect to the roll axis by means of a screw 45 threaded into a sleeve 46 mounted in the roll housing 2. The end of each screw 45 is received in a concave seat 47 provided in a bearing block 48, and in order to prevent the block

48 from falling away when the screw 45 is turned back from the bearing 44, a pin 49 extending through the block 48 is seated in a groove 50 provided on the reduced end of the adjusting screw 45.

In order to maintain the roll necks 1a against the working side of the roll neck bearings 44, each bearing provides a slot 51 around a portion of its periphery in which is freely received a carrier 52. As best shown in Fig. 6, the carrier 52 is held in place in the slot 51 by means of a leaf spring 53, the ends of which are engaged by notched heads 54 provided on rods 55 extending through the housing yoke on opposite sides of the bearing adjusting screw 45. Nuts 56 cooperating with threaded end portions of the rods 55 serve to hold the ends of the spring 53 in a flexed condition as shown in Fig. 6, thereby causing the carrier 52 to yieldingly maintain the associated roll neck 1a against the working side of the roll neck bearing 44.

For the purpose of holding the roll neck bearings 44 against the barrel of the roll, a counter-balancing device is employed, best shown in Figs. 7 and 5. To this end, a lever 57 pivoted at 58 on the housing has one end pivotally connected to a link 59 carrying a recessed collar 60, in which is seated the lower end of a compression spring 61. The upper end of the spring 61 bears against the under face of the housing yoke 2a, so that the spring tends to turn the lever 57 in a counter-clockwise direction. That portion of the lever 57 extending to the right of the pivot 58 as viewed in Fig. 5, is forked to provide arms 57a embracing the roll 1. As best shown in Fig. 7, the ends of the arms 57a are connected by links 62 to flanges 63 projecting from the lower roll neck bearing, so that the spring 61 acting through the lever 57 exerts a force tending to hold the bearing 44 against the barrel of the roll 1. The pressure exerted by the lever 57 can be varied by means of nuts 64 threaded on the link 59 so as to control the degree of compression of the spring 61.

It is to be noted that the above described counter-balancing arrangement is not adapted to carry the end thrust or the weight of the roll 1, since the roll is supported against thrust in both directions. The particular construction of thrust bearing shown in Fig. 5 forms no part of the present invention, the bearing being fully shown and described in the aforesaid copending Mekeel and Caylor application, and obviously, other types of thrust bearing may be employed in connection with the counter-balancing arrangement. For the purposes of the present description, it is sufficient to state that the weight of the roll 1, as well as the axial thrust in either direction thereon, is transmitted to roller bearings 65 through a stud 66 threaded into the roll neck 1a and carrying a thrust ring 67. For the purpose of vertically adjusting the roll and bearing assembly, a sleeve 68 carrying the roller bearings 65 cooperates with stationary helical guides 69, so that angular movement of the sleeve 68 is converted into axial movement of the roll. An operating shaft 70 carrying a worm in mesh with a worm wheel 71 mounted on the sleeve 68 provides means for conveniently turning the sleeve 68, and obviously movement of the roll with its thrust bearing assembly is accompanied by corresponding movement of the roll neck bearing 44, since this bearing is always urged against the barrel of the roll by the counter-balancing spring 61.

As best shown in Fig. 8, the right hand roll 1 of

Fig. 5 is supported by stationary bearings 72 and 73 cooperating with the upper and lower roll necks 1a. The lower bearing 73 provides flanges 73a which are supported from the roll housing 2 by studs 74 passing through the flanges 73a and cooperating with nuts 75. By means of the studs 74, the bearing 73 carrying the roll can be adjusted vertically with respect to the housing 2. The upper roll neck bearing 72 is held in engagement with the barrel by means of clamps 76, only one of which is shown, each clamp 76 having feet 77 fitted against a lip 78 provided along the edge of the housing 2, with a bolt 79 holding the opposite side of the clamp 76 in engagement with the top of the bearing 72. Thus the bearings 72 and 73 rigidly support the roll in axial thrust in both directions.

As best shown in Fig. 6, screws 45 determine the position of the bearings 72 and 73 in the same manner as described with reference to the screws 45 cooperating with the bearings 44. Furthermore, the roll necks 1a are held against the working side of the bearings 72 and 73 by means of rods 55 engaging the ends of leaf springs 53, which in turn bear on each carrier 52 pressing on a roll neck 1a within a slot 51 in the corresponding bearing. In setting up the vertical roll stand for operation, the right hand roll 1 as viewed in Fig. 1, is first adjusted laterally by means of the screws 45, after which the roll neck bearings 72 and 73 are secured in position by means of the clamps 76 and the studs 74 cooperating with the flanges 73a of the lower bearing 73. After this, the left hand roll 1 is adjusted vertically, as described in the aforesaid copending Mekeel and Caylor application to bring the roll pass grooves into register, the counter-balancing spring 61 serving to hold the lower roll neck bearing in place.

From the foregoing, it is apparent that by the present invention there is provided an improved wedging arrangement for maintaining a vertical roll stand assembly in adjusted position, so that the cage 6 when once locked between the ways 9 and 10, following the setting up of the mill, will not shift during the operation of the mill. Furthermore, the coupling boxes 39 and 40 are so constructed as to afford a substantially solid connection between the rolls, gears and interposed spindles, the aprons 42 on the upper coupling boxes cooperating with the sleeves in the platform depression to effectively prevent the passage of water and scale down the spindles 38 into the gear housing 7. In addition, the roll neck bearings are so constructed as to be maintained in engagement with the necks of the rolls, provision being made for preventing the bearing blocks from becoming loosened when the bearing adjusting screws are backed off.

We claim:

1. A rolling mill comprising in combination, a pair of rolls, a housing for rotatably supporting said rolls, a cage for supporting the roll housing, vertical ways for said cage below said housing, a screw shaft for moving said cage to shift the roll assembly as a unit, wedges disposed between the upper and lower portions of said cage and oppositely inclined faces on one of said ways, and a second screw shaft for moving said wedges in opposite directions against said faces to lock said cage against vertical movement.

2. A rolling mill comprising in combination, a

pair of rolls, a housing for rotatably supporting said rolls, a cage for supporting the roll housing, vertical ways for said cage below said housing, means for moving said cage to shift the roll assembly as a unit, a shoe disposed between one of said ways and one side of said cage and wedges cooperating with oppositely inclined faces of said shoe for locking said cage against movement.

3. A rolling mill comprising in combination, a pair of rolls, a housing for rotatably supporting said rolls, a cage for supporting the roll housing, vertical ways for said cage below said housing, means for moving said cage to shift the roll assembly as a unit, a shoe disposed between one of said ways and one side of said cage, wedges cooperating with oppositely inclined faces of said shoe at the upper and lower portions of said cage, and means for moving said wedges in opposite directions to lock said cage against movement.

4. A rolling mill comprising in combination, a pair of rolls, power transmission therefor, housings for rotatably supporting said rolls and for containing said power transmission, a platform intermediate said rolls and transmission and movable with both of said housings, spindles extending through said platform between said rolls and said power transmission, and coupling boxes for connecting said spindles with said rolls and said power transmission, each coupling box providing an integral partition intermediate its ends directly in contact with a spindle end and a roll or transmission shaft end.

5. A rolling mill comprising in combination, a pair of rolls, power transmission therefor, vertically spaced housings for rotatably supporting said rolls and for containing said power transmission, a platform intermediate said rolls and transmission and movable with both of said housings, with a portion of said platform inclined from the horizontal, spindles extending through openings in the inclined portion of said platform, couplings for connecting said rolls and power transmission to said spindles, flanges surrounding said spindle openings and extending upwardly around said spindles an appreciable distance above said platform and aprons carried by the spindle couplings above said platform in telescopic relation with said flanges to deflect scale and water from said roll housing on to the inclined portion of said platform.

6. A rolling mill comprising in combination, a pair of rolls, power transmission therefor, vertically spaced housings for rotatably supporting said rolls and for containing said power transmission, a platform intermediate said rolls and transmission and movable with both of said housings, spindles extending upwardly from said transmission housing through openings in said platform, upwardly extending tubes surrounding said spindles within said platform openings and coupling boxes connecting the ends of said spindles with said rolls above said platform, each coupling box providing a partition intermediate its ends directly in contact with a spindle end and a roll shaft end, and a downwardly extending apron in telescopic relation with one of said spindle tubes.

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