Aug. 30, 1932. J. R. COE 1,875,220

ROLLING MILL HOUSING

Filed May 27, 1931 3 Sheets-Sheet 1

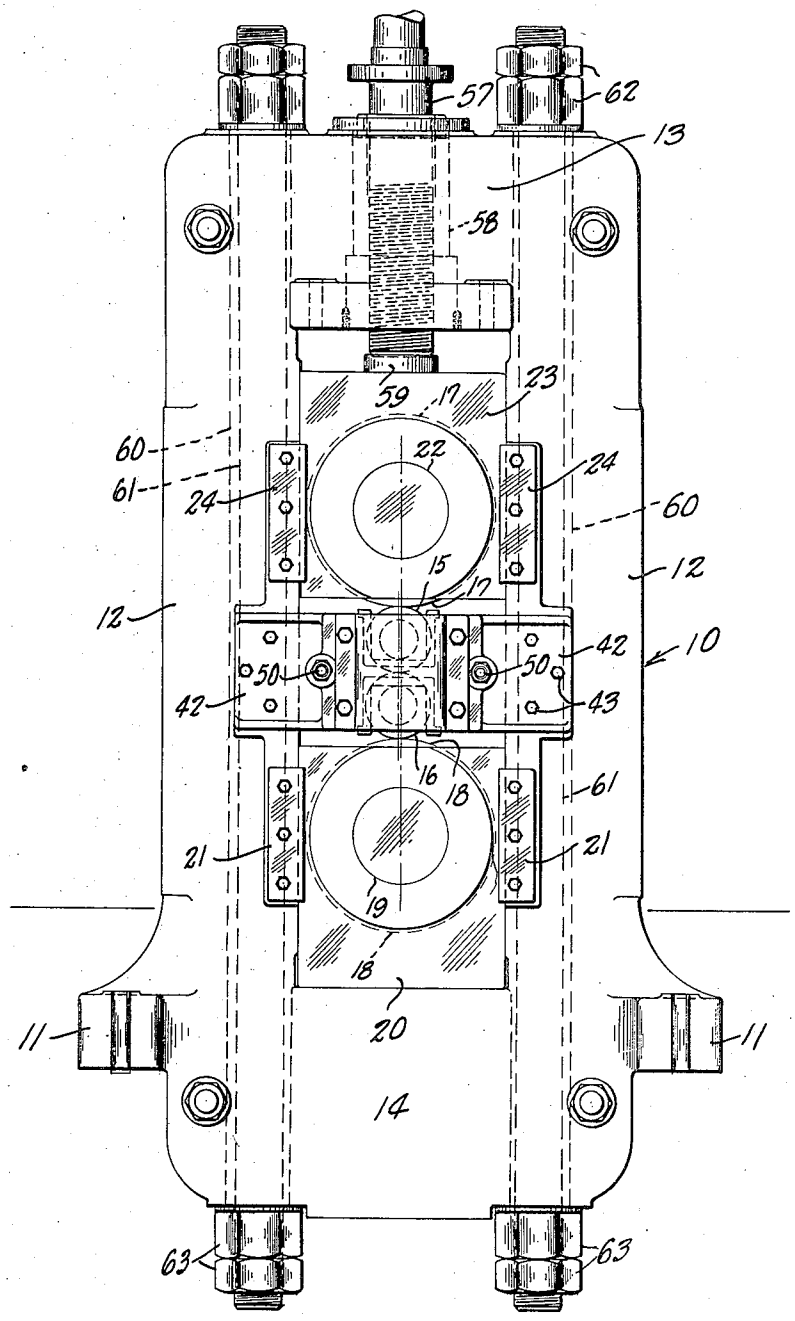


Fig. 1.

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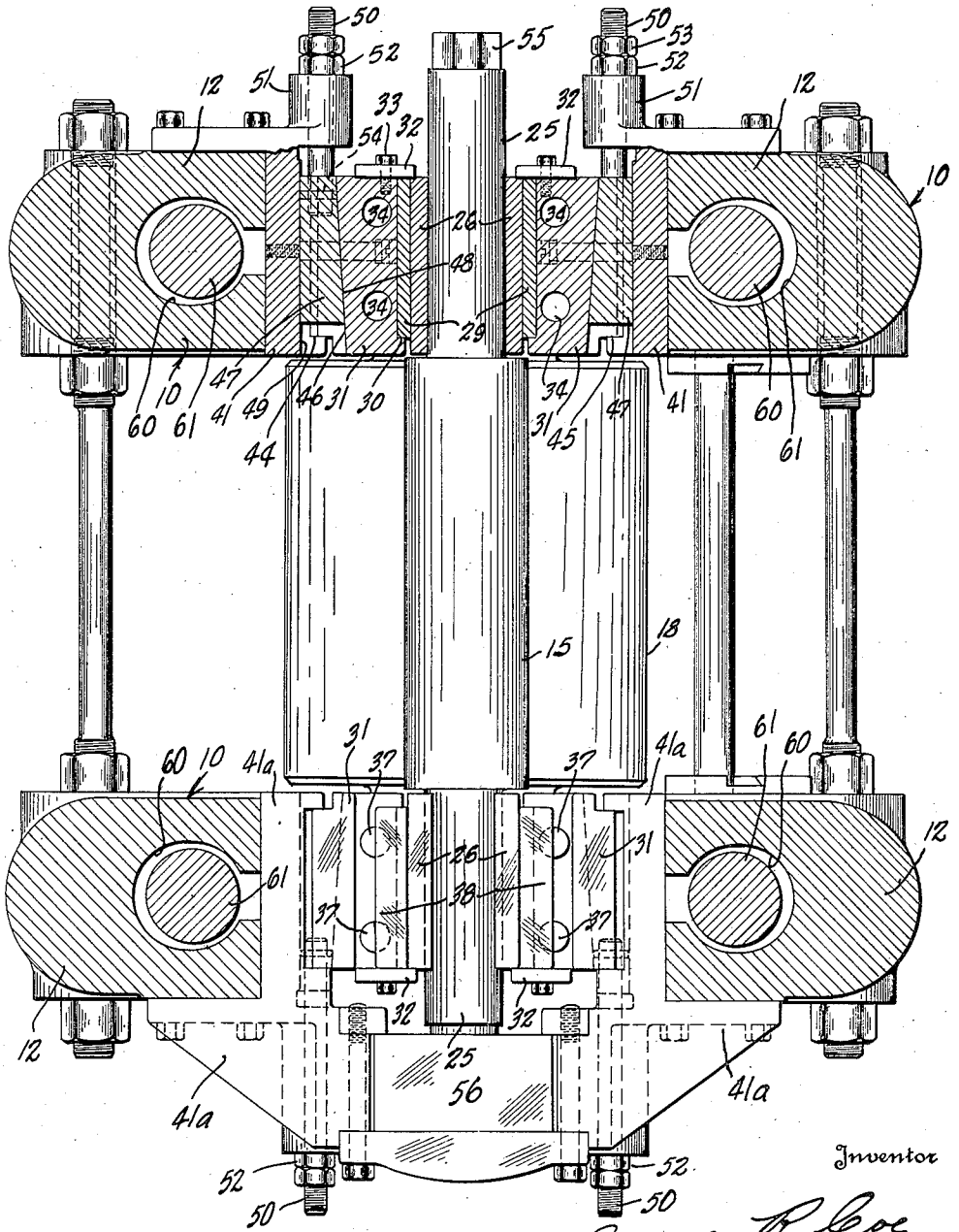


Fig. 2.

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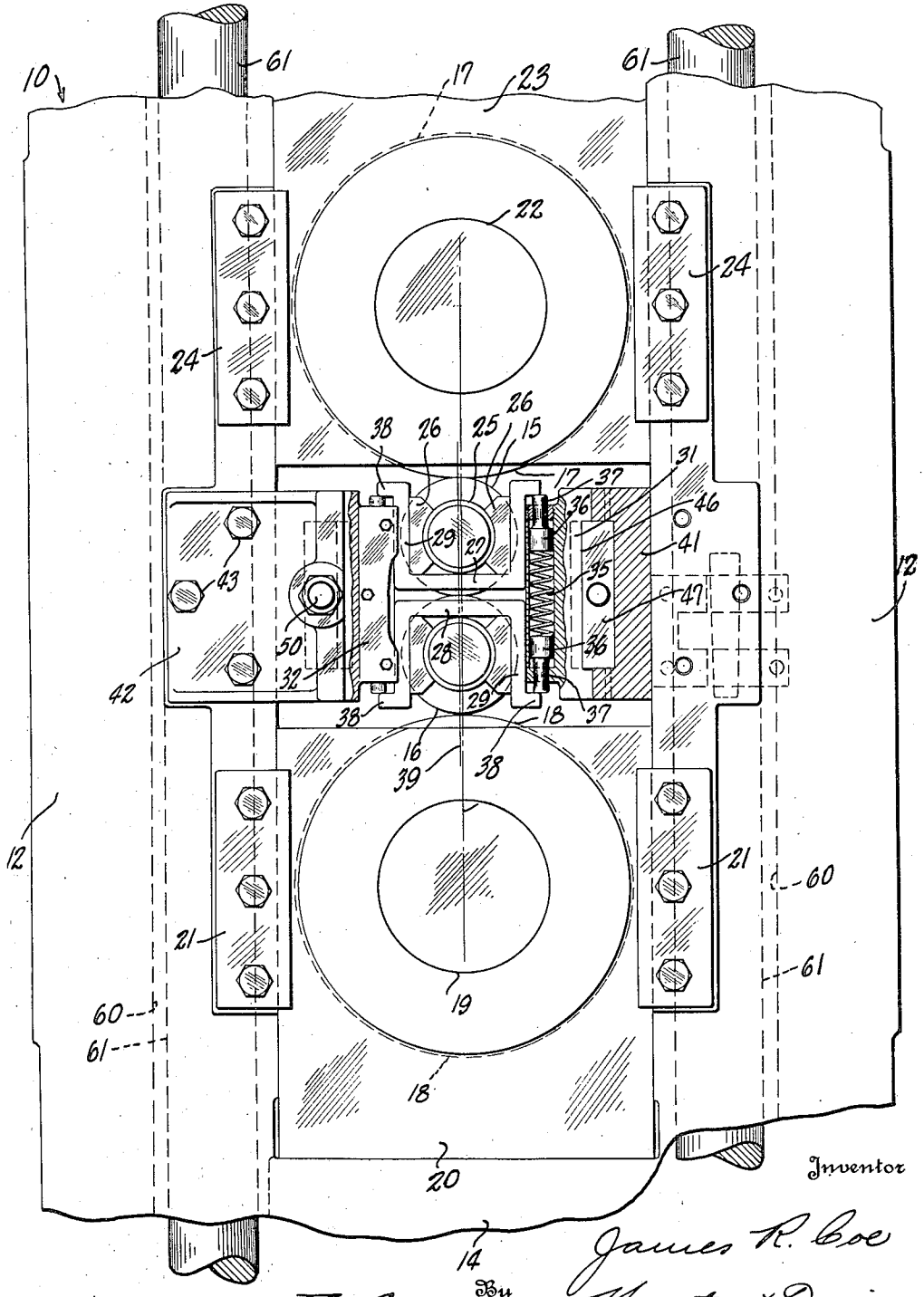


Fig. 3.

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UNITED STATES PATENT OFFICE

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ROLLING MILL HOUSING

Application filed May 27, 1931. Serial No. 540,302.

This invention relates to rolling mills, such for example as are used for rolling sheet metal. These rolling mills ordinarily have upright spaced housings between which the rolls are mounted, the bearings for the rolls being ordinarily mounted in the housings, and each housing carries means, such as a heavy screw, in its top member adapted to adjust the position of the upper rolls and vary the pressure on the rolls as required for the rolling operation. These adjusting screws may be operated by hand with long handled wrenches, or on larger mills are operated by electric motors.

It will be evident that in the rolling operations very high pressures are encountered, and these pressures are often so great as to stretch or expand the upright side members of the housings so that if the rolls are set for a given thickness this stretching will permit the rolls to separate and the metal will not be rolled to the proper gauge.

To overcome this objection it has been common practice to tighten up the adjusting screws on the rolls so as to place an initial pressure on the rolls and the housing comparable to the pressures encountered during the rolling operation to expand or stretch the housings before the metal is fed into the rolls and thus reduce or eliminate the separation of the rolls during the rolling operation. This operation has numerous objections such for example as that the rolls are under high pressure at all times, and when running idle as the contacting surfaces between the rolls is a line contact these pressures tend to crush or destroy the surface of the rolls. Also due to these high pressures there is a high pressure in the bearings for the necks of the rolls which absorbs a large amount of power so that it requires nearly as much power to operate the rolls when running idle as during the rolling operation. Obviously this means a great waste of power unless the rolls are used for rolling metal all the time they are operating. It also prevents easy sticking or starting of the metal in the rolls at the beginning of the rolling operation.

It is therefore an object of the present invention to provide an improved construction of rolling mill in which the above noted objections are obviated, and in which there is practically no pressure on the rolls when running idle, thus saving a large amount of power and protecting the surface of the rolls against injury.

It is also an object of the invention to provide improved means for use in fourhigh and similar mills for adjusting the positions of the work rolls.

It is a further object of the invention to provide a construction which will facilitate sticking or starting of the end of the metal in the rolls at the beginning of the rolling operation.

With the foregoing and other objects in view the invention consists in certain novel features of construction, combinations and arrangement of parts as will be more fully disclosed in connection with the accompanying drawings.

In these drawings:

Fig. 1 is an end elevation of a rolling mill, particularly a side elevation of one of the housings showing my improved construction;

Fig. 2 is a transverse section on an enlarged scale through this mill with a section through one housing being taken on a plane between the working rolls and the backing rolls and through the other housing on the plane substantially on the axis of the upper work roll; and

Fig. 3 is a side elevation of the central portion of the housing on an enlarged scale with parts broken away to more clearly show the construction.

The mill as illustrated comprises the two upright housings 10 having the usual laterally extending ears 11 resting on the usual rail supports not shown, and on which they are laterally adjustable in the usual manner. These housings comprise the upright side members 12 and the top and bottom connecting portions 13 and 14. These housings are usually of heavy steel castings to withstand the high strains incident to the forces required for the rolling operation. In the present instance I have illustrated a so called fourhigh rolling mill comprising two work

rolls 15 and 16 of relatively small diameter and two backing rolls 17 and 18 of relatively large diameter for backing up and supporting the work rolls to assist them in withstanding the high pressures of the rolling operation without undue bending, but it will of course be understood that the principles of the invention are applicable to different types of rolling mills such for example as twohigh, threehigh etc.

In the present instance the necks 19 of the lower backing roll are mounted in bearing blocks 20 resting on the lower portion 14 of the housings and they are held therein by the guide plates 21. The necks 22 of the backing roll 17 are held in suitable bearing blocks 23 guided for vertical movements in the housings and held therein by the guide plates 24.

The necks 25 of the work rolls 15 and 16 are held in bearing blocks 26 carried in yokes 27 and 28, the upper yoke 27 as shown in Fig. 3 being substantially U-shaped and the yoke 28 being substantially the same shape but inverted. The sides 29 of these yokes are mounted for vertical movement in guideways 30 in supporting blocks 31, the yokes being held in these guideways by the plates 32 secured by screws 33. The blocks 31 have upright pockets 34 in which are mounted springs 35 bearing at their opposite ends against plungers 36. These plungers have reduced end portions 37 engaging lateral flanges 38 on the free edges of the side members 29 of the yokes 27 and 28. It will therefore be evident that these springs 35 tend to separate the yokes 27 and 28 or shift them vertically in opposite directions, and thus hold the work rolls 15 and 16 in engagement with their respective backing rolls 17 and 18.

In this type of mill it is necessary that the work rolls be properly lined up with respect to the backing rolls, and for the best operation it is also desirable that the axes of the work rolls be located a short distance to one side of the axes of the backing rolls, and on the side on which the metal is fed out of the mill. Thus as shown in Fig. 3 if the metal is fed into the mill from the right, it is desirable that the center line of the work rolls 15 and 16 indicated by the line 39 be placed somewhat to the other side of the centers of the backing rolls 17 and 18 which are on the line 40. Therefore means is provided so that these work rolls may be shifted laterally so their axes may be shifted from one side to the other of the center line 40 of the backing rolls as desired when the rolls are used as reversing rolls, and also to permit use of the rolls for passing the metal in either direction. This construction is also used for keeping the work rolls parallel with each other and the backing rolls.

In the present instance the supporting blocks 31 are mounted in suitable guide blocks or brackets 41 and 41*a* secured to the sides of the housings. In the present instance these blocks or brackets 41 have front plates or arm portions 42 secured to the face of the housings as by screws 43, and they have upright guides 44 to receive the side guides 45 on the blocks 31 to thus permit these blocks 31 to shift laterally toward and from the sides of the housings in a horizontal plane, and therefore shift the centers of the work rolls. Suitable means is provided for shifting these blocks 31 and retaining them in adjusted position. Thus each of the blocks 31 is provided with an inclined side wall 46 and between this wall and the brackets 41 is a tapered cam or wedge block 47 having a side 48 inclined to correspond with the wall 46 and engage the same. It is preferred that these cam or wedge blocks 47 be of less width than the height of the blocks 31 and brackets 41 as indicated in Fig. 3, and that the inclined surfaces 46 on the block 31 and the opposed straight surface 49 in the bracket 41 to engage the opposite side of the wedge block 47 are on the bottoms of transverse recesses. Thus it will be evident that the wedge blocks 47 will retain the blocks 31 and support them in the brackets 41. To each wedge block 47 is connected an adjusting screw 50 passing through the bearing 51 on the bracket 41 and carrying an adjusting nut 52 and a lock nut 53. These screws are connected to their respective wedge blocks by any suitable means such as having the inner end of these screws extending into a recess in one side of the block and secured thereto by a pin 54. Thus it will be evident that by adjusting the nuts 52 the cam blocks may be shifted to laterally shift the supporting blocks 31 and the work rolls carried thereby. After adjustment they may be secured in adjusted position by the lock nuts 53.

The work rolls are driven by any suitable means not shown, from any suitable source of power. Thus they may be driven by couplings connected to a wabbler end 55 in the usual manner. At the opposite end the bracket 41*a* carries a suitable thrust bearing 56 to retain the roll in proper position.

The pressure of the rolls may be adjusted by heavy adjusting screws 57 threaded into heavy sleeves or nuts 58 mounted in the upper portions 13 of the housings and held against turning therein. At their lower ends these screws may seat in washers or plugs 59 mounted on the tops of the bearings 23. Screws 57 may be operated by any suitable means not shown, for adjusting the pressure on the rolls, such for example as a long handle wrench or an electric motor geared to the screw.

As intimated above, during rolling operations there may be very heavy pressures involved and these pressures may stretch or expand the sides 12 of the housings, and there-

fore the rolls may be separated too much to obtain the desired gauge, and it will be evident that if the screws 57 are run downwardly sufficiently to give this pressure to stress the side members 12 before the rolling operation there will be great pressure between the surfaces of the rolls tending to crush or mar them, and also when the rolls are running idle this pressure will cause great loss of power in the bearings on the necks of the rolls. I have overcome these objections by connecting the upper and lower portions of the housing with tie elements which are placed under initial tension greater than the pressures to be sustained during the rolling operation.

This may be done in various ways, but the simplest and most convenient is to provide the housing with upright longitudinal openings 60 through their side members 12, and mounting in these openings heavy bolts 61 which are held by nuts 62 and 63 at their upper and lower ends. It will be evident that if these bolts are expanded by heating to a given temperature to secure the necessary expansion which can be readily calculated, and the nuts 62 and 63 set while the bolts are so heated and expanded, when the bolts cool they will contract and place the housing under a compression strain depending upon the amount of expansion of the bolts before they were set up in the housing. It will thus be evident that these bolts can be heated and expanded and the nuts 62 and 63 so set while the bolts are thus expanded, that when they cool or contract these bolts are placed under an initial tension and the housing placed under an initial compression greater than the lateral pressures to be overcome due to the tendency of the metal being rolled to separate the rolls as it passes between them. Thus when the housing is so strengthened there is no pressure on the rolls when idling and very little power is lost, and the surfaces of the rolls are not liable to injury therefrom, and when the metal is passed between the rolls there is no stretching of the housing to permit the rolls to separate, therefore the rolls can be properly set without placing a large strain on the rolls or the adjusting screws 57 and this setting will be accurately maintained during the rolling operation. This also greatly facilitates sticking or starting of the metal through the rolls at the beginning of the rolling operation.

Having thus set forth the nature of my invention, what I claim is:

1. In a rolling mill, upright housings, a pair of relatively small diameter work rolls extending between the housings, backing rolls for the work rolls, guide blocks secured to the sides of the housing, supporting blocks carried by the guide blocks and movable laterally thereon, a wedge shaped block between each supporting block and its guide block, means to shift the wedge shaped blocks to shift the supporting blocks, yokes guided for vertical movement in the supporting blocks, bearings for the work rolls in the yokes, and springs tending to separate the yokes to hold the work rolls against the backing rolls.

2. In a rolling mill, upright housings, a pair of relatively small diameter work rolls extending between the housings, backing rolls for the work rolls, vertically movable supports for the work rolls, blocks carrying said supports and mounted for lateral movements transversely the axes of the rolls, guide blocks mounted in the housing outwardly of the supporting blocks, the adjacent guide blocks and supporting blocks having aligned transverse recesses extending in the direction of the axes of the rolls, wedge shaped blocks mounted in said recesses to retain the supporting blocks against vertical movement, and means for shifting the wedge blocks to shift the work rolls laterally.

3. In a rolling mill, upright housings, a pair of relatively small diameter work rolls extending between the housings, backing rolls for the work rolls, guide blocks mounted in the housings at opposite sides of the work rolls, supporting blocks mounted for lateral movement in the guide blocks, wedge blocks between each guide block and the adjacent supporting block, means for shifting the wedge block to shift the supporting blocks, each supporting block having one or more upright sockets, springs in said sockets, vertically movable plungers at the opposite ends of the springs and pressed outwardly thereby, a vertically movable yoke resting on the ends of the upper plungers, bearings for the upper work roll in said yoke, a second yoke having shoulders on which the ends of the lower plungers rest, and bearings for the lower work roll in the second yoke.

4. In a rolling mill, an upright housing, a pair of relatively small diameter work rolls extending from the housing, backing rolls for the work rolls having bearings in the housing, bearings for the work rolls, supports for the work roll bearings having laterally extending vertically spaced shoulders, supporting blocks mounted in the housing outwardly of said supports and having upright sockets, upright plungers projecting from the opposite ends of the sockets, the shoulders on the upper support resting on the upper plungers and the lower plungers resting on the shoulders of the lower supports, and springs between the plungers in a socket tending to shift them in opposite directions.

5. In a rolling mill an upright housing, a pair of relatively small diameter work rolls extending from the housing, backing rolls for the work rolls having bearings in the housing, bearings for the work rolls, supports for the work roll bearings, guide blocks mounted in the housing, a supporting block carried by each guide block and mounted for

lateral movement, each guide block and adjacent supporting block having aligned transverse recesses, a wedge block in said recesses and holding the supporting block against vertical movement, means for shifting the wedge block to shift the supporting block laterally, upper and lower vertically movable plungers carried by the supporting block, and spring means tending to shift the plungers in opposite directions, the support for the bearings for the upper work roll being supported by the upper plunger and the lower plunger being supported on the support for the bearings for the lower work roll.

In testimony whereof I affix my signature.

JAMES R. COE.