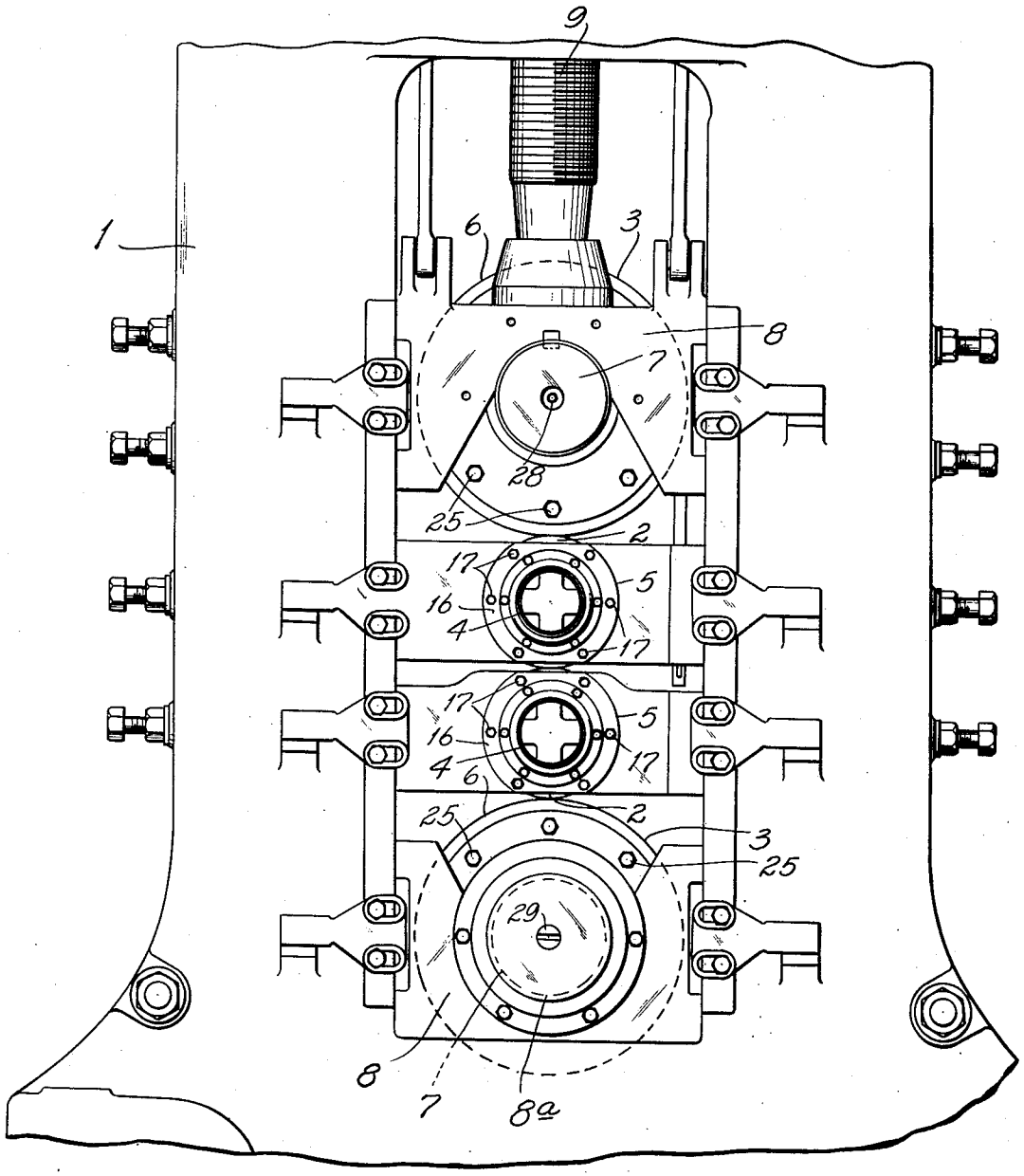
May 23, 1933. T. V. BUCKWALTER 1,910,148

ROLLING MILL

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Fig. 1.



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Fig. 2.

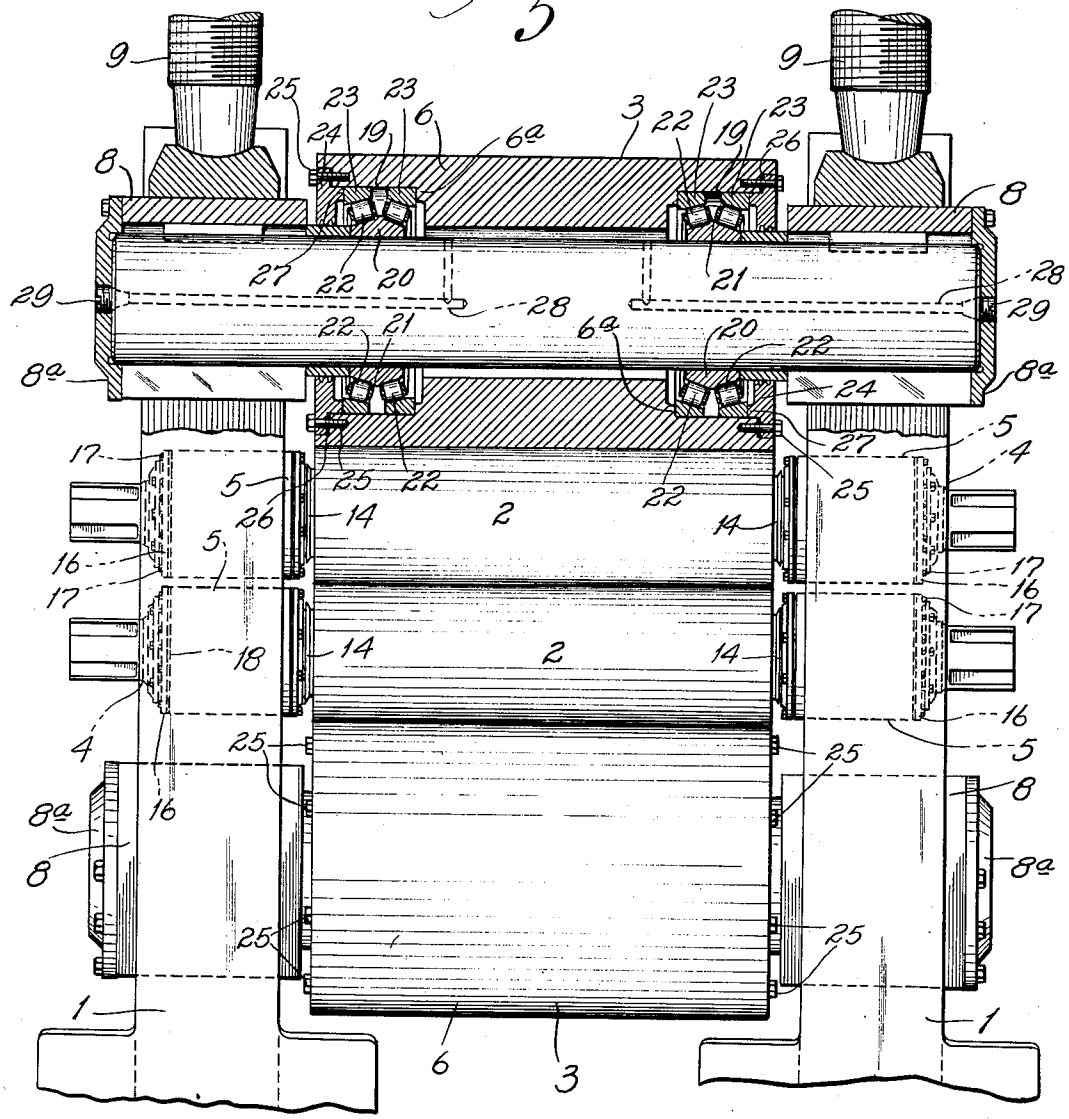
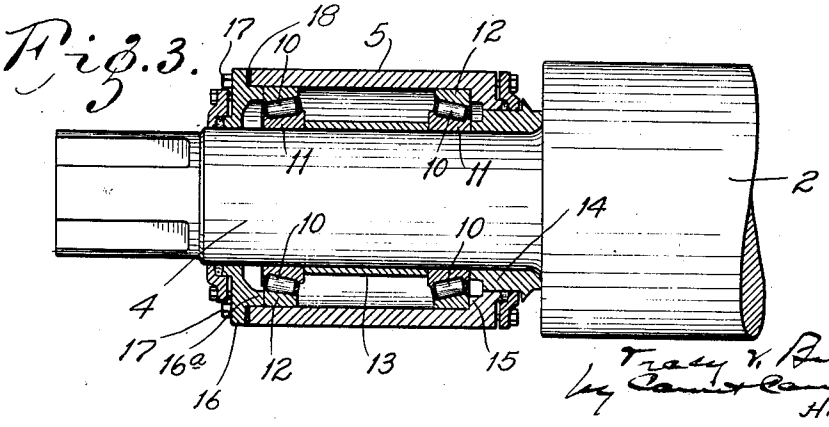


Fig. 3.



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UNITED STATES PATENT OFFICE

TRACY V. BUCKWALTER, OF CANTON, OHIO, ASSIGNOR TO THE TIMKEN ROLLER BEARING COMPANY, OF CANTON, OHIO, A CORPORATION OF OHIO

ROLLING MILL

Application filed March 28, 1928. Serial No. 265,241.

This invention relates to rolling mills of the kind wherein backing or supporting rolls are used to relieve the pressure on the working rolls. Its principal object is to provide for the mounting of the backing rolls on roller bearings located in the ends thereof. It consists principally in the construction and combination of parts hereinafter described and claimed.

In the accompanying drawings wherein like numerals refer to like parts wherever they occur,

Fig. 1 is an end view of a four high rolling mill embodying my invention, the end cap for the supporting box for the upper backing roll being shown removed;

Fig. 2 is a side elevation of said mill, the upper backing roll and the supporting boxes therefor being shown in section; and

Fig. 3 is an enlarged vertical longitudinal section through one of the housings for the ends of the working rolls, showing the roller bearings interposed between the neck at one end of a working roll and the housing therefor.

The four high mill illustrated in the drawings comprises a framework consisting of end frames 1 rigidly secured together and having a pair of working rolls 2 mounted therein, and a backing roll 3 for each working roll, the four rolls being in vertical alinement. The working rolls have their ends reduced to form necks 4 that extend into housings 5 provided therefor in the end frames 1, suitable roller bearings (hereinafter described) being preferably interposed between said roll necks and their housings respectively. Each backing roll 3 is made in the form of a hollow cylinder or thick walled shell 6 of substantially the same length as the working surface of the working roll. Extending through the cylinder 6 is a heavy beam or shaft 7 that is supported in boxes 8 in the end members 1 of the framework; and between said beam and the respective ends of the backing rolls are interposed suitable roller bearings (hereinafter described). By the arrangement described, the ends of the backing rolls 3 are supported in the boxes 8 which are mounted in vertical slideways provided therefor in the end frames 1 of the mill. These boxes are made vertically adjustable by means of heavy screws 9 provided therefor in the top portion of the framework and have their outer ends closed by caps 8*a*. By this arrangement, each backing roll may be made to bear against the corresponding working roll throughout the entire length thereof.

The bearing construction for the necks 4 of the working rolls 2 comprises two circular series of conical rollers 10 with their cones or inner bearing members 11 and their cups or outer bearing members 12, the cones 11 being mounted on the roll necks 4 and the cups 12 being mounted on the housings 5. The cones 11 on each neck 4 are arranged with their large ends toward each other but separated by a spacing member in the form of a sleeve 13 slidable on the roll neck. The small end of the inner cone bears against a ring 14 provided therefor on the roll neck and itself bearing against a shoulder on the working roll. The innermost cup or outer bearing member has its large end bearing against a flange 15 provided therefor on the inner end of the housing. The outer or endmost cup has a sliding fit in the outer end of the housing and bears against an annular rib 16*a* provided therefor on a closure plate 16 that is secured to the end of said housing, as by means of cap screws 17, shims 18 being interposed between said closure plate and the end of the housing to provide for the adjustment of the bearings. The same construction is used at the opposite end of the working roll.

By this arrangement the bearings of the working roll neck may be easily and accurately adjusted. For instance, if the bear-

ings wear, it is only necessary to remove the closure cap 16 and one or more shims 18, and then replace such cap. In tightening the cap 16, the flange 16*a* thereof bears against the end of the outer cup 12, which is thereby moved endwise and such movement is transmitted through the antifriction rollers 10 of the outer bearing to the outer cone 11 and thence through the sleeve 13 to the inner cone and the rollers associated therewith.

The end portions of the backing roll 3 are counterbored, as at 19 to accommodate the roller bearings therefor. The bearing for each end of the backing roll comprises a duplex or reversely tapered cone 20 on the shaft or supporting beam 7, such reversely tapered cone having conical bearing surfaces tapering from the middle toward each end and have the usual thrust rib 21 near the middle thereof. A circular series of rollers 22 is mounted on each bearing surface of said duplex cone, and each series of rollers cooperates with a cup or outer bearing member 23 which fits in the enlarged counterbored end portion 19 of the backing roll. By enlarging the end of the axial bore in the backing roll, a shoulder 6*a* is provided against which the large end of the innermost cup bears. At each end of the backing roll a closure plate 24 is secured thereto, as by cap screws 25, with shims 26 interposed between the end of the closure and the end of the backing roll. On each closure plate 24 is an annular flange or rib 27 arranged to bear against the outermost bearing cup in said backing roll. It is obvious from this arrangement that endwise movement of the closure plate has the effect of adjusting both conical bearings.

In the construction shown, a passageway 28 extends from each end of the supporting beam or shaft 7 longitudinally and thence laterally and opens into the annular space between the shaft and backing roll, thus affording an easy and efficient way of lubricating the bearings. The ends of said passageway are provided with plugs 29 that have threaded engagement with the shaft. Any suitable means may be used at the ends of the roller for sealing the annular space between the closure cap and the shaft so as to prevent the escape of lubricant therethrough.

As the roller bearings are located in the ends of the backing roll and close to the supports for the beam, the tendency of the stresses due to rolling to bend the beam is relatively small in comparison with the tendency of the same amount of stress applied midway of the length of the beam. Likewise by reason of the roller bearings being located in the ends of the backing roll, where the cross bending stresses are relatively negligible, the wall of the roll need be only thick enough to safely take care of the shearing stresses. The outside diameter of the working roll may be largely or wholly controlled by other considerations than those that affect the bearings and the beam. In practice, the beam is of sufficient diameter or thickness to resist the stresses thereon, and ample provision is made to accommodate suitable roller bearings on said beam; and under ordinary conditions the backing roll of desirable diameter can be counterbored to receive said bearings in its ends and still have its end walls of sufficient strength to resist the stresses thereon. As the cross bending stresses on the backing roll are the maximum midway of the length thereof, the wall of the backing roll is made very much thickner throughout its middle portion than at its ends. In fact the middle portion of the backing roll has an inside diameter not much larger than the supporting beam. By this arrangement, the backing roll is made very rigid for resisting cross bending stresses.

What I claim is:

1. A rolling mill comprising a housing, working rolls, a backing sleve for each working roll provided at its ends with interior recesses, fixed mandrels extending through said sleeves, roller bearing rings mounted on said mandrels within said recesses, roller bearings arranged between said rings and sleeves, backing rings abutting against the ends of said bearing rings, blocks in said housing surrounding the ends of said mandrels, and keeper plates engaging said housing and acting upon and through said blocks to position said sleeves.

2. A rolling mill comprising a framework having crossbeams, working rolls whose working surfaces extend close to said framework at their ends, hollow backing rolls through the bores of which said crossbeams extend, and roller bearings interposed between said backing rolls and said crossbeams, the ends of said backing rolls being counterbored to form seats for bearing cups, and said bearings comprising cups mounted in said seats, cones mounted on said crossbeams, and rollers between said cups and said cones, said backing rolls being of much greater length than thickness and being of substantially even length with the working faces of said working rolls and the bores of said backing rolls being only slightly greater in diameter than the crossbeams which extend through said bores.

3. A rolling mill comprising a framework having crossbeams, working rolls whose working surfaces extend close to said framework at their ends, hollow backing rolls through the bores of which said crossbeams extend, and roller bearings interposed between said backing rolls and said crossbeams, the ends of said backing rolls being counterbored to form seats for bearing cups, and said bearings comprising cups mounted in said

seats, cones mounted on said crossbeams, and taper rollers between said cups and said cones, and means for adjusting said roller bearings, said backing rolls being of much greater length than thickness and being of substantially even length with the working faces of said working rolls and the bores of said backing rolls being only slightly greater in diameter than the crossbeams which extend through said bores.

Signed at Canton, Ohio, this 23rd of March 1928.

TRACY V. BUCKWALTER.