Jan. 11, 1927. 1,614,424

J. R. COE

ROLLING MILL

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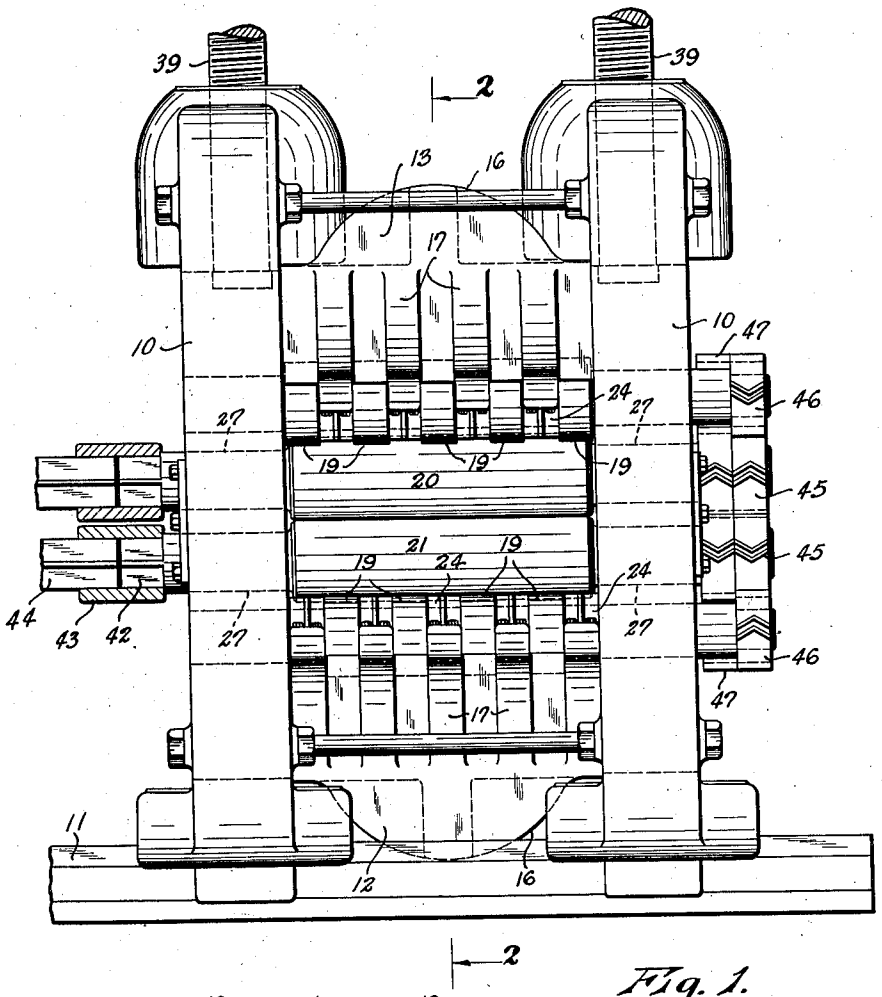


Fig. 1.

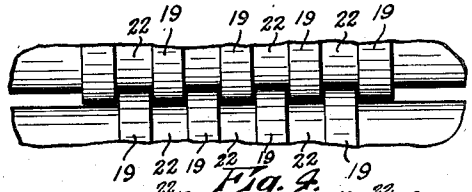


Fig. 4.

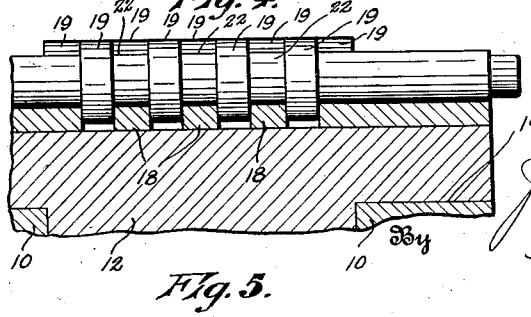


Fig. 5.

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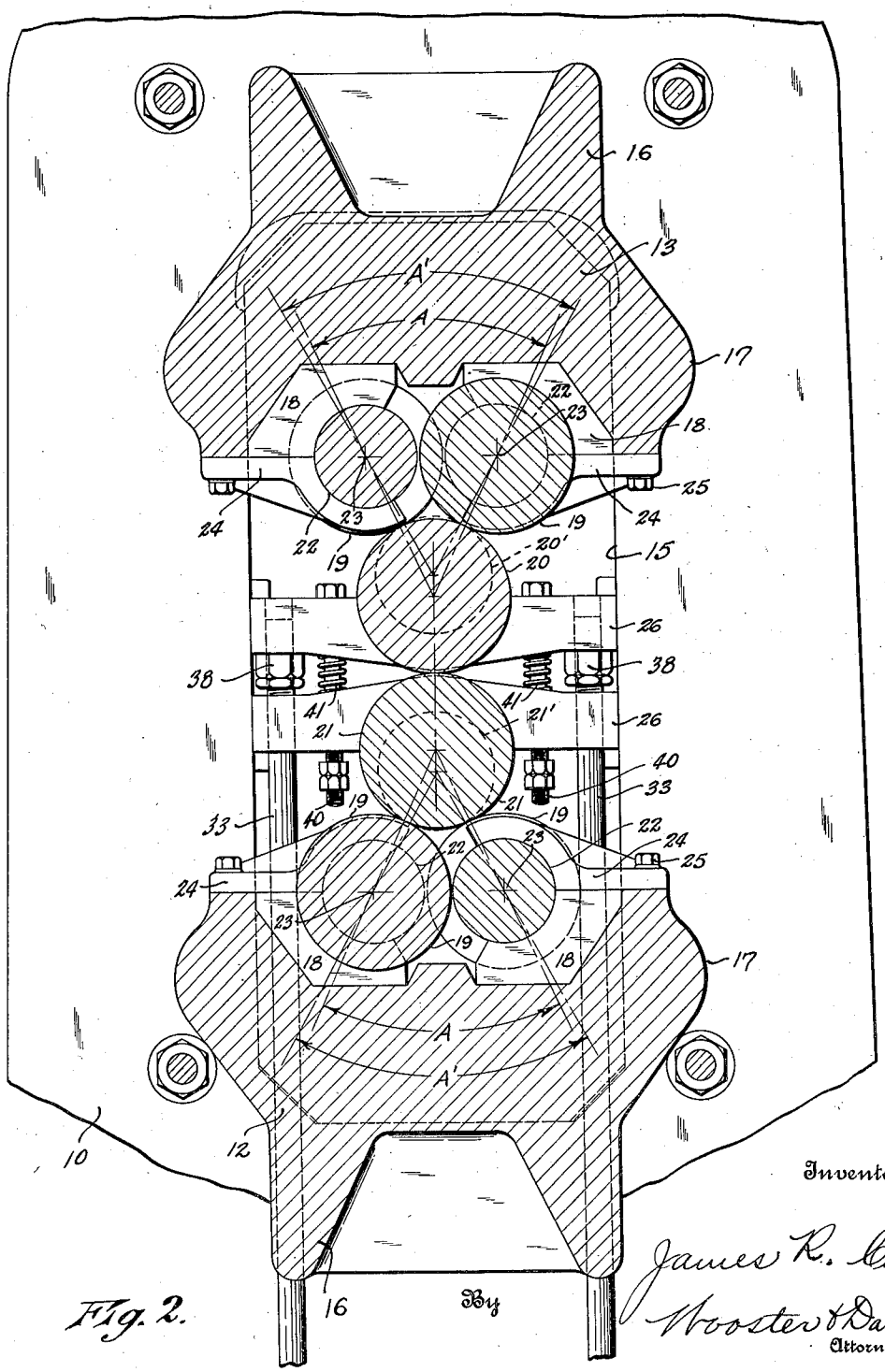


Fig. 2.

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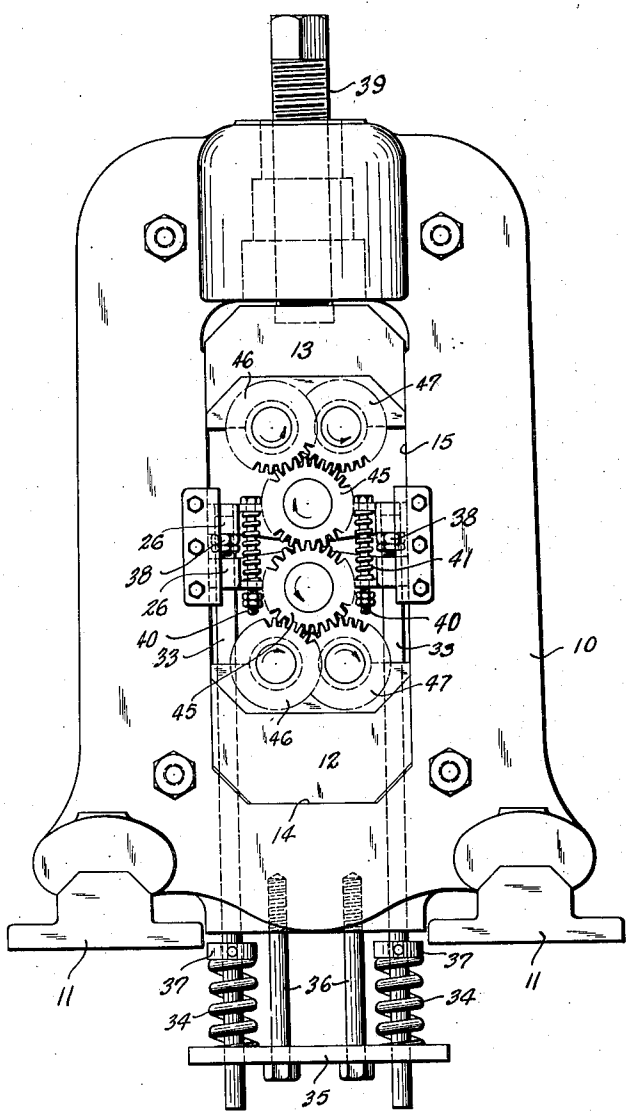


Fig. 3.

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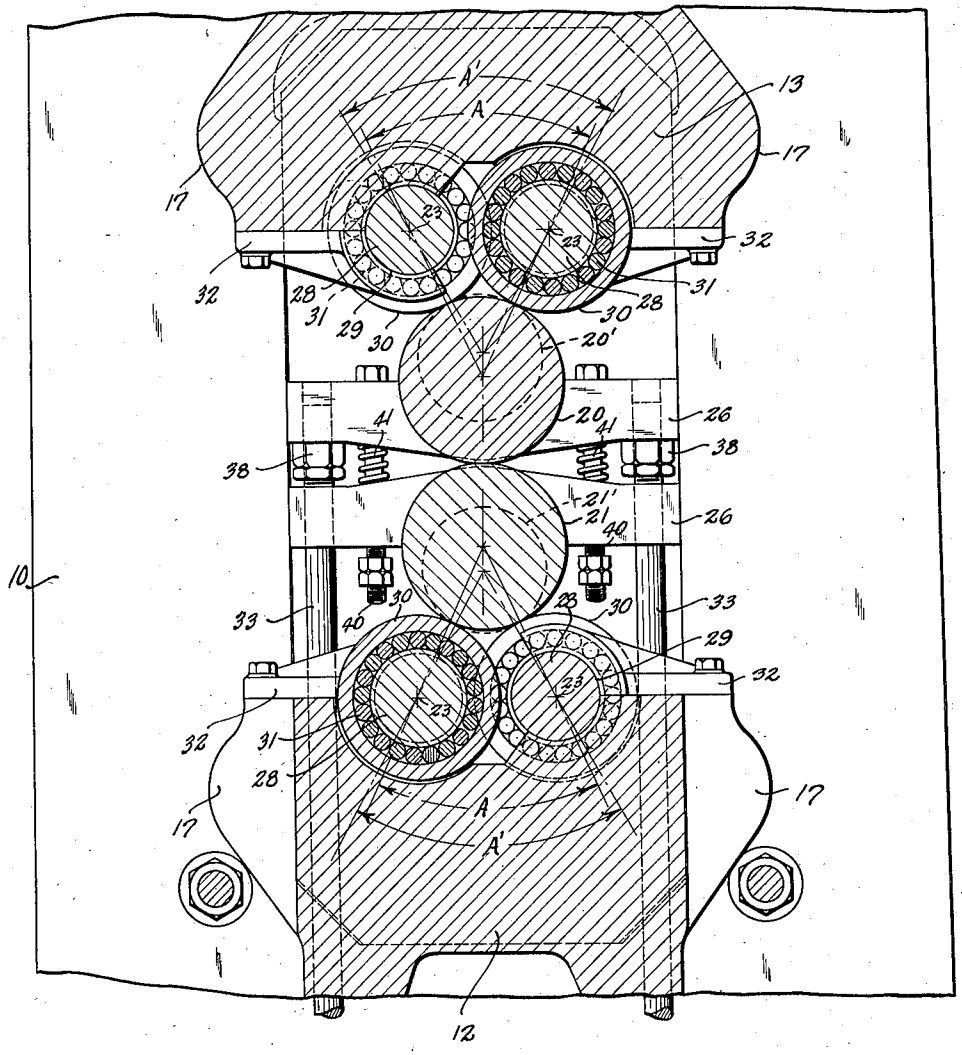


Fig. 6.

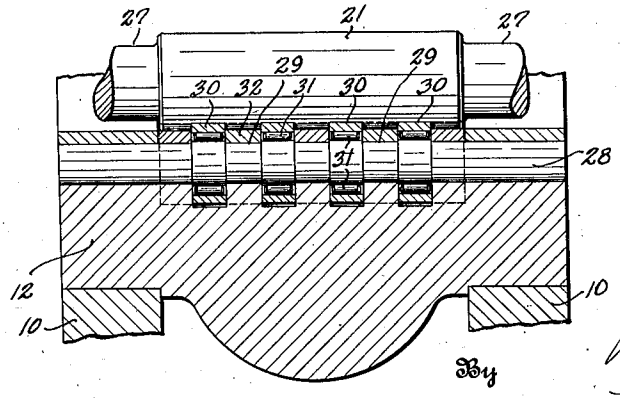


Fig. 7.

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Patented Jan. 11, 1927. 1,614,424

UNITED STATES PATENT OFFICE.

JAMES R. COE, OF WATERBURY, CONNECTICUT, ASSIGNOR TO THE AMERICAN BRASS COMPANY, OF WATERBURY, CONNECTICUT, A CORPORATION OF CONNECTICUT.

ROLLING MILL.

Application filed September 28, 1925. Serial No. 59,092.

This invention relates to rolling mills, and has for an object to provide improved means to obtain the necessary stiffness with the use of rolls of comparatively small diameter.

It is also an object of the invention to so mount the working rolls and the stiffening and supporting means therefor that one of the rolls and its stiffening means may be adjusted as a whole or as a unit relative to the other working roll to secure the required relative adjustment between the rolls.

It is a further object of the invention to so construct the mounting and stiffening means for the working rolls that they may be mounted in the standard housings used in this type of device, and therefore, rolls provided with my improved stiffening and supporting means may be substituted for larger rolls mounted in the housings without reconstructing the housings.

This invention relates to the type of rolling mills in which rotating backing members are used for supporting the working roll throughout substantially its entire length, and it is a still further object of the invention to so construct and arrange these backing members that a relatively small diameter of working roll may be used with relatively large diameters of backing rolls without increasing the angle between the lines joining the axes of the backing members and the axis of the roll and thus without increasing the lateral thrust beyond what is considered good engineering practice; and it is also an object of the invention to so form and arrange the backing members that the wear thereof on the working roll is distributed uniformly throughout the entire surface of this roll.

With the foregoing and other objects in view, I have devised the construction illustrated in the accompanying drawings forming a part of this specification, similar reference characters being employed throughout the various figures to indicate corresponding elements. In these drawings—

Fig. 1 is a front elevation of a rolling mill showing my invention applied thereto.

Fig. 2 is a vertical transverse section through the same substantially on line 2–2 of Fig. 1.

Fig. 3 is an end elevation looking from the right of Fig. 1.

Fig. 4 is a plan view showing the arrangement of the backing members for the roll.

Fig. 5 is a vertical section through the supports for the backing members and showing one form of these members in elevation.

Fig. 6 is a view similar to Fig. 2 showing a slightly different construction, and

Fig. 7 is a vertical section through one of the groups of backing members and the support therefor shown in Fig. 6.

In rolling mill practice frequently vary high pressures are required and rolls to withstand these pressures and not yield or spring an objectionable amount must be of a very large diameter, which makes them expensive and also difficult to handle. These larger rolls are also objectionable for certain work because, on account of the small angle at the rolling point between the rolls, it is difficult to secure the required reduction in the metal being rolled.

To overcome these objections mills have been made with working rolls of relatively small diameter in order to secure a larger angle at the rolling point between the rolls and give the required reduction, and these rolls have been backed or supported by means of separate idling rolls to prevent excessive springing of the working rolls and to give the required strength, but as these backing rolls are supported in substantially the same way as the working rolls they must be of a large diameter to give the required strength and stiffness, and they require specially designed housings or frames.

I have found that by providing the working rolls with a plurality of backing members which are spaced from each other longitudinally of the roll, providing supporting means for these backing members between the adjacent members and mounting the supporting means in a heavy casting to give the required strength and stiffness, I can use relatively small working rolls, and that I can mount these rolls with their backing means in the standard housings or frames.

In the accompanying drawings I have shown a mill involving my improved construction. In this mill 10 represents a pair

of the usual housings or frames mounted on the usual supporting rails 11 on which they are longitudinally adjustable, but may be secured in adjusted positions by any suitable means. Mounted in these housings is a pair of heavy castings 12 and 13 which extend longitudinally between the housings. In the present construction the lower casting is seated at its opposite ends in the housings and rests on the lower walls 14 of the openings 15 in the housings, while the upper casting 13 is guided at its opposite ends for vertical movement in these openings, the side walls of the openings forming guides for the casting to maintain it in proper position. These castings are of similar construction and are strengthened to give them the required vertical stiffness by the ribs 16, and they are also provided with lateral ribs 17 to give them the required lateral stiffness. In the construction shown in Figs. 1 to 5 these castings are recessed on their opposite sides to receive the bearing blocks 18 for the backing or supporting members 19, there being in the present construction two groups of backing members for each working roll as shown in Fig. 2, two above the upper roll 20 and two below the lower roll 21.

In the construction shown in Figs. 1 to 5 each working roll has a set of these backing members, each set comprising two groups and each group comprises a plurality of these members spaced from each other longitudinally of the working roll. The members of each group are mounted to rotate about an axis parallel with the working roll but spaced laterally from the axis of the other group, one group being on one side of the vertical plane through the axis of the working roll while the other group is on the opposite side of this plane, as shown in Fig. 2. In the construction shown in Figs. 1 to 5 the backing members of each group are all formed as one integral element although the backing members are in effect separate and distinct. In this construction the member is reduced in diameter at suitable spaced points intermediate its length as shown at 22 to provide bearings running in the bearing blocks 18 and also to provide a plurality of spaced backing members 19 to engage the surface of the working rolls 20 and 21. By this arrangement the bearings are removed from the surfaces which engage the surfaces of the working roll, and, therefore, the oil and grease which is required for these bearings is not carried to the surface of the working rolls where they would be transferred to the metal being rolled. This arrangement, therefore, not only provides supporting bearings at suitably spaced distances throughout the length of the group of backing members, but these bearings are secured without contaminating the surfaces of the roll with grease. It is to be noted that the backing members in one group of a set are staggered with respect to or arranged in alternate relation with the corresponding backing members of the other group of the set, and therefore, they may be arranged in overlapping relation as indicated in Figs. 2 and 4. With this arrangement the axes 23 of the backing members may be placed closer together without reducing the diameters of these members, and thus the included angle (A) or (A′) between the line joining the axes of the backing members and the axis of the working roll, as indicated in Fig. 2, is smaller than would be the case if these backing members were arranged opposite to each other, and therefore, with this arrangement I can use a smaller working roll with the same diameter of backing members without increasing this angle and the side thrust beyond what is considered good engineering practice. It also reduces the amount of space laterally of the rolls which is required by these backing members in the housing. This arrangement, therefore, allows the use of backing members of a larger diameter in the same size housing. I have shown in Fig. 2 how this overlapped arrangement of backing members will allow the use of a considerably smaller diameter of working roll, indicated by dotted lines 20′ and 21′, and said smaller working roll may be used with the same backing members without materially increasing this included angle. It will be further apparent that the strains are taken up by the heavy castings 12 and 13 which give the backing members, and through the backing members the working rolls, the required stiffness. Thus the working rolls may be given any desired diameter which is the most suitable for the particular work to be performed.

It is also preferred to provide caps 24 on the opposite side of the bearings for the backing members from the bearing blocks 18, these caps being secured to the castings 12 and 13 by any suitable means, such as screws 25, these caps helping to retain the backing members in the castings. Bearing blocks 26 are provided for reduced necks 27 of the working rolls, and these blocks are also guided in the openings 15 in the housings.

In the form of device shown in Figs. 6 and 7 the construction and arrangement is the same as that shown in Figs. 1 to 5 except that instead of making the backing members of each group from a single piece of metal a stationary support is provided and the backing members are individually mounted to rotate on this support. The arrangement of the backing members and their supporting effect on the working rolls are, however, the same in both cases. In

this construction and arrangement the supporting member for the backing members is indicated as a stationary shaft 28 mounted in the heavy castings 12 and 13. These shafts are reduced in diameter somewhat at various spaced points as shown at 29 which rest on either separate blocks mounted in the casting, or the wall of the casting may be extended to engage these surfaces. The rotatable backing members are indicated at 30 and comprise rings which engage the surfaces of the working rolls 20 and 21 and rotate about the shaft 28 on the roller bearings 31. These elements are held in position by suitable caps 32 secured to the castings. It is to be noted that in this form, the same as in the form shown in Figs. 1 to 5, the backing members 30 for each working roll are arranged in two groups, one group rotating about an axis located on one side of the vertical plane through the axis of the working roll while the other group is located on an axis on the other side of this plane as indicated in Fig. 6. It is also to be noted that the backing members of one group are staggered in respect to or are arranged in alternate relation with the backing members of the other group so that they may be overlapped to bring their axes closer together than would be possible if they were arranged opposite each other, and thus reduce the included angle (A) or (A′) between the lines joining the axes of these backing members and the axis of the working roll, the same as in the first form. In other words the lateral distance between the axes of the backing members may be less than twice the diameter of these members.

The construction and arrangement illustrated in Figs. 6 and 7 gives exactly the same effect and support for the working rolls as is secured in the form shown in Figs. 1 to 5, except that the backing members comprise separate and distinct elements mounted to rotate about stationary supports mounted in the castings whereas in the form shown in Figs. 1 to 5 the backing members of each group are formed of a single member rotating in these castings, but although the latter members are integral they are in effect separate members as far as supporting and backing the working rolls is concerned, so that where throughout the specification and claims I have mentioned the backing members as being arranged in groups I wish it to be understood that this term includes either the form shown in Figs. 1 to 5 where the members of the group are integral or the form shown in Figs. 6 and 7 where they are separate and rotate about a stationary member.

Not only does this overlapped relation of the backing members allow the use of a smaller diameter of working rolls but another distinct advantage is that they distribute their wear throughout the entire surface of the working rolls as the entire surface of these rolls is in contact with the backing members. Thus there are no grooves worn in the backing rolls by the supporting members even though the members themselves are not continuous throughout the length of the rolls. Thus with this arrangement I secure a support for the working rolls throughout the entire length thereof, secure a uniform wear of the surfaces of these rolls on the backing members throughout their entire lengths and secure this effect with supporting means which are themselves supported throughout substantially their entire length so that they are always held in the proper position, and I do this without contaminating the surfaces of the working rolls with grease and dirt from the backing members.

The supports for the various rolls in both forms shown are so constructed and arranged that each working roll, its backing members, and the supporting casting therefor comprise a second unit, and one of these units, the upper one in the present instance, is mounted so that it is adjustable as a whole relative to the lower unit to give the required adjustments between the two working rolls for rolling various thicknesses of metal and so forth. To accomplish this, in the present construction the upper bearing blocks 26 for the upper working roll 20 are supported by the rods 33 which extend upwardly from below the housing where they are supported by the usual lever and counterweights or heavy springs 34. These springs are mounted on a support 35 carried on the under side of the housing by the bolts 36 and bear at their upper ends against collars 37 secured on the rod 33 and thus tend to lift these rods. These rods carry suitable nuts 38 which engage the lower sides of the blocks 26 and thus tend to lift the upper working roll 20, the two groups of backing members therefor and the supporting casting 13 as a unit. The upper movement of this unit is controlled by the usual adjusting screws 39 mounted in the tops of the housings and engaging the casting 13. It will thus be apparent that the springs 34 acting through the rods 33 maintain the upper working roll, the backing members therefor and their supporting casting always in the same relative position, and that these elements by the coaction of the adjusting screw with these rods and springs allow adjusting of this unit as a whole and without changing in any way the relative positions of the elements of the unit; and further that this unit may be adjusted in a vertical plane relative to the lower working roll. The lower blocks 26 are provided to form upper bearings for the necks of the lower working roll through which the rods 33 extend. Bolts

40 extend through and between the two bearings and carry springs 41 reacting at their opposite ends against these two bearings and tend to separate the same and hold the lower working roll in proper position on its backing members.

The rolls are driven from any suitable source of power not shown. As shown in Fig. 1 the squared ends 42 of the working rolls are connected by suitable couplings 43 to the blocks 44 driven by any suitable means from the source of power. At their opposite ends the two working rolls have driving connections through the gears 45. In the forms shown in Figs. 1 to 5 the backing members 19 for the respective working rolls may be driven from the gears 45, but as the two sets of backing members for each working roll must be driven in the same direction one group of backing members is driven by a gear meshing 46 meshing with one half of its driving gear 45 while the other group of backing members is driven by the gear 47 meshing with the other half of the gear 45.

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

1. In a rolling mill, a working roll, rotatable backing members for said roll arranged to rotate about axes parallel with that of the roll and spaced laterally of each other, said members including portions of a diameter to engage the surface of the roll and spaced from each other longitudinally of the roll, the roll engaging portions on one side of the roll being alternately arranged with respect to those on the other side of the roll, and supports for said members located between the roll engaging portions.

2. In a rolling mill, a working roll rotatable backing members for said roll arranged to rotate about axes parallel with that of the roll and spaced laterally of each other, said members including portions of a diameter to engage the surface of the roll and spaced from each other longitudinally of the roll, the roll engaging portions on one side of the roll being alternately arranged with respect to those on the other side of the roll and in overlapped relation therewith, and supports for said members located between the roll engaging portions.

3. In a rolling mill, a working roll, a set of backing members for said roll mounted to rotate about laterally spaced axes, the members on each axis comprising enlarged portions spaced from each other longitudinally of the roll and alternately arranged with respect to those on the other axis and mounted to engage the surface of the roll to support the roll, and supporting means for said members arranged between the roll engaging portions.

4. In a rolling mill, a working roll, a set of backing members for said roll mounted to rotate about laterally spaced axes, the members on each axis comprising enlarged portions spaced from each other longitudinally of the roll and arranged in alternate relation with and overlapping those on the other axis, the enlarged portions being mounted to engage the surface of the roll to support the roll, and supporting means for said members arranged between the enlarged portions.

5. In a rolling mill, a pair of working rolls, a set of backing members for each roll, the members of each set being arranged in groups, each group mounted to rotate about an axis spaced laterally from the axis of the other group, each group comprising members spaced from each other longitudinally of the roll and engaging the surface thereof to support the roll, the members of one group being alternately arranged with respect to those of the other group, and supporting means for the members arranged between the adjacent members of each group.

6. In a rolling mill, a pair of working rolls, a set of backing members for each roll, the members of each set being arranged in groups, each group mounted to rotate about an axis spaced laterally from the axis of the other group, each group comprising members spaced from each other longitudinally of the roll and engaging the surface thereof to support the roll, the members of one group being alternately arranged with respect to those of the other group and overlapping the same so that the distance between the axes of the members is less than twice the diameter of the members, and supporting means for the members arranged between the adjacent members of each group.

7. In a rolling mill, a working roll, a set of backing members for the roll, the members being arranged in groups, each group mounted to rotate about an axis spaced laterally from the axis of the other group, each group comprising members spaced from each other longitudinally of the roll and engaging the surface thereof to support the roll, the members of one group being alternately arranged with respect to those of the other group, means for supporting the members arranged between the adjacent members of each group, and means for adjusting the roll, the backing members and the supporting means as a unit.

8. In a rolling mill, a pair of spaced housings, a working roll mounted in between the housings, a set of backing members for the roll, the members being arranged in groups, each group mounted to rotate about an axis spaced laterally from the axis of the other group, each group comprising members spaced from each other longitudinally of the roll and engaging the surface thereof to support the roll, the mem-

bers of one group being alternately arranged with respect to those of the other group, means for supporting the members arranged between the adjacent members of each group, and a support for the supporting means mounted in the housings and extending between the same.

9. In a rolling mill, a working roll, rotatable backing members for said roll arranged to rotate about axes parallel with that of the roll and spaced laterally of each other, said members including portions of a diameter to engage the surface of the roll and spaced from each other longitudinally of the roll, the roll engaging portions on one side of the roll being alternately arranged with respect to those on the other side of the roll and in overlapped relation therewith.

10. In a rolling mill, a working roll, a set of backing members for said roll mounted to rotate about laterally spaced axes, the members on each axis comprising enlarged portions spaced from each other longitudinally of the roll and arranged in alternate relation with and overlapping those on the other axis, the enlarged portions being mounted to engage the surface of the roll to support the roll.

11. In a rolling mill, a working roll, a set of backing members for said roll arranged in groups, each group being mounted to rotate about an axis spaced laterally from the axis of the other group and comprising members spaced from each other longitudinally of the roll and engaging the surface thereof to support the roll, the members of one group being alternately arranged with respect to those of the other group and overlapping the same so that the distance between the axes of the members is less than the diameters of the members.

12. In a rolling mill, a working roll, rotatable backing members for said roll arranged to rotate about axes parallel with that of the roll and spaced laterally of each other, the members on each axis comprising enlarged portions spaced from each other longitudinally of the roll and alternately arranged with respect to those on the other axis, said enlarged portions being mounted to engage the surface of the roll to support the roll.

13. In a rolling mill, a pair of spaced housings, a pair of working rolls between said housings, a set of backing members for each roll, the members for each set being arranged in groups, each group of each set being mounted to rotate about an axis spaced laterally from the axis of the other group, each group comprising members spaced from each other longitudinally of the roll and engaging the surface thereof to support the roll, the members of one group being alternately arranged with respect to the members of the other group of the set and in overlapped relation therewith so that the distance between the members of each set is less than the diameter of the members, supporting means for the members arranged between the adjacent members of each group, and a support for the supporting means of each set mounted in the housings and extending between the same.

In testimony whereof I affix my signature.

JAMES R. COE.