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2,540,552

VERTICAL ROLLING MILL

Filed Sept. 24, 1947

2 Sheets-Sheet 1

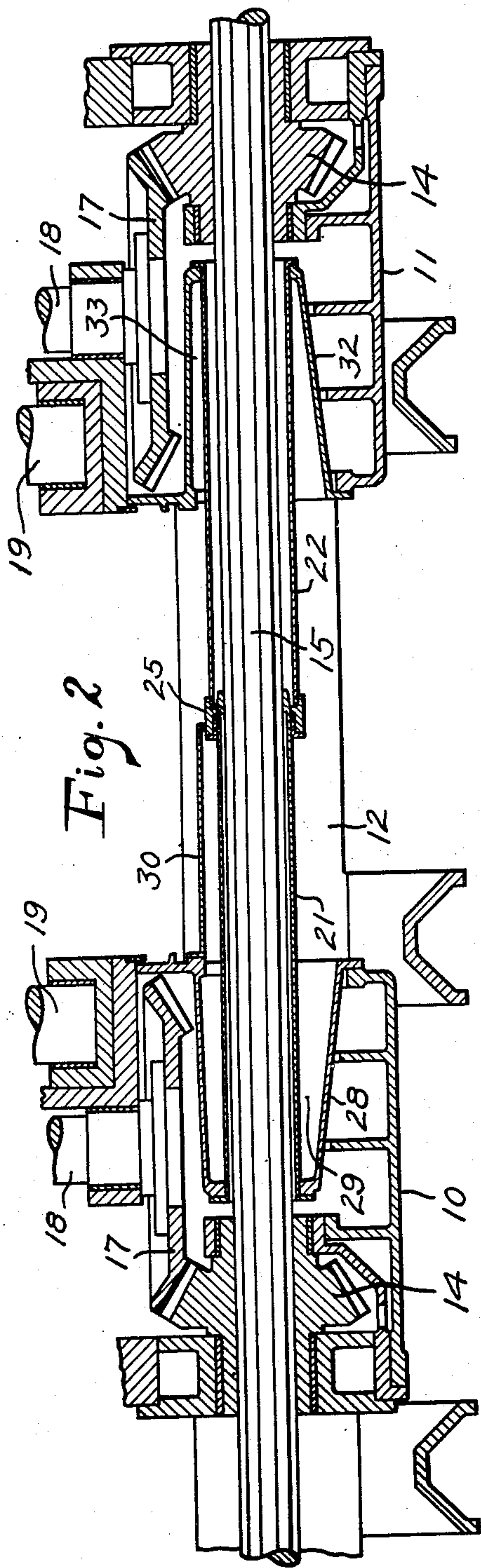


Fig. 2

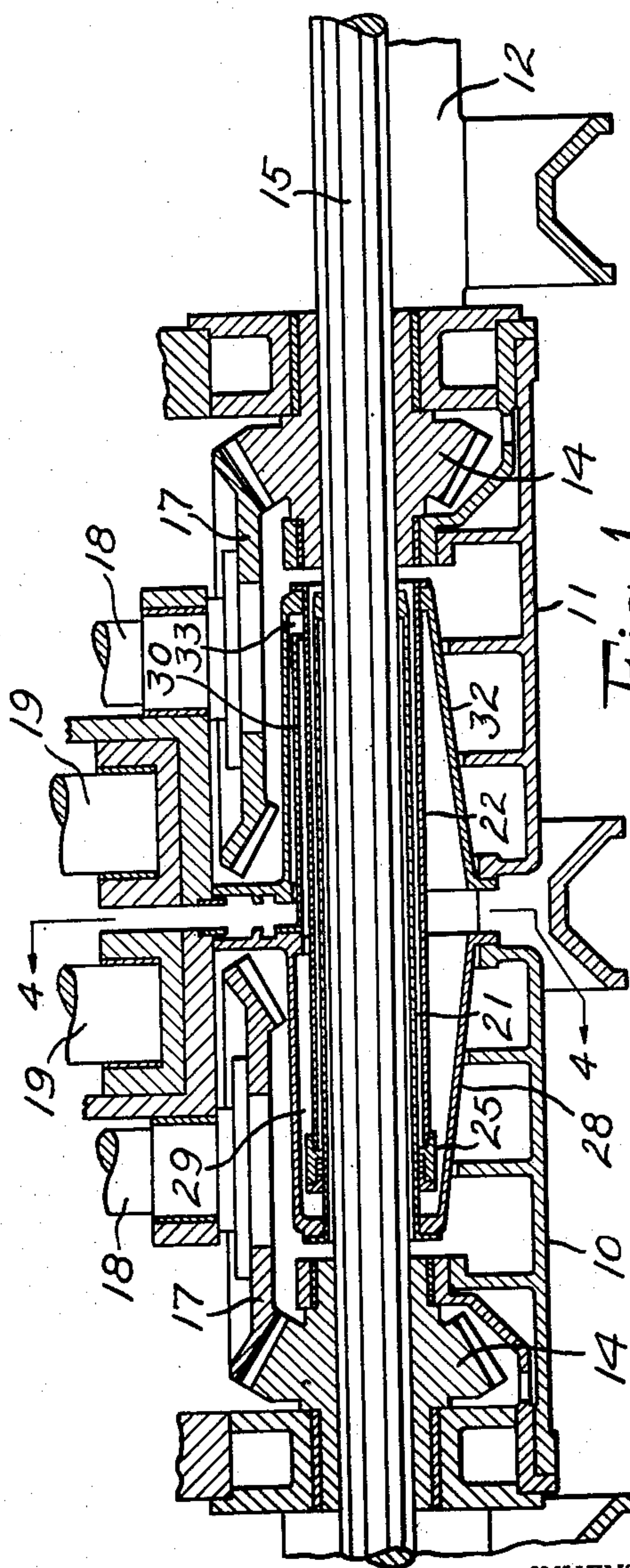


Fig. 1

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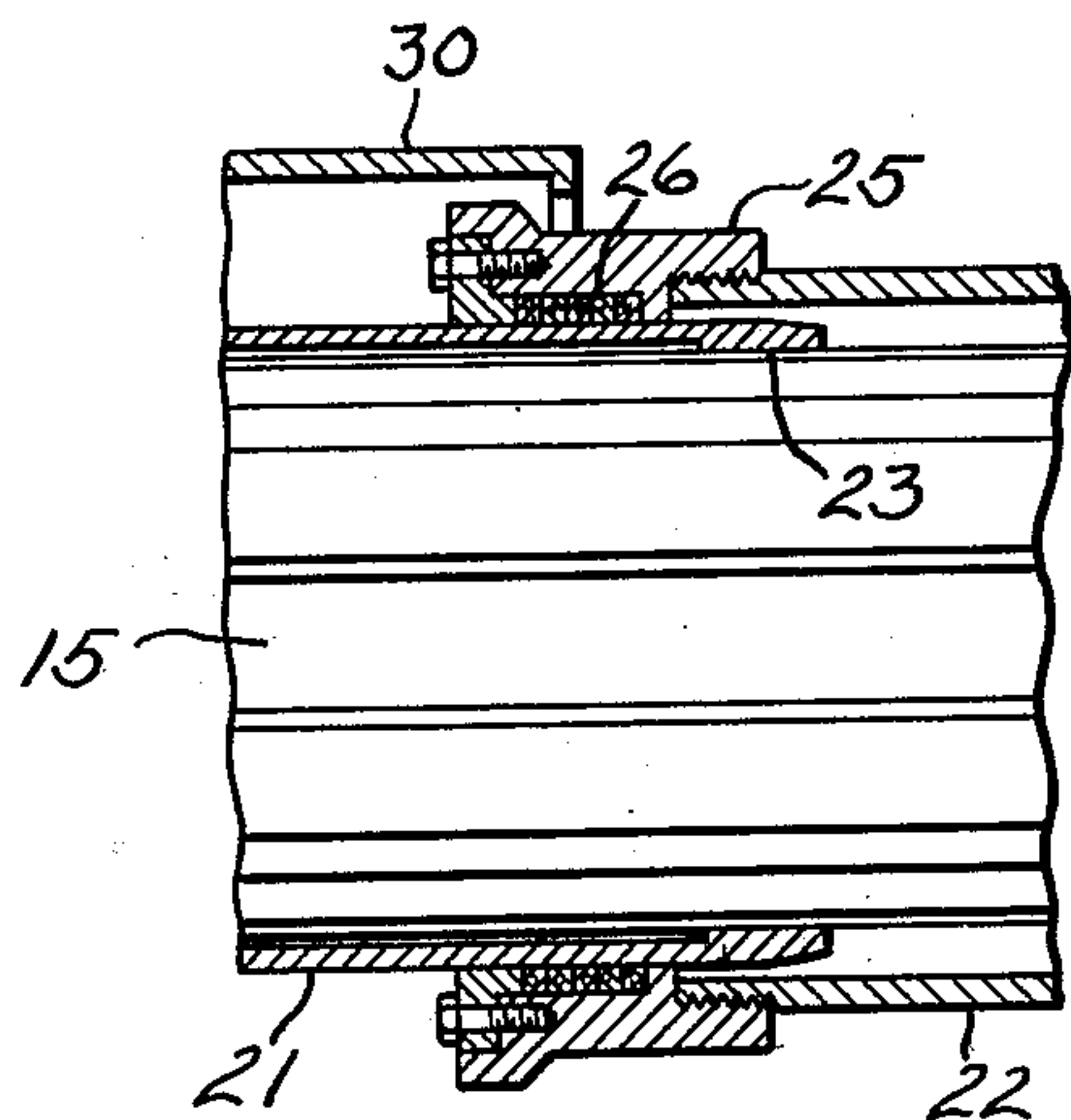


Fig. 3

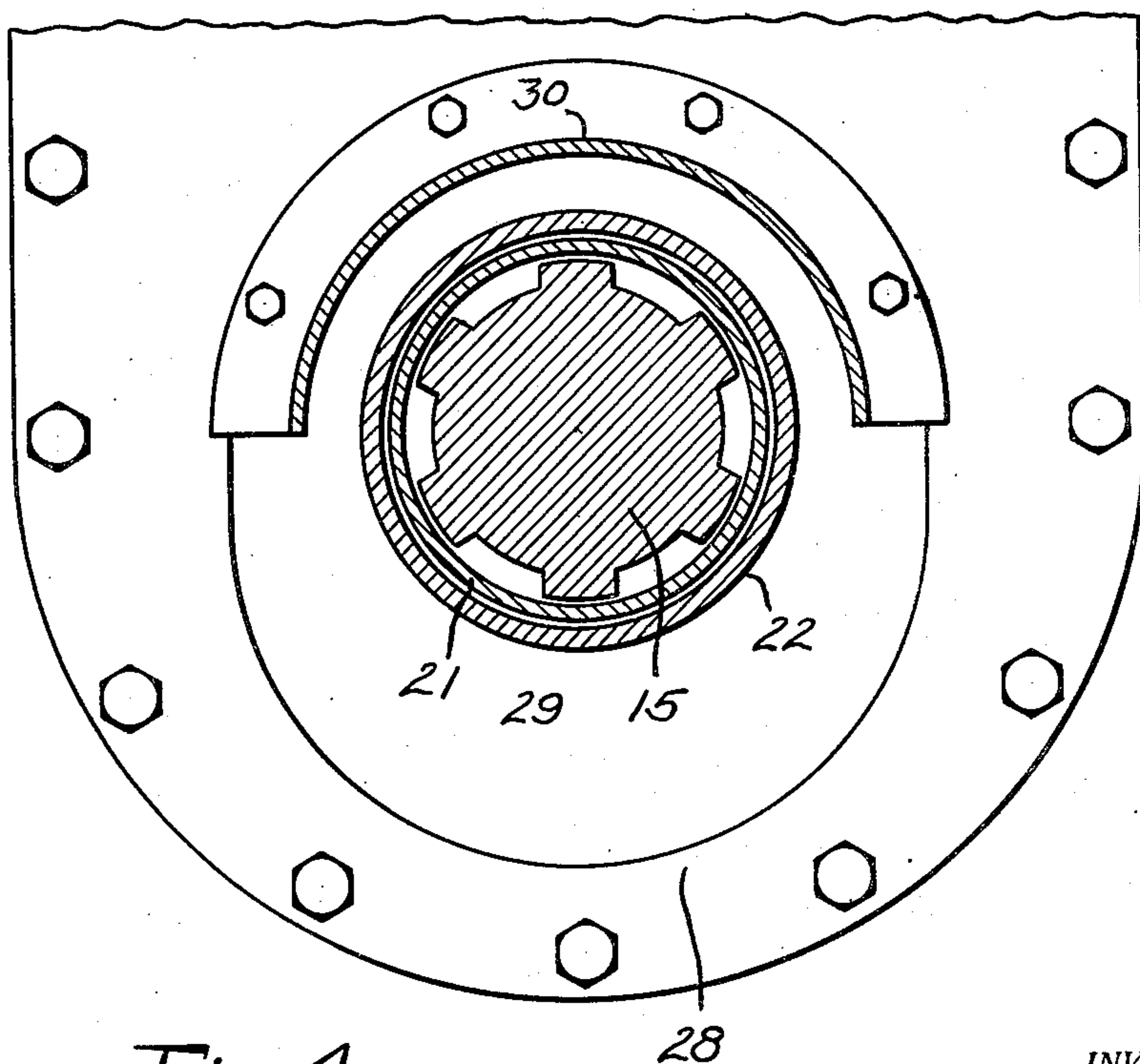


Fig. 4

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## UNITED STATES PATENT OFFICE

2,540,552

## VERTICAL ROLLING MILL

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3 Claims. (Cl. 80—54)

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This invention relates to vertical rolling mills, and more particularly to mills of the type having two vertical rolls which are driven in unison, by bevel gearing, from a common horizontal driving shaft.

Vertical rolling mills of this general type are often used as edging mills in the production of metal slabs or the like, one example of such a mill being disclosed in the patent to George et al. No. 1,553,230, granted September 8, 1925. This prior patent shows the driving gears for the respective rolls mounted in separate gear housings which are adjustable horizontally to and from one another as required for rolling products of different widths. The driving shaft extends through both the gear housings, and between the housings the shaft is exposed, during the operation of the mill, to a deluge of water and mill scale. Such scale is very destructive of packings and seals, and consequently a serious problem is involved in preventing water from entering the gear housings and contaminating the lubricant therein.

It is accordingly one object of the invention to provide a vertical rolling mill having two gear housings which are adjustable horizontally and through which a common horizontal drive shaft extends, together with a thoroughly dependable construction to prevent water from entering the housings around the shaft.

It is a further object of the invention to provide a vertical rolling mill which may be adjusted for edging metal slabs or the like throughout a considerable range of widths, while effectively preventing water from entering the mill gear housings around the driving shaft.

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

Referring to the drawings illustrating one embodiment of the invention and in which like referring numerals indicate like parts,

Fig. 1 is a vertical sectional view through the lower portion of a vertical rolling mill, with the rolls adjusted close to one another for rolling narrow stock;

Fig. 2 is a view similar to Fig. 1, but showing the rolls adjusted far apart;

Fig. 3 is an enlarged view of a portion of the construction as shown in Fig. 2; and

Fig. 4 is an enlarged sectional view taken on the line 4—4 of Fig. 1.

The embodiment illustrated comprises two gear

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housings 10 and 11 mounted upon a stationary base 12. One or both of these housings is movable horizontally along the base 12 in a direction to and from the other housing to vary the distance therebetween, as shown for example in the above-mentioned Patent No. 1,553,230. Within each of the gear housings there is mounted a bevel pinion 14, the two pinions being rotatable about a common horizontal axis and driven by a common horizontal shaft 15. This shaft is longitudinally fluted or otherwise of non-circular cross section to fit correspondingly shaped bores in the pinions and thus provide for transmission of the necessary driving torque to the pinions. Within each gear housing there is also mounted a bevel gear 17 rotatable about a vertical axis and meshing with the corresponding pinion 14. The gears 17 are mounted above the shaft 15, and from each of these gears a shaft 18 extends upwardly. Each gear housing also serves to support a vertical roll 19, only the lower ends or necks of these rolls being shown. For a disclosure of the upper portion of the mill, reference may be had to the said Patent No. 1,553,230, from which it will be apparent that the vertical shafts 18 are suitably connected to the rolls 19 to drive the same in unison.

The present invention is particularly concerned with preventing water and scale, which is present during the rolling operation, from traveling along the shaft 15 and thus entering the gear housings. The preferred construction includes two telescopically arranged sleeves surrounding the shaft and carried by the respective gear housings. Thus the housing 10 carries a generally cylindrical sleeve 21 which extends toward the housing 11, and the latter housing carries a generally cylindrical sleeve 22 which extends toward the housing 10. The sleeve 21 is slightly larger in diameter than the shaft 15 to provide ample clearance around the same, but at its projecting end, as indicated at 23 in Fig. 3, this sleeve is somewhat reduced in internal diameter to fit the shaft more closely and thus ensure proper alignment of these parts. The sleeve 22 is slightly larger in diameter than the sleeve 21 in order to receive the latter when the housings 10—11 are moved together. As best shown in Fig. 3, the outer sleeve 22 carries on its projecting end a stuffing box 25 having suitable packing material 26 therein for contact with the outer surface of the inner sleeve 21. This packing forms an annular seal which will exclude water from the interior of the sleeves.

In order to prevent interference between the



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outer sleeve 22 and the housing 10 when the two gear housings are close to one another, the housing 10 includes a thimble 28 which extends inwardly beneath the corresponding bevel gear 17. This thimble surrounds the shaft 15, and the inner end of the thimble forms a support for the adjacent end of the inner sleeve 21. The thimble 28 serves to define an annular recess 29 which surrounds the inner sleeve 21 and opens outwardly toward the housing 11. When the housings are moved toward one another the outer sleeve 22 will enter this recess, as shown in Fig. 1.

It is desirable to protect the inner sleeve 21 from falling water and scale, particularly when the gear housings are moved apart as shown in Fig. 2, since the scale might reach the stuffing box 25 and damage the packing material 26 when the housings are again moved together. Accordingly a shield 30 is carried by the housing 10 and extends outwardly therefrom above the projecting portion of the inner sleeve 21. This shield is preferably of semi-cylindrical shape, as best shown in Fig. 4, and spaced sufficiently above the inner sleeve to avoid interference with the outer sleeve 22 and the stuffing box 25. The shield is preferably long enough to reach the stuffing box when the gear housings are moved far apart, as shown in Fig. 2.

In order to prevent interference between the shield 30 and the housing 11 when the two gear housings are close to one another, the housing 11 includes a thimble 32 which extends inwardly beneath the corresponding bevel gear 17. This thimble surrounds the shaft 15, and the inner end of the thimble forms a support for the adjacent end of the outer sleeve 22. The thimble 32 serves to define an annular recess 33 which surrounds the sleeve 22 and opens outwardly toward the housing 10. When the housings are moved toward one another the shield 30 will enter this recess, as shown in Fig. 1.

The operation of the invention will now be apparent from the above disclosure. The rotating shaft 15 will drive the pinions 14, the gears 17, and the shafts 18, which in turn will drive the rolls 19 for the rolling of hot metal bars or slabs in known manner. Water will be sprayed on the rolls and bars, and this water, mixed with scale from the hot metal, will fall downwardly between the gear housings 10 and 11. The telescoping sleeves 21 and 22 will be effective to prevent this water and scale from entering the gear housings. The shield 30 will deflect the water and scale from the top of the inner sleeve even with the housings far apart, and thereby avoid damage to the packing material 26 in the stuffing box 25. The recess 29 will receive the projecting portion of the outer sleeve 22 when the housings are moved close together, and at the same time the recess 33 will receive the shield 30. Thus a considerable range of adjustment is possible while maintaining an effective seal.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A driving mechanism comprising two housings mounted for relative horizontal adjustment

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to and from one another, a vertical bevel gear within each housing, two aligned horizontal bevel pinions within the respective housings and meshing with the corresponding gears to drive the same, a horizontal shaft connected to both pinions, one housing including a thimble which surrounds the shaft beneath the corresponding gear, a sleeve surrounding the shaft and connected at its inner end to the inner portion of the thimble, the thimble defining an outwardly open annular recess around the sleeve, and an outer sleeve projecting from the other housing in surrounding relation to the shaft and arranged to receive the first mentioned sleeve telescopically, the said recess receiving the outer sleeve when the housings are close to one another.

2. A driving mechanism comprising two housings mounted for relative horizontal adjustment to and from one another, a vertical bevel gear within each housing, two aligned horizontal bevel pinions within the respective housings and meshing with the corresponding gears to drive the same, a horizontal shaft connected to both pinions, each housing including a thimble which surrounds the shaft beneath the corresponding gear, two telescoping sleeves surrounding the shaft between the housings and connected to the inner portions of the respective thimbles, the thimbles defining outwardly open annular recesses around the corresponding sleeves, and a shield overlying the outer portion of the inner sleeve and supported by the corresponding housing, one recess receiving the shield and the other recess receiving the outer sleeve when the housings are close to one another.

3. A driving mechanism comprising two housings mounted for relative horizontal adjustment to and from one another, a vertical bevel gear within each housing, two aligned horizontal bevel pinions within the respective housings and meshing with the corresponding gears to drive the same, a horizontal shaft connected to both pinions, a sleeve surrounding the shaft and carried by one housing, a shield carried by the said one housing and located above the sleeve, and an outer sleeve surrounding the shaft and carried by the other housing in position to receive the first mentioned sleeve telescopically, the said other housing including a thimble which surrounds the outer sleeve and supports the same, the thimble defining a recess arranged to receive the shield when the housings are close to one another.

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