No. 803,763. PATENTED NOV. 7, 1905.

J. T. HORNER.

BEARING FOR THE ROLLS OF ROLLING MILLS.

APPLICATION FILED OCT. 14, 1903.

2 SHEETS—SHEET 1.

Fig. 1.

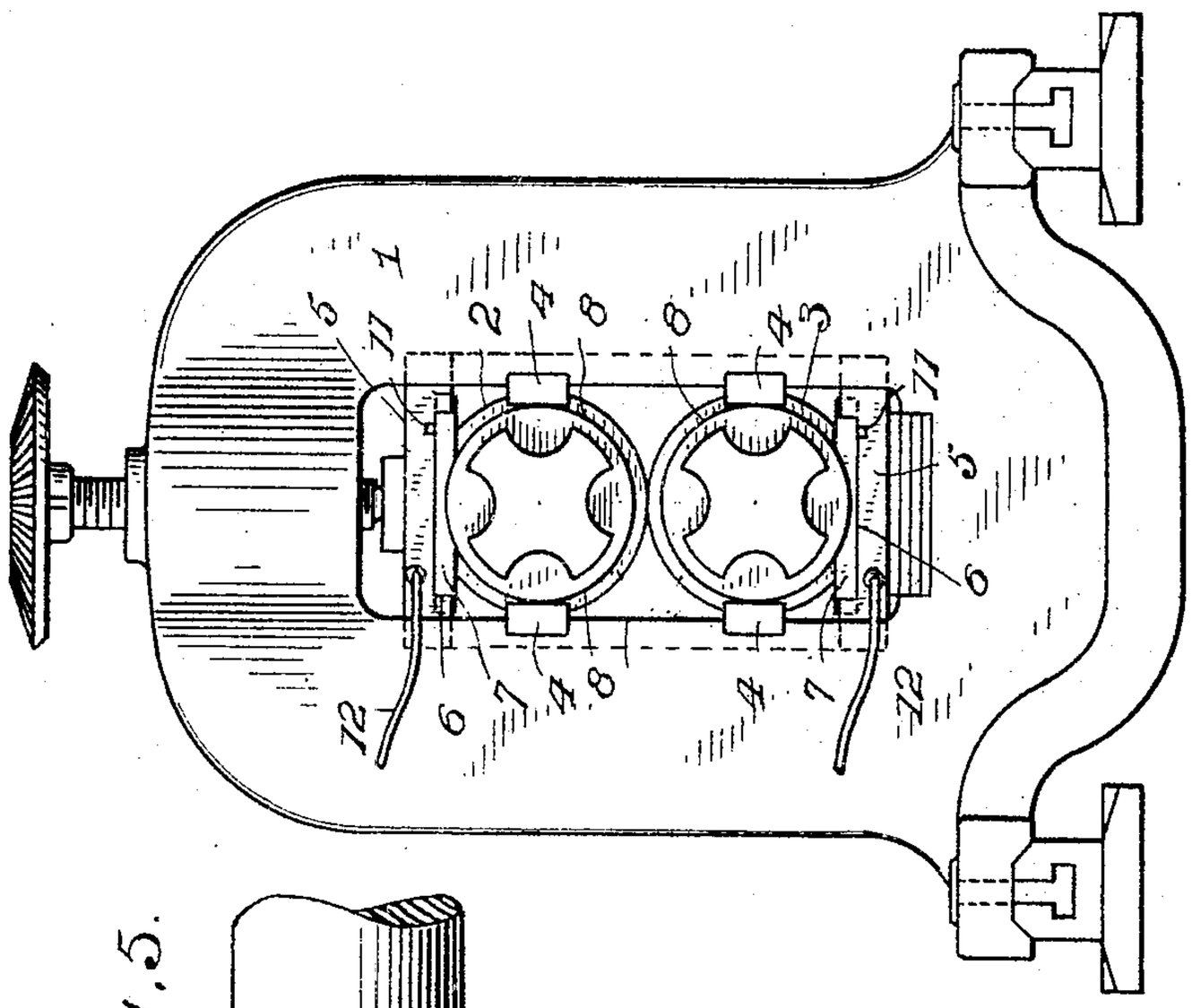


Fig. 5.

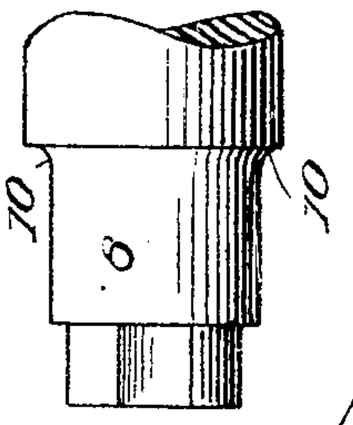


Fig. 3.

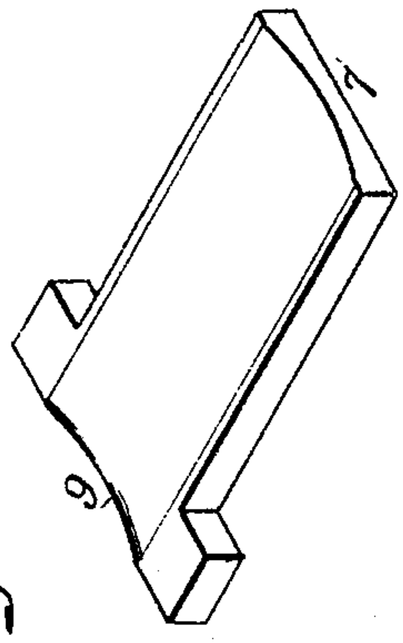


Fig. 2.

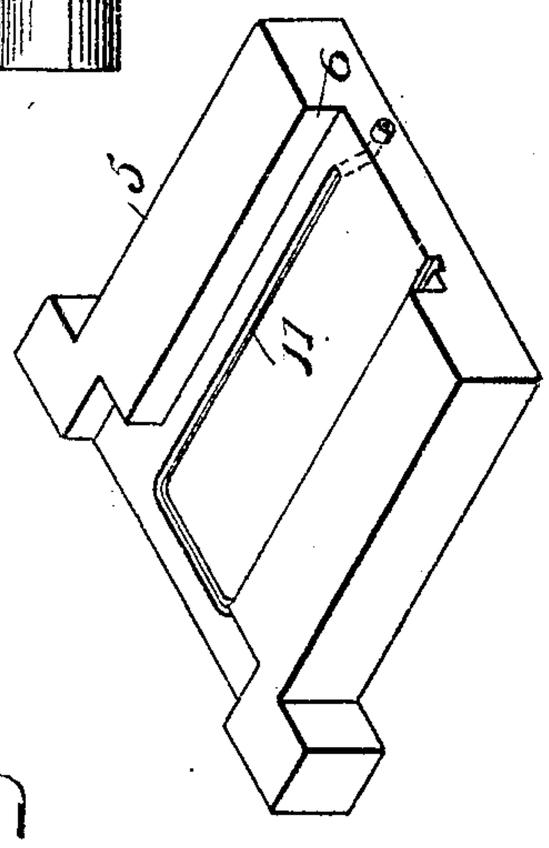
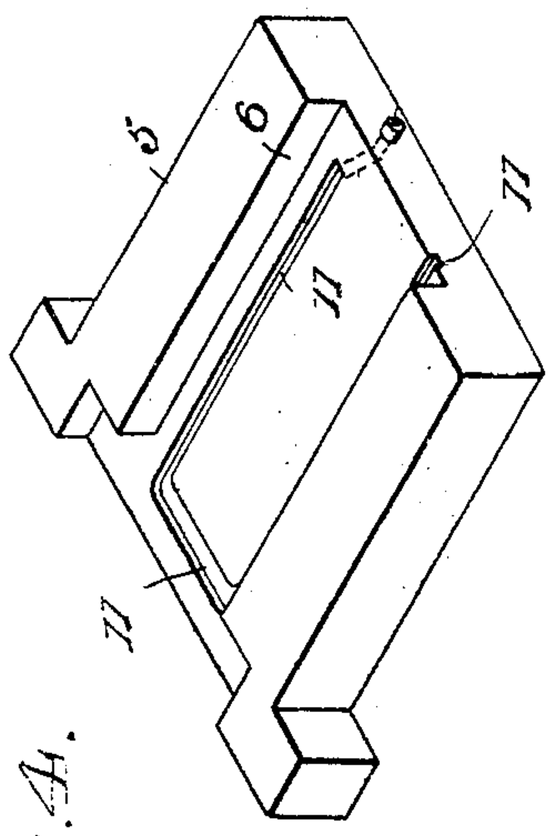


Fig. 4.



WITNESSES:

H. A. Lamb.
S. J. Chazfee

INVENTOR
John T. Horner.
BY Geo. O. Phillips.
His ATTORNEY

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2 SHEETS—SHEET 2.

Fig. 6.

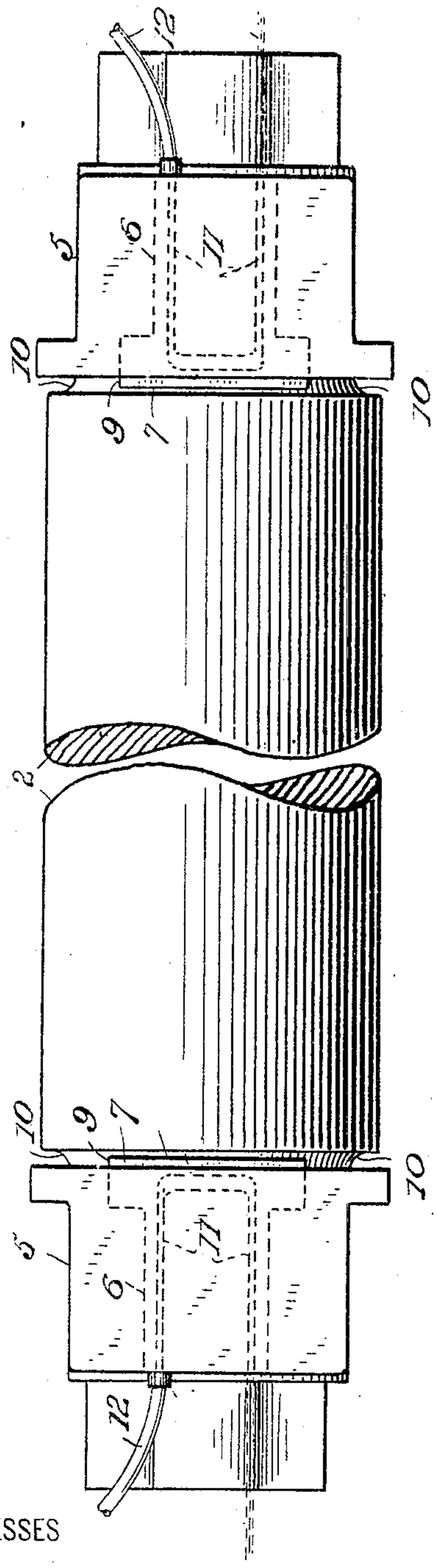
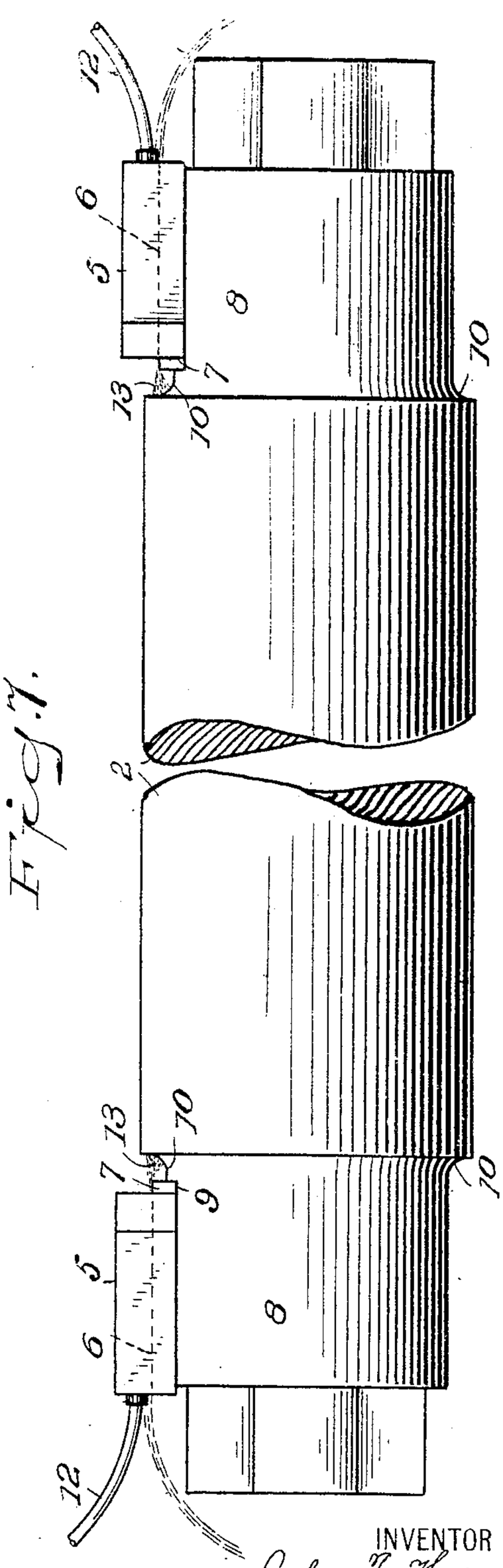


Fig. 7.



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INVENTOR
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BY Geo. D. Phillips.
his ATTORNEY

UNITED STATES PATENT OFFICE.

JOHN T. HORNER, OF NEWCASTLE, PENNSYLVANIA.

BEARING FOR THE ROLLS OF ROLLING-MILLS.

No. 803,763. Specification of Letters Patent. Patented Nov. 7, 1905.

Application filed October 14, 1903. Serial No. 176,986.

To all whom it may concern:

Be it known that I, JOHN T. HORNER, a citizen of the United States, and a resident of Newcastle, in the county of Lawrence and State of Pennsylvania, have invented certain new and useful Improvements in Bearings for the Rolls of Rolling-Mills, of which the following is a specification.

My invention relates to certain new and useful improvements in bearings for the rolls of rolling-mills. In order that the objects and advantages of my invention may be fully understood by those skilled in the art to which it appertains, I will first explain the peculiar conditions under which the rolls of rolling-mills are used and which render necessary and advantageous bearings of the character involved in my invention.

In the use of rolls for what is known as "pack-rolling" it is essential that hot reducing-rolls should be used, for otherwise and if a hot pile or pack composed of thin plates or sheets be passed between cold rolls for the purpose of reducing the thickness of the individual plates or sheets therein such pack will by contact with the cold rolls become chilled upon the two outer surfaces, and the pile or pack not being homogeneous, but comprised of plates or sheets in plurality, is free to the individual elongation of each plate or sheet in such pile or pack, and any undue variation in the temperature of such individual plates or sheets will result in unequal reduction and elongation of the same. The unavoidable results of such undue reduction and elongation are, first, the cohesion of the plates or sheets to each other, and which is commonly designated as "patching," which renders it difficult or impossible to "open" or separate the sheets in the finished pack; second, if the outside plates or sheets of the pack become chilled in their reduction they will not draw out or elongate to the same extent as the hotter and interior plates or sheets, and as the length of the finished pack is determined or measured by the length of the shortest plate or sheet it follows that an undue and greater quantity of waste scrap must be sheared from the tail end of the pack to square and even all the plates or sheets than would be the case in a pack where said plates or sheets were uniformly elongated. In the use of hot rolls, however, it has been found that the necks of the rolls and the bearing-brasses become unduly heated and to such an extent as to render the retention of the necessary lubricant difficult, and in proportion to its dissipation increased friction and harmful heat result. These considerations render it desirable and necessary to maintain the rolls at a proper degree of heat for effective rolling and to balance the heat between the rolls, their necks, bearing-brasses, and supporting-blocks, which is rendered difficult by reason of the indispensible fillet existing between the body of the rolls and their necks, into which the "bearing-brasses" are fitted. The curve of the filleted necks and bearing-brasses extending from a horizontal line to a perpendicular renders proper lubrication of that portion exceedingly difficult, and hence much undue heat resulting from friction is generated at this critical locality and readily passes into both the body and neck of the rolls and constitutes the principal source of disaster and breakage of the rolls, owing to the fillets becoming fire-cracked. Undue heat at this locality also eventuates not only in wasteful consumption of the lubricant material, but in the effort to compensate for the rapid disappearance of the lubricant by additional and excessive supply results in the surplus working back upon the body of the rolls, causing injury to the pack being rolled and delay in its removal. These enumerated conditions have led to many experiments designed to overcome the difficulties, but so far as I am aware without satisfactory results. Most of the efforts have been directed toward the use of hollow bearing-brasses adapted for circulation of water therein, such as are common in the operation of many kinds of machinery where loads and stresses although heavy are uniform. The use of such brasses, however, in hot-rolling metal sheets in packs is impractical, for the reason that the duty performed is variable and intermittent, and owing to the impact or blows resulting from operating the top roll by frictional contact with the bottom roll or the metal passing between the two rolls an action called "jumping" occurs, which means that as the metal enters between the rolls the top roll raises or jumps from the bottom roll a distance sufficient to admit of the entering of the metal to be reduced. This jumping action tends to a disastrous degree to pound or hammer the brasses, and consequently if such brasses are made hollow and adapted for the circulation of water through the hollow channels or pipes located therein

this pounding action soon weakens and destroys the structure.

When water-circulating tubes are used in connection with the brasses, the brasses must necessarily be increased in size and weight, and the larger the brasses the larger must be the circulating water-pipe required to cool it, and, furthermore, when the water is circulated through a pipe located or cast within the brass it is incapable of imparting the same cooling influence as the same body of water would impart when in direct contact with the body of the brass.

The necessity for keeping the body of rolls employed in hot-pack rolling at a uniform heat is too well understood by those skilled in the art to require any special comment, and it is also well understood that it is not practical to inject cold water upon the necks of the rolls for two reasons—first, because it tends to eliminate too much of the necessary heat required in the necks, and, second, the nature of the lubricant employed is such that this application of cold water chills the lubricant to such an extent as to cause it to crumble and become detached from the neck where the water is applied, resulting in an overheated ring encircling that portion of the neck.

I have thus elaborately explained the existing conditions in the art to which my invention appertains that my improvement may be more readily comprehended and its advantages recognized.

My invention has for its object to preserve the proper temperature of the rolls of rolling-mills to produce uniform results in the reduction of packs of plates or sheets passed between them and to at the same time secure the proper and economical lubrication of the same; and it consists in mounting said rolls in bearings composed of hard-metal supporting-blocks formed with suitable recesses for the reception of the usual brasses and formed with water-circulating channels or passages adapted to permit the contact of the circulating water with said brasses, a suitable connection between one terminus of said passages with a water-supply, and brasses located within the recesses in the bearing-blocks and constituting a part of the boundary of the water-passages, so that the water circulated through the bearing-blocks shall contact directly with the inner face of the brasses, as will be hereinafter more fully explained.

My invention also consists in the details of construction hereinafter specifically described whereby a portion of the circulated water is permitted to traverse the entire area of the inner faces of the brasses and likewise the necks, fillets, and ends of the rolls.

In order that those skilled in the art may fully understand my invention, I will proceed to describe the same in detail, referring to the accompanying drawings, in which—

Figure 1 is a side elevation of a "hot-mill" housing supported upon the usual shoe-plates and carrying a pair of reducing-rolls equipped with my invention. Fig. 2 is a detail perspective view of the under side of one of my improved supporting-blocks. Fig. 3 is a detail perspective view of the under side of one of the bearing-brasses. Fig. 4 is a view similar to Fig. 2 and showing the preferred shape of the fluid or water passage. In this preferred form the fluid or water passage adjacent to the fillet of the roll is of greater area or wider than the remainder of the passage to produce a greater cooling-surface. Fig. 5 is a detail side elevation of one of the reducing-rolls broken away near the neck. Fig. 6 is a plan view, on enlarged scale, of the top roll broken away centrally and showing the supporting-blocks and brasses in position and also showing a suitable connection with a water-supply; and Fig. 7 is a side elevation, on like scale, of the roll shown at Fig. 6, and with the supporting-blocks and brasses separated from the ends of the roll to illustrate the manner in which the water traversing the conduits in the bearing-blocks is permitted to reach and contact with the fillets, neck, and ends of the roll.

Similar reference-numerals indicate like parts in the several figures of the drawings.

1 is a roll-housing, and 2 and 3 are the rolls located therein and prevented from lateral movement by side bearings 4.

The supporting-blocks, which may be used only in connection with the upper roll, but which, if desired, may also be used in connection with the lower roll, are indicated by the numeral 5. These blocks are formed with suitable recesses or seats 6, adapted to receive the usual solid bearing-brasses 7, which have one surface adapted to fit the necks 8 of the rolls and the inner extremity 9 being curved to fit the fillet 10 between the rolls and their necks. These brasses are located in the recesses 6 of the bearing-blocks with their flat faces resting upon the bearing-blocks and so as to cover or form a part of the boundary of water grooves or conduits 11 in the bearing-blocks, which are preferably of U shape, as clearly shown. These grooves, as clearly shown at Figs. 2 and 4, traverse the recesses or seats 6 of the bearing-blocks. They are open-sided, as shown, and one end dips down into the body of the block and penetrates the outer end, which is connected by a suitable flexible or other tube 12 with any suitable water-supply, while the opposite end or outlet is free to discharge the water directly from the end of the brass. This discharge end may, however, be supplied with suitable means for connection with an ordinary waste-pipe.

I do not wish to be limited as to any particular design or proportion of the water grooves or channels, but prefer to make them of a width and depth of about one-quarter of

an inch and of the design shown either at Fig. 2 or Fig. 4 in order to secure as much benefit as possible of the cooling influence of the water at and upon the fillets of the rolls. As these grooves are closed by the location of the brasses within the recesses provided for the same in the supporting-blocks, it will be readily understood that the character of the closure is such that a limited portion of the water may leak and spread between the contact-surfaces of the brasses and the supporting-blocks and finally fall by gravity. This small quantity of leakage, however, is not a disadvantage, but, on the contrary, may tend to more effectually temper the heat of the rolls, and at that point where the grooves traverse a path adjacent to the fillets of the rolls V-shaped or other furrows may be made leading from the grooves 11 to permit a limited quantity of tempered water to spray upon the fillets, as indicated at 13. (See Fig. 7.)

While I prefer to use water as the cooling agent, I do not wish to be confined in this respect, as any other cooling agent which is adapted to be circulated through the grooves or channels 11 may be used, and in "warming up" the rolls a heating agent may be circulated through the grooves for that purpose.

Having described the construction and operation of my improved bearing and the advantages derived from its use, what I claim as new, and desire to secure by Letters Patent, is—

Bearings for the rolls of rolling-mills consisting of supporting-blocks formed with recesses adapted to receive "bearing-brasses" and with open-sided fluid grooves or channels; bearing-brasses adapted to be seated within the recesses in the supporting-blocks and to constitute closures of the fluid grooves or channels therein; and a suitable connecting-conduit between the fluid grooves or channels and a supply of water or other cooling agent, substantially as and for the purpose set forth.

Signed at Newcastle, in the county of Lawrence and State of Pennsylvania, this 5th day of October, A. D. 1903.

JOHN T. HORNER.

Witnesses:

L. A. JOHNSTON,

GEO. W. MILLER.