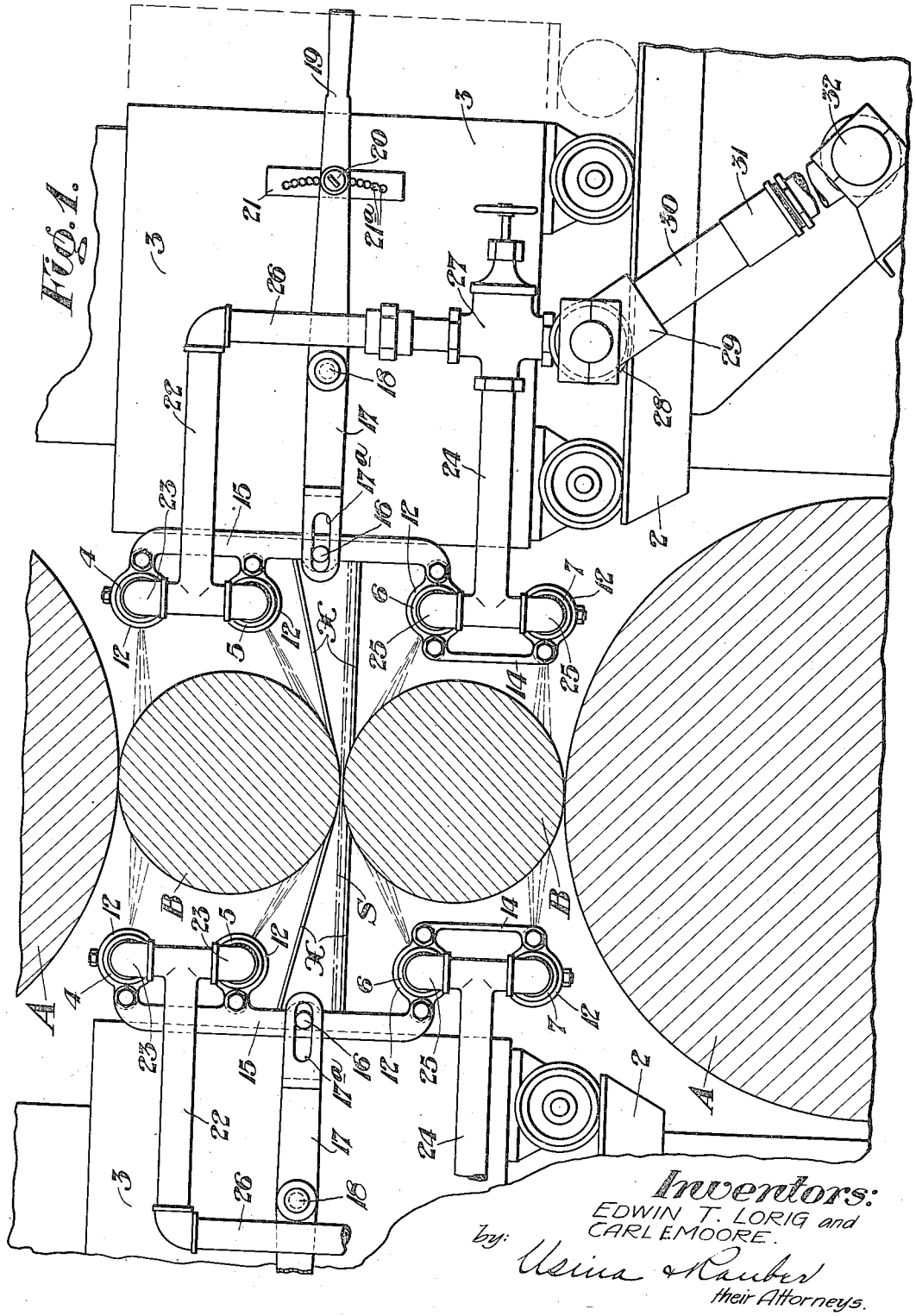
March 19, 1935. E. T. LORIG ET AL 1,994,721

APPARATUS FOR MAINTAINING CONSTANT THE TEMPERATURE OF METAL WORKING ROLLS

Filed Nov. 13, 1933 3 Sheets-Sheet 1

Fig. 1.



Inventors:
EDWIN T. LORIG and
CARL E. MOORE.
by: Ussina & Rauber
their Attorneys.

March 19, 1935. E. T. LORIG ET AL 1,994,721

APPARATUS FOR MAINTAINING CONSTANT THE TEMPERATURE OF METAL WORKING ROLLS

Filed Nov. 13, 1933 3 Sheets-Sheet 2

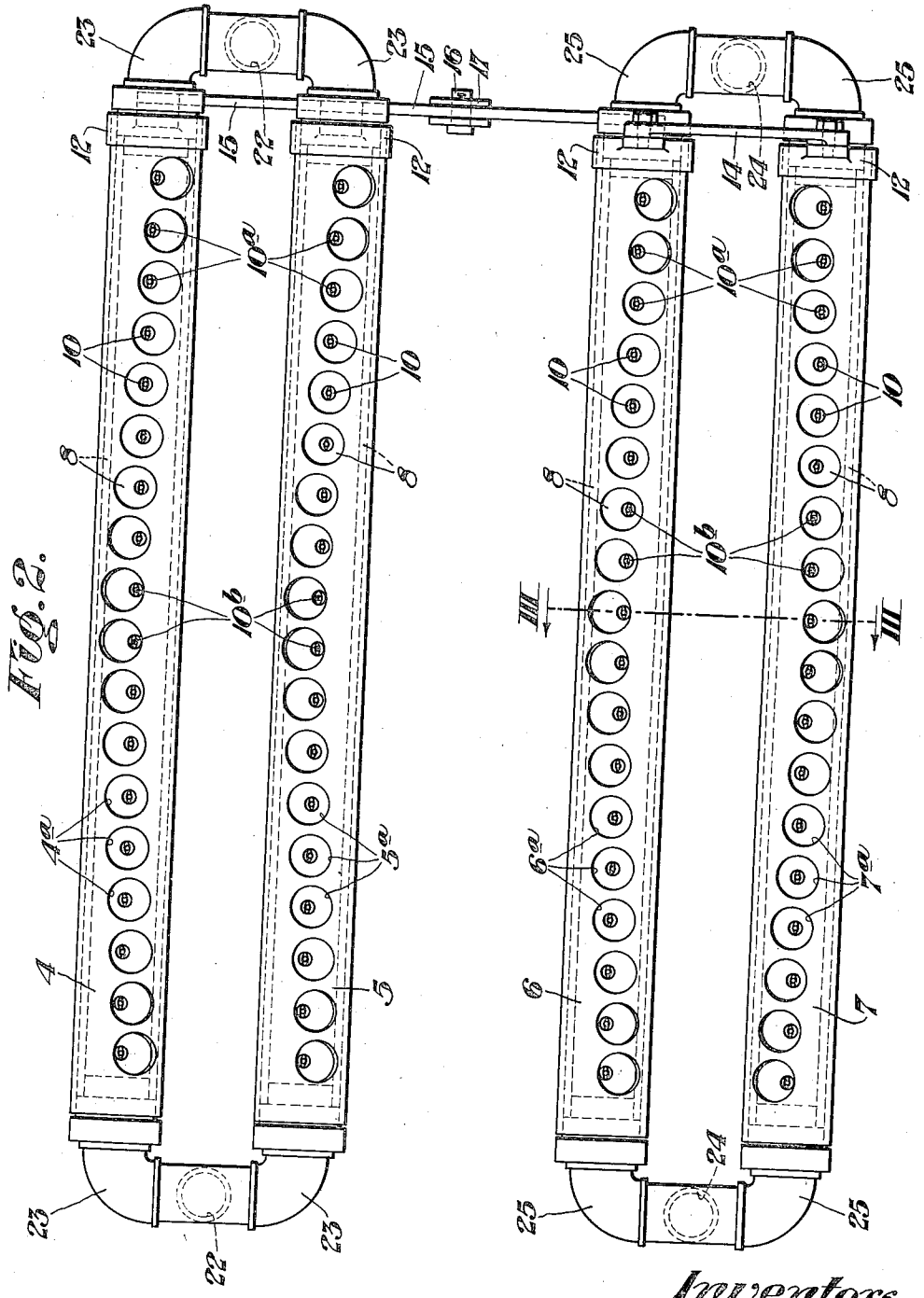


Fig. 2.

Inventors
EDWIN T. LORIG and
CARLE MOORE.
by: Usina & Raubar
their Attorneys.

March 19, 1935. E. T. LORIG ET AL 1,994,721

APPARATUS FOR MAINTAINING CONSTANT THE TEMPERATURE OF METAL WORKING ROLLS

Filed Nov. 13, 1933 3 Sheets-Sheet 3

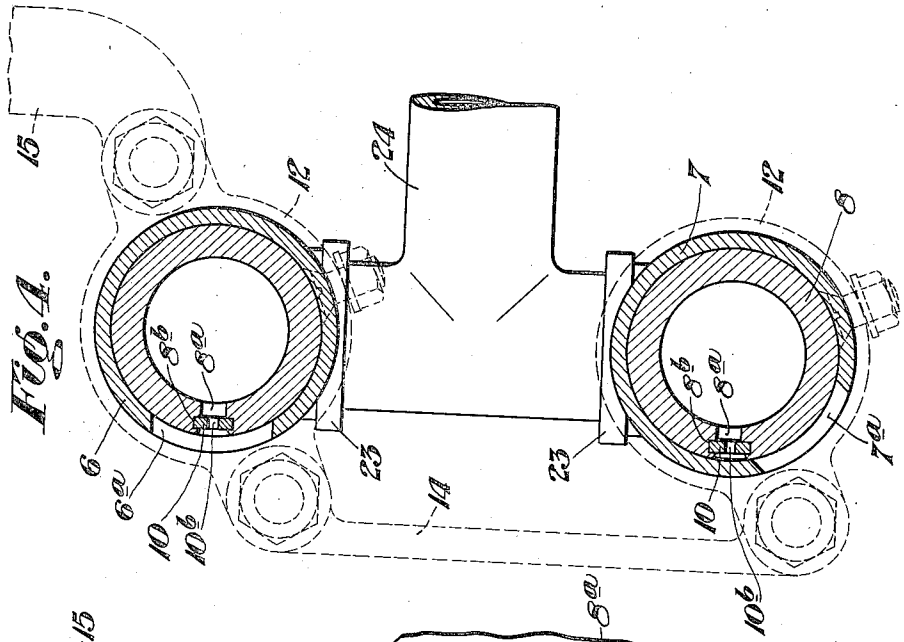


Fig. 4.

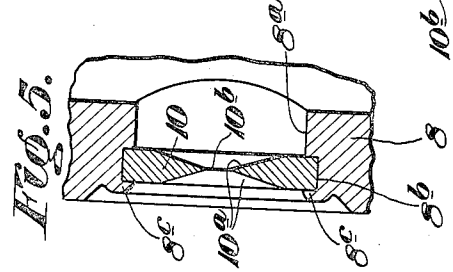


Fig. 5.

Fig. 3.

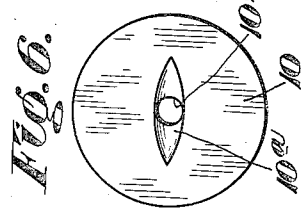


Fig. 6.

Inventors:
EDWIN T. LORIG and
CARL E. MOORE.
by: Ulrich & Lauber
their Attorneys.

Patented Mar. 19, 1935 1,994,721

UNITED STATES PATENT OFFICE

1,994,721

APPARATUS FOR MAINTAINING CONSTANT THE TEMPERATURE OF METAL WORKING ROLLS

Edwin T. Lorig and Carl E. Moore, Gary, Ind., assignors to American Sheet and Tin Plate Company, a corporation of New Jersey

Application November 13, 1933, Serial No. 697,862

2 Claims. (Cl. 80—41)

This invention relates to a method and apparatus for maintaining constant the temperature of metal working rolls, and particularly those employed in cold reduction units of the "4-high" type, although not limited thereto.

In the use of metal working rolls for processing various commercial shapes considerable difficulty arises if their temperatures are not maintained constant. It is impossible under these circumstances to properly maintain the contours of the rolls, and uneven processing results. This is particularly true in the manufacture of continuous strip material for commercial sheets and plates by the use of cold reduction units for obtaining finished surfaces.

For some time past cold reduction units of the well known "4-high" type have been used to effect reductions of very substantial lengths of strip material. However, this operation has not been attended with the most satisfactory results for the reason that the rolls acquire heat not only from frictional contact with the material being processed, but from the internal heat generated in the material even though it is initially cold; and their contours are accordingly changed.

At the present time the settings of the various rolls are frequently changed in an attempt to overcome changes in the contours of roll bodies accruing from increments of heat imparted to them, which heat increments pyramid in the rolls, increasing the temperature to the point where steel or alloy rolls tend to "puff" or suddenly swell, thus causing loss of contour control entirely, with resultant damage or loss of processed material.

In accordance with the teachings of the present invention all of these difficulties are overcome to such an extent that processing may be carried on with highly efficient results in the yield of product, and the obviating of frequent and troublesome adjusting operations.

One object of the present invention is to provide a novel method and apparatus for maintaining constant and uniform the temperature of metal working rolls throughout their lengths, and at the same time provide means for maintaining sufficiently low roll temperatures at relatively high rolling speeds to prevent "puffing" of the rolls.

Another object is the provision of means for selectively spraying a coolant on various portions of the bodies of metal working rolls, resulting in the maintenance of a constant temperature and diameter.

These and further objects will be apparent after referring to the drawings, in which:

Figure 1 is an elevation of the device of the invention as used in connection with a 4-high mill, the latter being shown in section.

Figure 2 is a side elevation of part of the apparatus of Figure 1.

Figure 3 is a sectional end view on the line III—III of Figure 2.

Figure 4 is a view similar to Figure 3 of the apparatus at another stage of operation.

Figure 5 is a fragmentary sectional detail elevation of part of the apparatus.

Figure 6 is an elevation of a part of the detail of Figure 5.

Referring more particularly to the drawings, the letter A designates a pair of large backing-up rolls between which there is disposed a pair of smaller metal working rolls B.

A trackway 2 is provided on either side of the backing-up and metal working rolls A and B, respectively, and adapted to support a wheeled carriage 3.

A pair of dispensing outer tubes are provided adjacent each of the metal working rolls B—B, as at 4, 5, 6 and 7, and on either side thereof. The dispensing tubes 4, 5, 6 and 7 are provided with apertures 4^a, 5^a, 6^a and 7^a arranged arcuately throughout a substantial portion of their respective lengths. In practice, the apertures 4^a, 5^a and 6^a are adapted to curve toward and away from their upper mid-portions, while the apertures 7^a of the lowermost tubes 7 curve toward and away from their lower mid-portions.

An inner tube 8 is journaled for a substantial portion of its length in each of the outer dispensing tubes 4, 5, 6 and 7, and provided with a plurality of apertures 8^a which are arranged in a position parallel with respect to its axis. These parallel apertures 8^a are adapted to be successively aligned with the apertures 4^a, 5^a, 6^a and 7^a of the various outer dispensing tubes.

Each of the apertures 8^a is provided with a standard disk type spray nozzle 10 having a groove 10^a on each of its sides which are adapted to extend in the direction of the axis of the tube 8, and a concentric opening or spray orifice 10^b. As shown in Figure 5, the disks 10 are disposed in seats 8^b in the respective apertures 8^a and a portion of the metal of the tube 8 is upset, as at 8^c, to maintain the same in position.

A collar 12 is connected to one of the ends of each of the various tubes 8 and those for the lower dispensing tubes 6 and 7 are connected together by means of a link 14. The collars 12 for the tubes 8 in each of the lower dispensing tubes 6 and those for the upper dispensing tubes 4 and

5 are connected together by means of a common link 15, which carries a pin 16 intermediate its length. A lever 17 is provided with a slot 17a in which the pin 16 is adapted to ride, and is pivoted, as at 18, to the wheeled carriage 3. The lever 17 carries at its outer extremity a handle portion 19 and an adjacent pin 20, a plate 21 being secured to the carriage 3 and provided with a plurality of apertures 21a in which the pin 20 is adapted to seat. Each of the carriages 3 carries a supply conduit 22 and connections 23 for supplying the inner tubes 8 of each of the upper dispensing tubes 4 and 5, while a similar supply conduit 24 is provided with connections 25 for supplying the inner tube 8 for each of the lower dispensing tubes 6 and 7. The supply conduits 22 and 24 on each of the carriages 3 are each connected to a pipe 26 and a valve 27, to which there is connected a pivotal coupling 28, sleeve coupling 29 and a pipe 30. The pipes 30 are each connected at their other ends to a sleeve 31 which is, in turn, connected to a pivotal coupling 32. A suitable coolant is supplied to the pivotal coupling 32 in any suitable manner.

Referring to Figure 1 of the drawings, the material being processed is indicated by the letter S. If it is desired to reverse the direction of rolling in accordance with well known principles, scraping or stripping devices are employed for cleaning the roll bodies on the sides on which the strip emerges from between the metal working rolls B. These stripper devices are generally indicated at X, and form no part of the present invention, being the subject matter of a co-pending application of Lawrence S. Dahl and John L. Peet, filed October 19, 1933, entitled "Method and apparatus for cleaning metal working rolls", and bearing Serial No. 694,315.

In practice, the disposition of the apertures 8a of the inner tubes 8 with respect to the arcuated apertures of each of the outer dispensing tubes 4, 5, 6 and 7 is suitably adjusted by the handles 19 of the levers 17 on each side of the mill. Due to the parallel relationship of each of the series of apertures 8a, the operation of the various arcuated apertures is progressed from the center of the tubes outwardly and inwardly from their ends. This is for the reason that it may be desired to cool the ends, or intermediate portions, of the roll bodies to the exclusion of other areas. The dispensing tubes 4, 5 and 6 function simultaneously, while the lowermost dispensing tube 7 is arranged oppositely for the reason that even though the former group is inoperative the latter will still function at a point adjacent the bottom of the lower working roll B and tend to cool it and indirectly its cooperating backing-up roll A. The quantity and intensity of the spray for at least one of the metal working rolls B can be regulated so as to be progressively, proportionately and simultaneously increased or decreased toward or away from the ends thereof.

Referring to Figures 3 and 4 of the drawings, the various stages of operation of the dispensing tubes 6 and 7 are illustrated.

While we have shown and described one specific embodiment of our invention it will be understood that we do not wish to be limited thereto, since various modifications may be made without departing from the scope thereof, as defined in the following claims.

We claim:

1. In combination with a metal working mill, a carriage mounted on each side of said mill and adapted for movement with respect thereto, a plurality of tubes mounted on each of said carriages and having apertures arranged arcuately throughout a substantial portion of their lengths, a second tube journaled throughout a substantial portion of its length in each of said first named tubes and having apertures arranged for successive alinement with the apertures in said first named tubes when said last named tubes are rotated, means for enabling the simultaneous rotation of each of said last named tubes, means carried by said carriage for conducting a coolant to each of said last named tubes, and supply means for said conducting means.

2. In combination with a metal working mill, a carriage mounted on each side of said mill and adapted for movement with respect thereto, a plurality of tubes mounted on each of said carriages and having apertures arranged arcuately throughout a substantial portion of their lengths, a second tube journaled throughout a substantial portion of its length in each of said first named tubes and having apertures arranged for successive alinement with the apertures in said first named tubes when said last named tubes are rotated, means for enabling the simultaneous rotation of each of said last named tubes, means carried by said carriage for conducting a coolant to each of said last named tubes, supply means for said conducting means, and slip couplings for said supply means.

EDWIN T. LORIG.
CARL E. MOORE.