Oct. 16, 1962 F. S. BLOOM 3,058,731

INTERNALLY COOLED CONVEYOR ROLL

Filed July 17, 1959

Fig. 1.

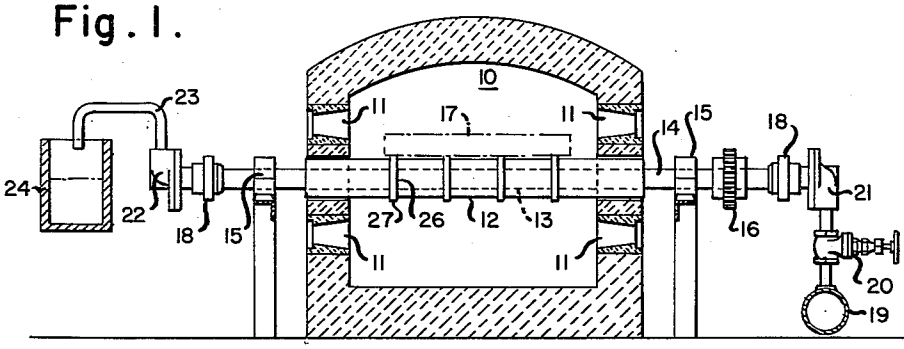



Fig. 2.

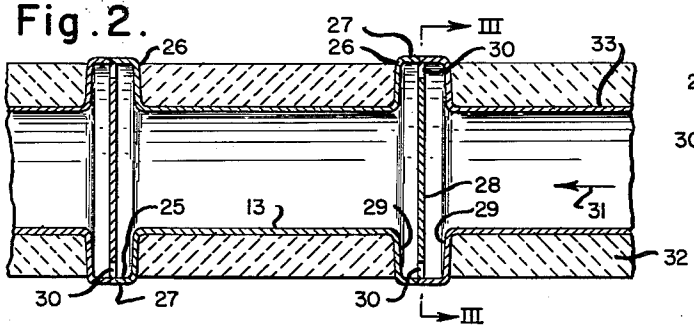



Fig. 3.

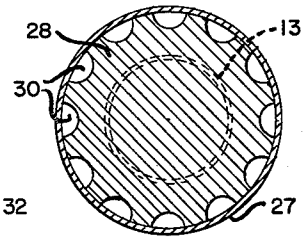



Fig. 4.

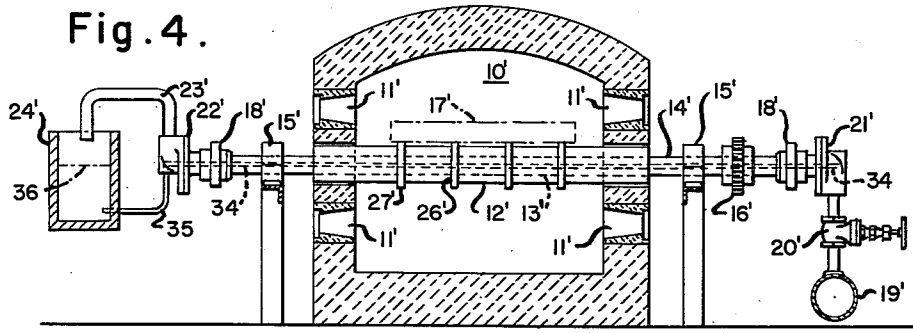



Fig. 5.

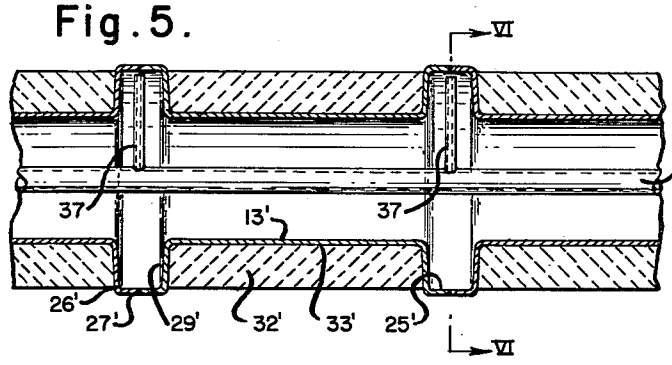
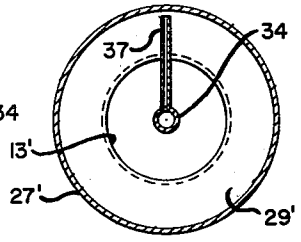



Fig. 6.

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# INTERNALLY COOLED CONVEYOR ROLL

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4 Claims. (Cl. 263—6)

This invention relates to an internally cooled conveyor roll utilizable in or in connection with industrial furnaces. More particularly, this invention pertains to water-cooled rolls for roller hearth furnaces for the metal industries.

In the heating of intermediate steel shapes to finish temperatures above 2000° F. while supportably conveying them on rolls, the use of alloy rolls is expensive and often subject to undue deterioration. This is particularly the case where the shapes are to be heated to final temperatures in the neighborhood of 2250° F. and above. On the other hand, when conventional water-cooled rolls are used under such furnace conditions, transversely spaced peripheral supports generally are utilized to support the work and even though welded to the water-cooled roll, they tend to deteriorate relatively quickly, necessitating removal of the roll for reconditioning or replacement and to impair refractory which may be against them. In the instant invention, internally cooled conveyor rolls are provided which are relatively trouble-free, less expensive and longer lasting, even under relatively high temperature furnace conditions. Furthermore, such conveyor rolls are uniformly cooled with consequent avoidance of overheated or weakened portions which contribute to reduced roll life. Preferably, the new conveyor rolls will be covered with refractory between the work supporting portions thereof to inhibit heat losses, minimize chilling of the furnace and work and to protect the rolls. Such refractory may also enable such rolls to be made out of relatively less expensive steel, or other suitable material.

Other objects, features and advantages of this invention will be apparent from the following description and the accompanying drawings, which are illustrative only, in which:

FIGURE 1 is a schematic view in cross section of a roller hearth furnace illustrating one internally cooled conveyor roll embodiment of this invention;

FIGURE 2 is a longitudinal sectional view of a portion of the conveyor roll shown in FIGURE 1;

FIGURE 3 is a view taken along line III—III of FIGURE 2;

FIGURE 4 is a view similar to FIGURE 1 showing another conveyor roll embodiment of this invention;

FIGURE 5 is a longitudinal sectional view of a portion of the conveyor roll shown in FIGURE 4; and

FIGURE 6 is a view taken along line VI—VI of FIGURE 5.

Referring to FIGURES 1 to 3, inclusive, of the drawings, a cross section of a refractory lined furnace **10** is illustrated having a horizontal roller hearth therein for the heating and heat treatment of work such as slabs, blooms, sheets, plates or other shapes of steel or other metal or material. Furnace **10** may be heated by burners (not shown) firing through ports **11** above and below the hearth itself. The hearth comprises a plurality of transversely extending longitudinally spaced conveyor rolls **12** of this invention. Each roll **12** comprises a water-cooled body **13** having ends **14** projecting beyond the sides of the furnace for journaling in bearings **15**. A gear **16** may be secured to one end of the roll body for the turning thereof in accordance with the turning of the other rolls in the hearth to supportably convey work **17** through furnace **10** for the heat treatment of such work. A



rotary seal in joint **18** is provided at each end of the roll **12**, one of such joints being supplied by coolant such as water through a main **19**, through a regulating valve **20** and an elbow **21** to the stationary portion of the joint **18**, the other portion of which revolves with the roll while maintaining the seal therein. At the other end, the effluent coolant passes out through an elbow **22** and a pipe **23** to a sump **24** from which the coolant is discharged to a sewer or recirculated through a cooling tower for return or otherwise handled as desired.

As shown, body **13** may be made of high strength steel pipe sections with the ends **25** of those sections swaged to a diameter greater than the diameter of the cylindrical conduit portion of the body **13** between such ends. The swaged ends of abutting sections may be welded together in a watertight joint to form integral annular disks **26** with peripheral faces **27** to supportably convey the work **17**. Before the opposed adjoining ends **25** are welded or otherwise secured together, a distributor plate **28** is positioned in each disk **26** transverse to the axis of the roll and spaced from the respective sides **29** thereof. The plates **28** are secured in place by welding or otherwise and are provided with circumferentially spaced openings **30**, the aggregate area of which will cause the coolant water to spurt through such openings when water fills and is forced through the interior of each roll **12** in the direction of arrow **31**. Thereby, such water will flow over and wipe the entire interior of the roll body **13** inclusive of the disks **26** in generally uniform manner around the axis of the roll to prevent "hot spots" and inhibit the formation of any gas pocket within the disk **26**. The initial pressure head of the coolant will be sufficient to provide a suitable pressure drop across each plate **28** before the coolant reaches discharge pipe **23**. Such distributor plates **28** may also serve to rigidify the roll construction. Precast or castable refractory material **32** is employed to cover the sides **29** and cylindrical surfaces **33** of the conveyor roll body sections in higher temperature furnaces especially to inhibit deterioration of the roll and chilling of the work and furnace.

In the modified embodiment shown in FIGURES 4 to 6, inclusive, parts generally corresponding in construction and functioning are provided with the same reference numerals, respectively, with the addition of a prime accent thereto. In such modified embodiment, the internally cooled roll body **13'** may be made in sections as aforesaid and assembled without the use of distributor plates. However, a stationary outlet manifold **34** is provided so as to extend through the body **13'**. The right hand end of manifold **34**, as shown in FIGURE 4, may be supported in fixture **21'** and plugged or otherwise separated from the stream of coolant water passing through that fixture **21'**. The left hand end of manifold **34** is supported in stationary fixture **22'** and has an outlet therefor which is separate from the water outlet to which discharge pipe **23'** is connected. A vent pipe **35** communicates with the left hand end of manifold **34** to conduct gas, such as steam, passing therethrough into a body of discharged coolant liquid **36** in sump **24'**. Vertical intake branches **37** are fastened to manifold **34** with the upper ends thereof adjacent to the inside of the topmost point or crest of the respective faces **27'**, whether the rolls **12'** are turning, or are stationary at the time being. Thus, any gas which may tend to accumulate inside the disks **26'** will vent itself through the intakes **37** and manifold **34** to insure liquid coolant contact against the whole of the interior of each roll **12'** inclusive of the hollow annular disk portions **26'** thereof.

Various changes may be made in the illustrated embodiments and other embodiments provided without de-

parting from the spirit of this invention or the scope of the appended claims.

I claim:

1. A water-cooled conveyor roll comprising, in combination, a plurality of body sections in end-to-end relation, at least some of said body sections having their respective adjoining ends in enlarged form and joined to form hollow annular disks along said roll, a distributor plate having openings therethrough around its circumference and secured within each disk across the entire interior thereof between the respective sides of said disk, the area of the openings through said distributor plate being less than the adjacent cross section for coolant flow, means for admitting coolant directly to the whole interior of said roll at one end and discharging it from the other, and refractory fixed to the periphery of said roll and covering the same inclusive of the sides of said disks.

2. An internally cooled conveyor roll comprising, in combination, a plurality of tubular metal body sections in end-to-end relation, at least some of said body sections having their respective adjoining ends in enlarged form and joined to form hollow annular disks along said roll, and a distributor plate having openings therethrough around its outer portion and secured within each disk across the entire interior thereof between the respective sides of said disk and to the interior of the peripheral portion thereof, the area of the openings through said distributor plate being less than the adjacent cross section area for coolant flow.



3. A water-cooled conveyor roll comprising, in combination, a plurality of sections having cylindrical hollow metal body portions, a plurality of hollow metal annular disks between said portions with the respective interiors opening fully into each other, a distributor plate positioned across said sections within said disks and fixed to the interior thereof, said distributor plate having openings therethrough to direct water against the interior of said disks uniformly around the axis of said roll, and a refractory covering for and fixed to said portions.

4. A water-cooled conveyor roll comprising, in combination, a plurality of cylindrical hollow metal body portions, a plurality of hollow metal annular disks between said portions with the respective interiors opening into each other, and a plurality of distributor plates positioned at least in said disks respectively and having openings around the periphery of each thereof to promote and maintain water contact against the interior of said body including said disks, said plates being attached to the inside of said body respectively.

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