Feb. 20, 1951 H. OTTINGER ET AL 2,542,878

CONVEYING APPARATUS FOR FURNACES

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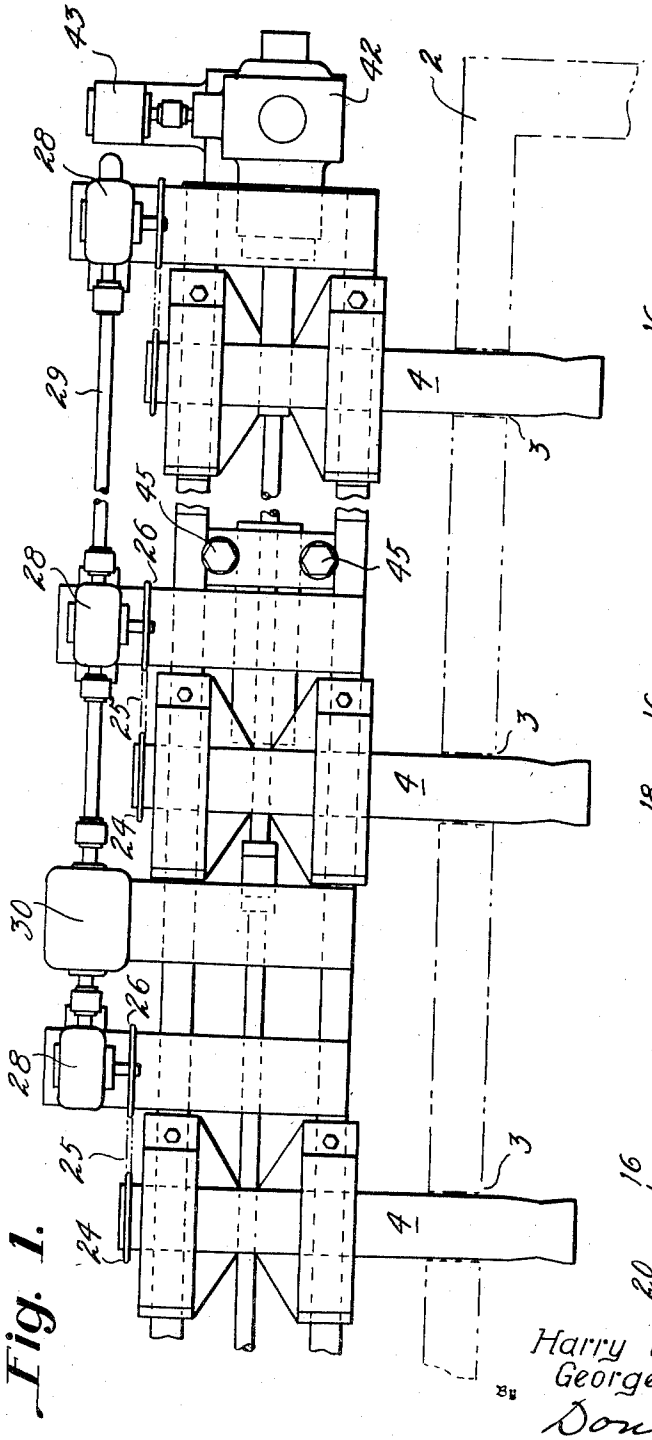


Fig. 1.

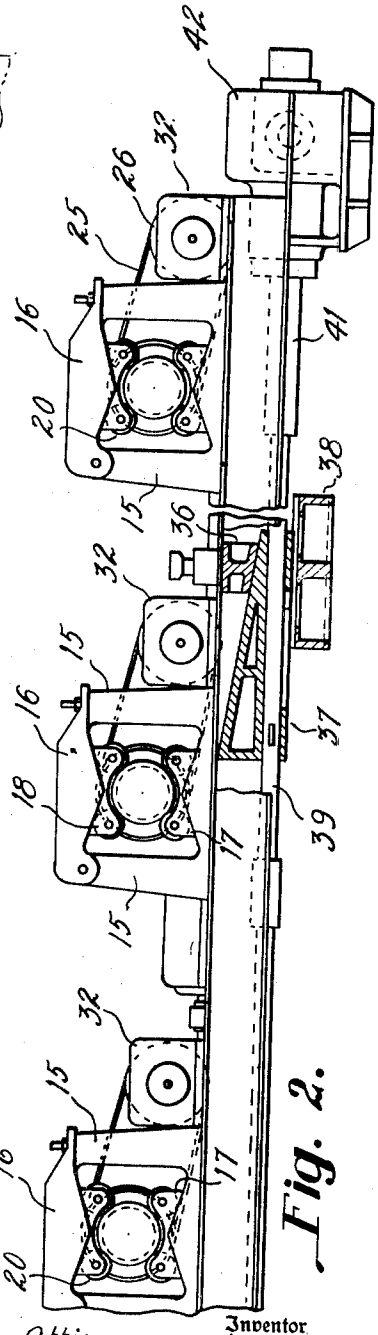


Fig. 2.

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Fig. 3.

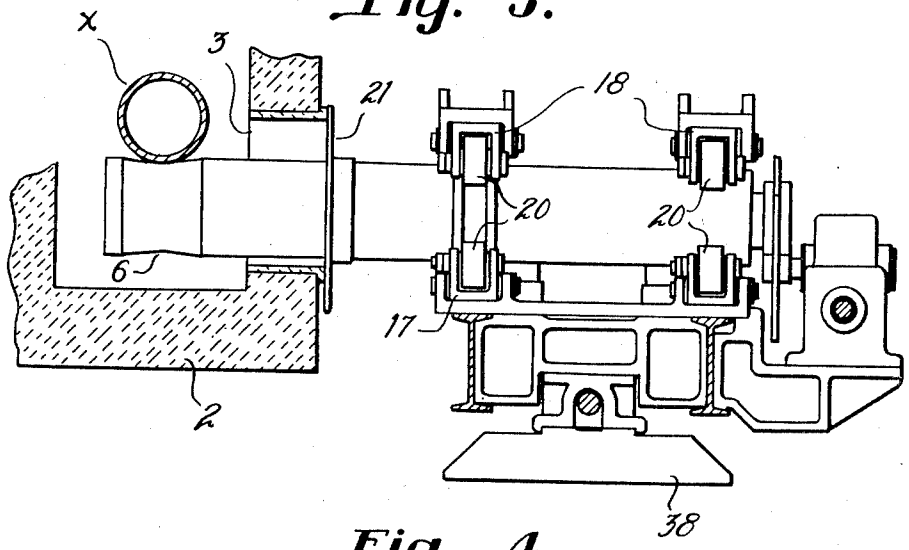
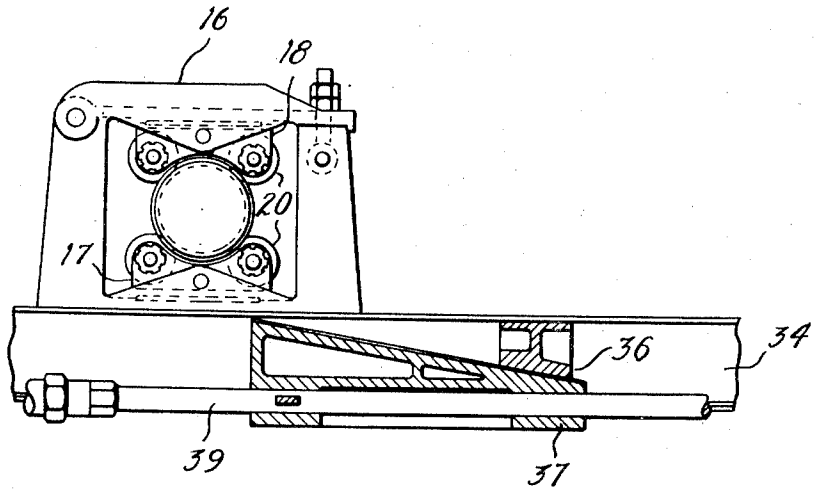


Fig. 4.



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Fig. 5.

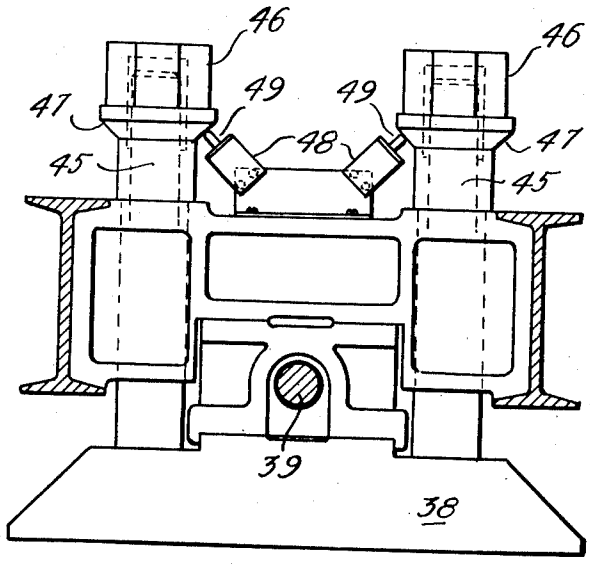
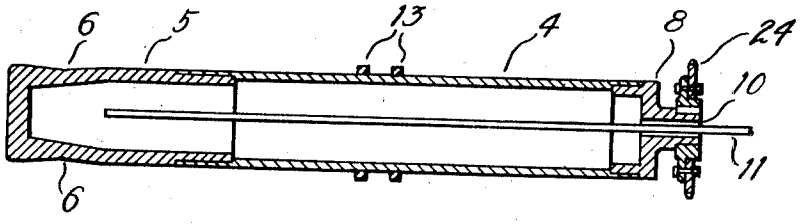


Fig. 6.



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UNITED STATES PATENT OFFICE

2,542,878

CONVEYING APPARATUS FOR FURNACES

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3 Claims. (Cl. 308—203)

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This invention relates to a conveying apparatus such as is used for conveying pipe and the like through heating furnaces.

In the manufacture of steel pipe, for example, the workpiece is passed through heating furnaces while supported on, and moved by, power-driven rolls. Usually these conveyor rolls are water-cooled, and sometimes they are supported exteriorly of the furnace into which they extend by outboard bearings. Such conveyor rolls must possess sufficient strength to carry the load of the moving workpiece and to withstand the additional stresses set up by the high temperature conditions within the furnace. Failure of a conveyor roll introduces a number of problems. An unexpected crack or failure in the body of the conveyor roll would permit the cooling water to escape and flow into the hot interior of the furnace. In case of a roll failure, it might not be convenient to shut down the mill and remove the damaged roll, wherefore it is sometimes decided to run the conveyor roll without the benefit of water cooling. The heat resulting from such an expedient is, of course, very hard on the bearings.

In order to obviate the foregoing disadvantages it is sometimes decided to disconnect a damaged conveyor roll from its driving medium and simply permit the said roll to function as an idle roll, postponing until some future convenient time the substitution of a new or spare role.

Because of the foregoing difficulties conveyor rolls of the type referred to usually have a comparatively short length of service.

It is among the objects of the present invention to provide a conveying apparatus for furnaces which obviates the difficulties described.

Another object is the provision of a conveying apparatus for furnaces which is highly efficient and durable in service and one which may be easily dismantled, repaired and replaced.

The invention, then, comprises the features hereinafter described and as particularly pointed out in the claims, the following description and the annexed drawings setting forth in detail certain illustrative embodiments of the invention, these being indicative of several of the number of ways in which the principles of the invention may be employed.

In said drawings:

Figure 1 is a fragmentary plan of a series of water-cooled conveyor rolls shown as extending into a heating furnace, the latter being shown fragmentarily and in dotted lines;

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Figure 2 is an elevation of a modification of the showing of Figure 1;

Figure 3 is an enlarged elevation, partly in section, taken at a point intermediate the length of the furnace;

Figure 4 is an end view, partly in section, of a portion of the showing of Figure 3;

Figure 5 is an elevation, partly in section, of an operating detail; and

Figure 6 is a sectional view of the water-cooled roll per se.

Referring more particularly to the drawings, the numeral 2 designates a furnace of elongate construction through which it is desired to continuously pass the workpieces to be heat treated, for example steel pipe, as hereinbefore mentioned. Such a furnace may be used for annealing, warm-working, etc. In the operation of the continuous furnace 2, it is essential that the workpiece be supported at a plurality of points throughout the length of the furnace. For this reason it is necessary to so dispose a number of water-cooled conveyor rolls as to extend into the furnace 2 through suitably spaced apertures 3.

The water-cooled conveyor roll of the present invention comprises a tubular body portion 4, an outward hollow extension 5 having a pipe-receiving groove 6 therein, and an inward extension 8 in the form of a cap or closure. Preferably, but not necessarily, all three of the elements 4, 5 and 8 are steel castings which may be telescoped together in the manner shown in Figure 6. In addition, the inward extension 8 has an aperture 10 through which there extends a tube 11 for the purpose of conveying cooling water to the interior of the water-cooled conveyor roll.

Referring still to Figure 6, the mid-portion of the tubular body portion 4 to the conveyor roll is provided with a pair of spaced annular rings 13 which are attached in any suitable manner, for example by welding, shrink-fitting, etc.

As shown in Figure 2, each of the water-cooled conveyor rolls is supported by, and extends from, a bearing housing 15, one of the latter being disposed opposite each of the apertures 3 in the side wall of the furnace 2.

To the top of each of the bearing housings 15 there is connected a hinged cap 16. The bottom of each of the bearing housings 15 carries a lower rocker arm 17, while a similar rocker arm 18 is carried on the bottom of each of the hinged caps 16. Each of these rocker arms 17 and 18 carries a pair of spaced "grindstone" type alloy

steel bushed roller bearings, the same being generally indicated at 20. Finished races (not shown) on the tubular body portion 4 of each of the water-cooled conveyor rolls are engaged by the "grindstone" type roller bearings 20 and cause the said rolls to rotate smoothly. The spaced annular rings 13 act as a thrust collar for the opposed "grindstone" type bearing assemblies in one of the housings 15 opposite each of the apertures 3 in the furnace 2 (see Figure 2), thereby preventing lateral shifting of the water-cooled rolls within the furnace.

To each of the water-cooled rolls there is keyed a baffle plate 21 which shields the adjacent "grindstone" bearings 20 from the hot gases which tend to escape from the furnace through the apertures 3.

According to the foregoing construction and arrangement, each of the water-cooled rolls is provided with cantilever type bearings which are disposed entirely exteriorly of the furnace 2 and are protected against the escape of the furnace gases through the apertures through which the water-cooled rolls extend. In addition, each of the water-cooled rolls is supported and aligned by an 8-point bearing comprising four rocker arms 17—18, of which each carries two spaced "grindstone" type bushed alloy steel roller bearings. In the case of each of the water-cooled rolls, two of the rocker arms are disposed below its horizontal center line and two are disposed above the said center line. The substantial spacing of each cooperating pair of upper and lower bearing assemblies lends rigidity to the water-cooled rolls supported thereby. The hinged caps 16 permit expeditious removal of the adjacent water-cooled roll without disturbing any of the other parts of the apparatus.

The water-cooled rolls may be driven in any suitable manner, as for example by attaching a sprocket 24 to each of the water-cooled rolls and connecting the same through a chain 25 with a sprocket 26 of an adjacent speed-reducing unit 28, all of the said units being connected by a line shaft 29.

A motor 30 with shaft extension on both ends thereof may be inserted directly in the line shaft 29, and driving through the individual speed-reducing units 28 power may be diverted laterally from the driving shaft to each of the water-cooled rolls at suitable speeds through the said chain and sprocket drives.

According to the immediately foregoing construction and arrangement any individual speed-reducing unit 28 may be removed from the driving mechanism through the medium of flexible couplings and a straight section of the motor driven line shaft 29 substituted therefor, thus keeping the line shaft intact. Or, if desired, the chain 25 may be removed from the sprockets and any one of the water-cooled rolls taken out of operation.

Referring to Figure 2, the water-cooled rolls may, if desired, be driven through the chain and sprocket arrangement hereinbefore described, but from adjacently disposed individual motors 32.

It is proposed to so dispose the water-cooled rolls that the same may be elevated and lowered in a unitary fashion to thereby accommodate workpieces of various sizes. More specifically, such supporting instrumentalities may take the form of a pair of spaced parallel rails

34 which extend throughout the length of the furnace and provide support for the bearing housings 15. The longitudinally extending rails 34 carry at suitable intervals cheek plates 36, a longitudinally movable wedge 37 being disposed between each of the cheek plates and a bearing pad 38 which is disposed immediately therebelow.

The longitudinally movable wedges 37 are unitarily moved through a connecting rod 39 to which motion is imparted by a threaded nut 41, the latter in turn receiving rotation from a conveniently disposed reversible electric motor 42. In order to maintain the stability of the construction after the series of wedges 37 has been so disposed as to properly elevate the water-cooled rolls, the supporting instrumentalities are locked in position upon the wedges by a series of spaced posts 45 which are firmly anchored or fixed to the bearing pads 38, the threaded upper ends of the posts being threaded to receive suitable heavy threaded nuts 46. When these nuts 46 engage the threaded upper ends of the spaced posts 45, premature starting of the reversible electric motor 42 (and operation of the series of wedges 37) may be prevented by utilizing a series of safety devices, each of which may take the form of a limit switch 48 having a plunger 49 which engages one of the heavy threaded nuts, the control circuit (not shown) being such that the said reversible electric motor 42 may be started only after all of the hold-down nuts are fully relieved or backed away.

While we have shown and described certain specific embodiments of the present invention, it will be readily understood by those skilled in the art that we do not wish to be limited exactly thereto, since various modifications may be made without departing from the scope of the invention as defined in the appended claims.

We claim:

1. A bearing structure for rotatably supporting a conveyor roll as a cantilever, comprising a pair of spaced bearing housings, each housing having a pair of vertically spaced rocker arms pivoted therein, each rocker arm having a plurality of bearing rollers journaled thereon, the rollers of said two housings being adapted to engage races spaced along the length of said roll.

2. A bearing structure as defined in claim 1 characterized by each of said housings including a cap pivoted to one side thereof, the upper of said rocker arms being mounted on said cap.

3. A bearing structure as defined in claim 1 characterized by the rollers in at least one of said housings cooperating with thrust-sustaining means on said conveyor roll to restrain axial movement thereof.

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GEORGE J. KIRCHNER.

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