Aug. 4, 1936. G. W. ELSEY 2,049,800

HEAT TREAT MACHINE

Filed Jan. 21, 1935 7 Sheets-Sheet 1

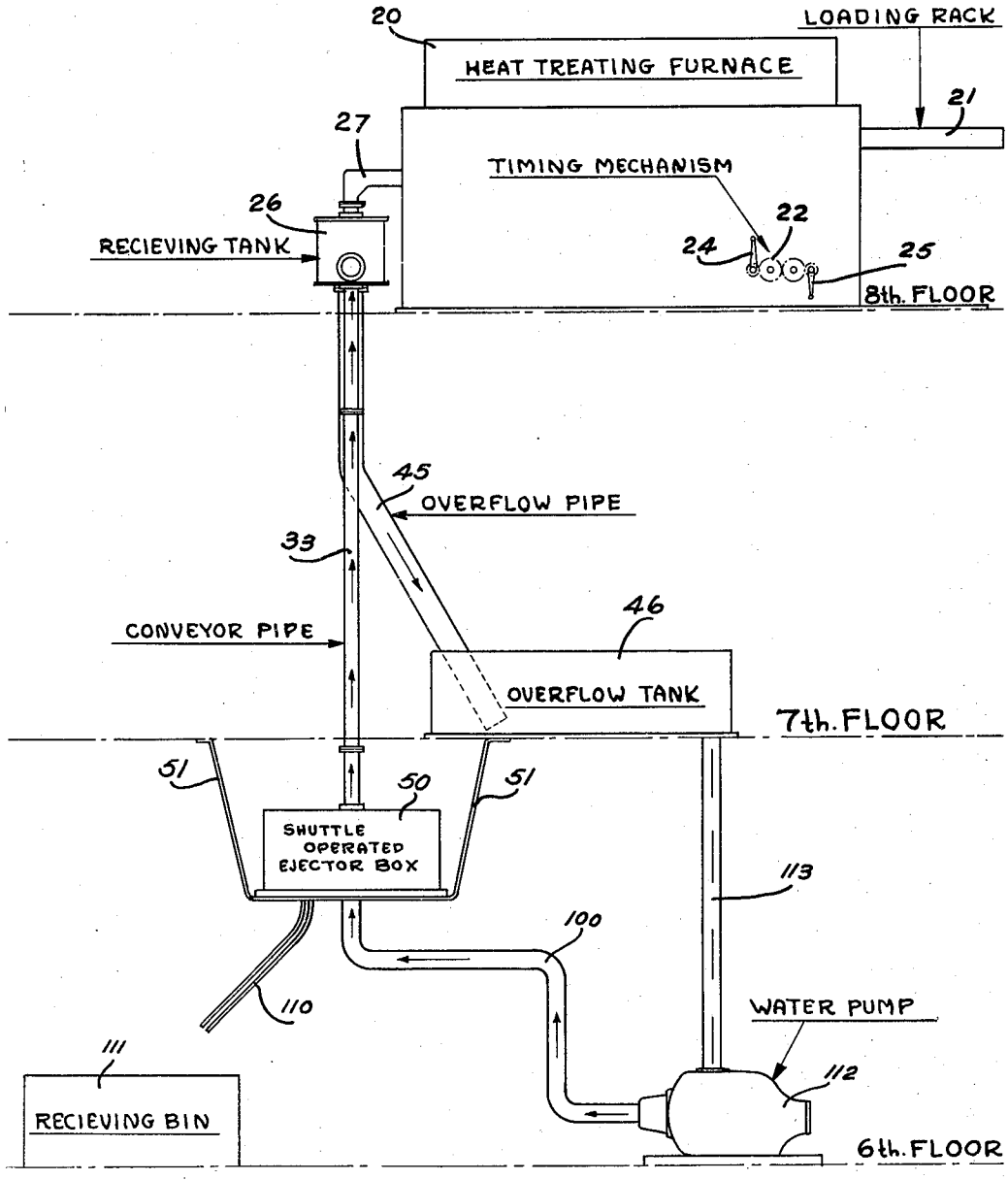


Fig. 1

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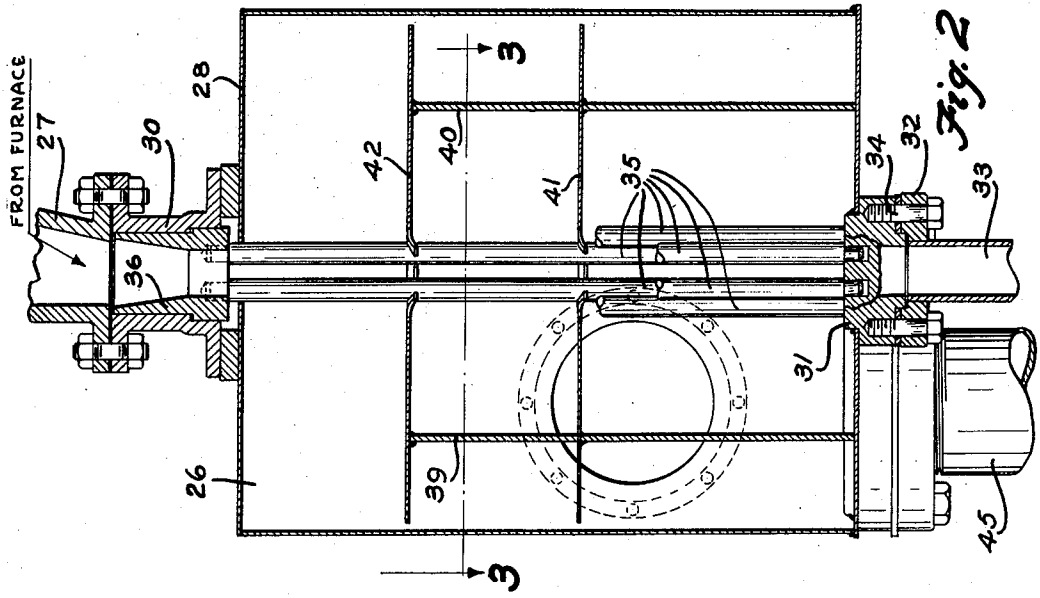


Fig. 2

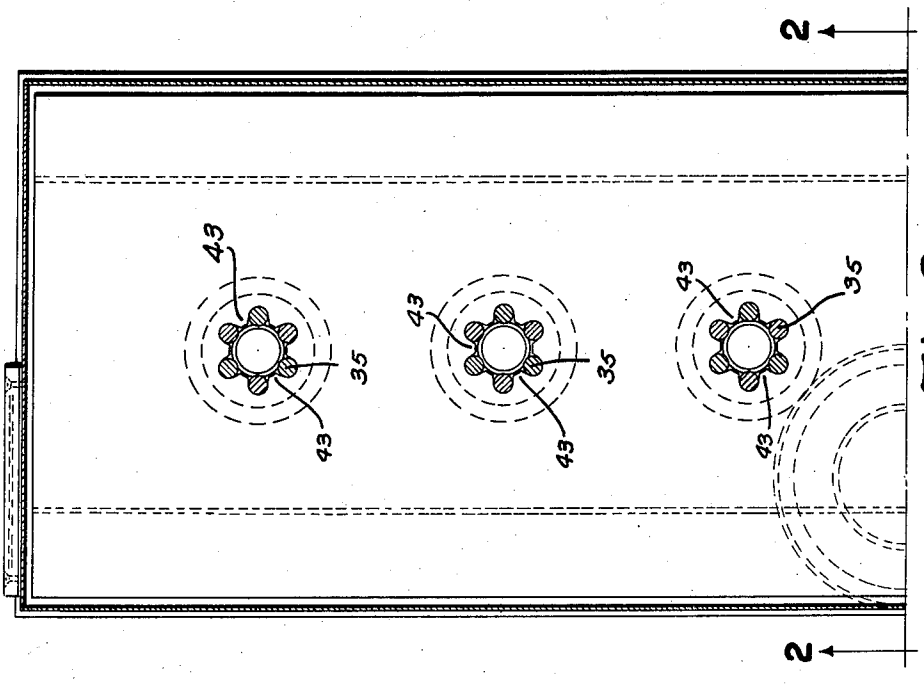


Fig. 3

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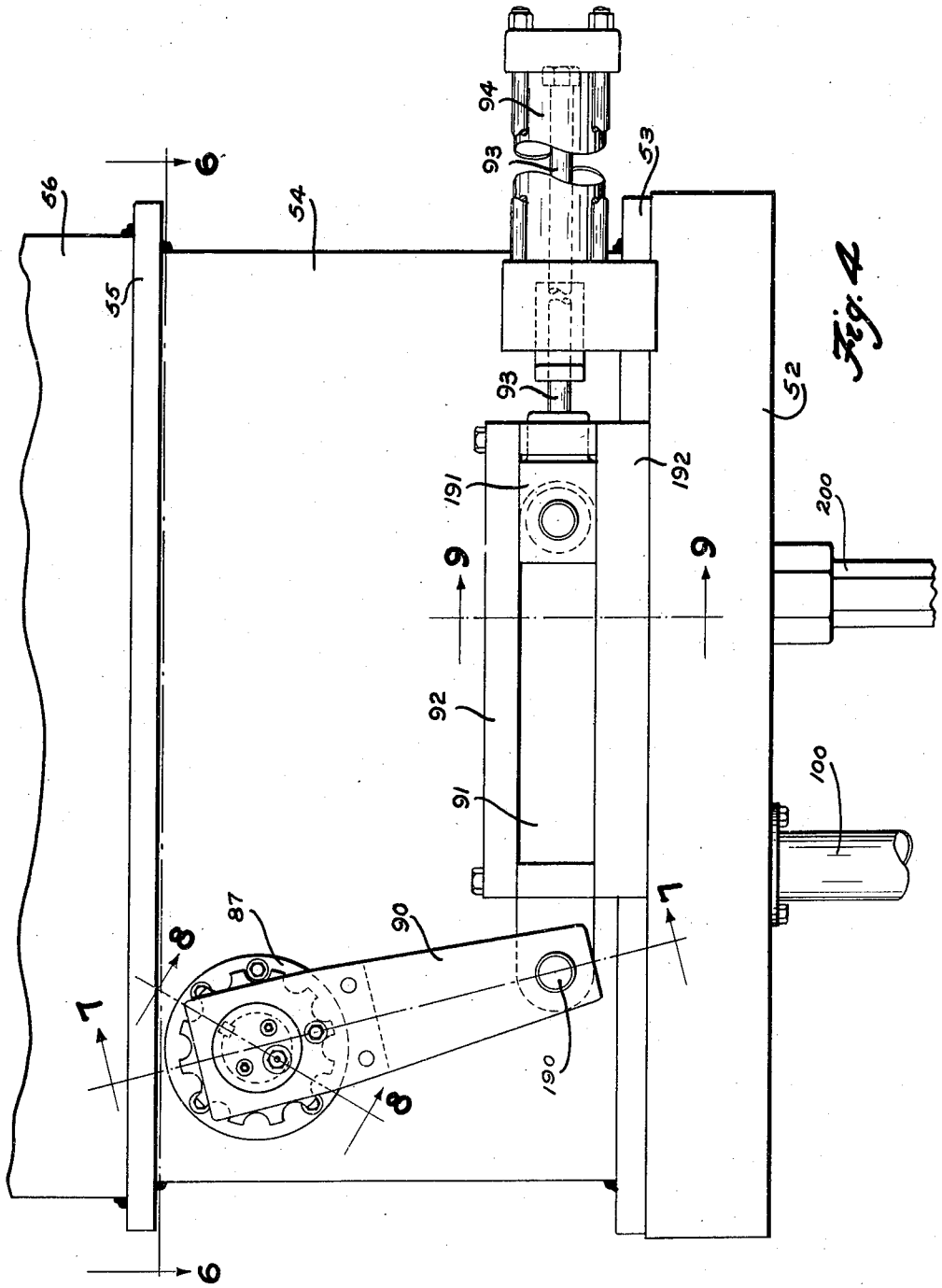


Fig. 4

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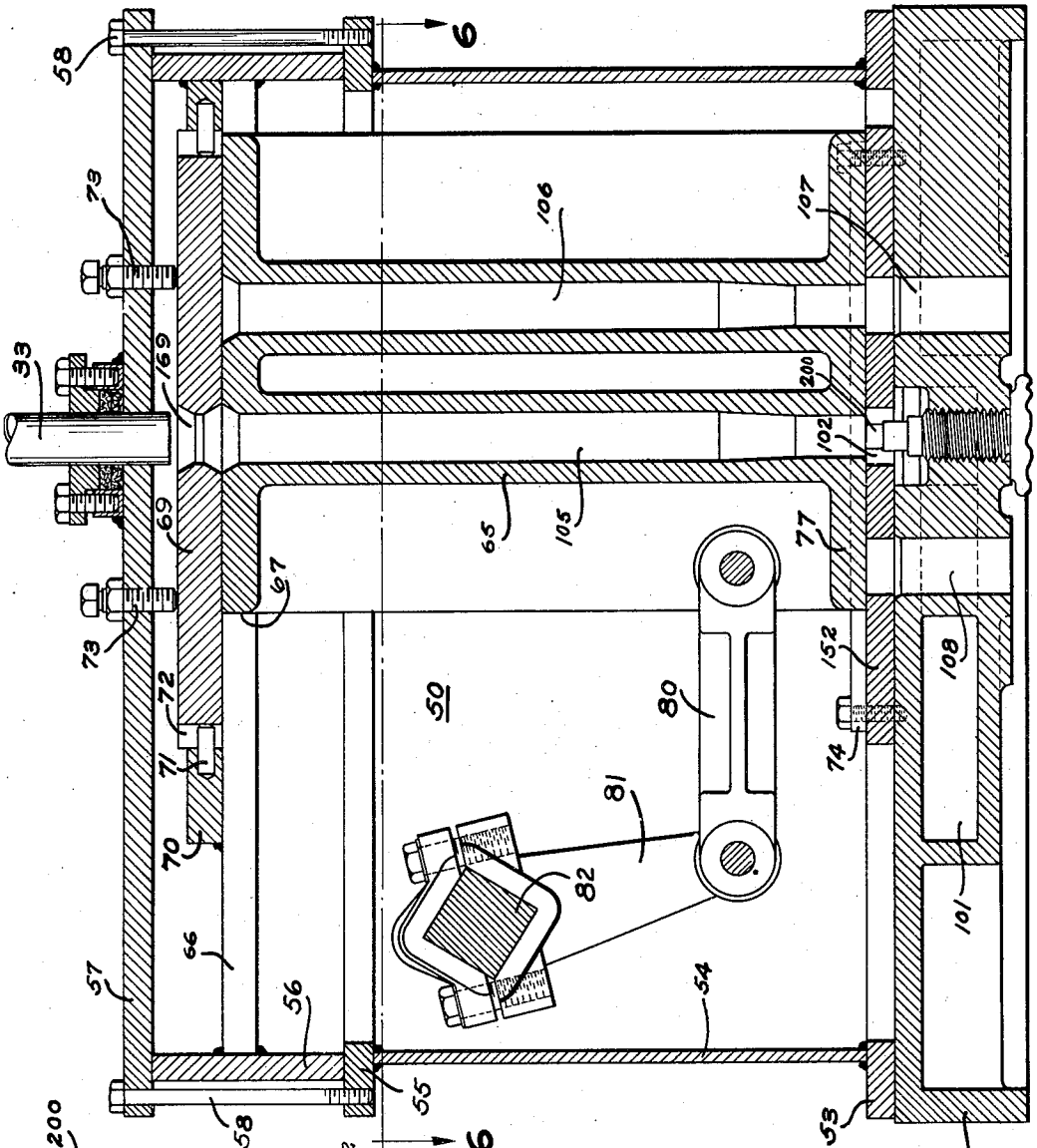


Fig. 5

Fig. 10

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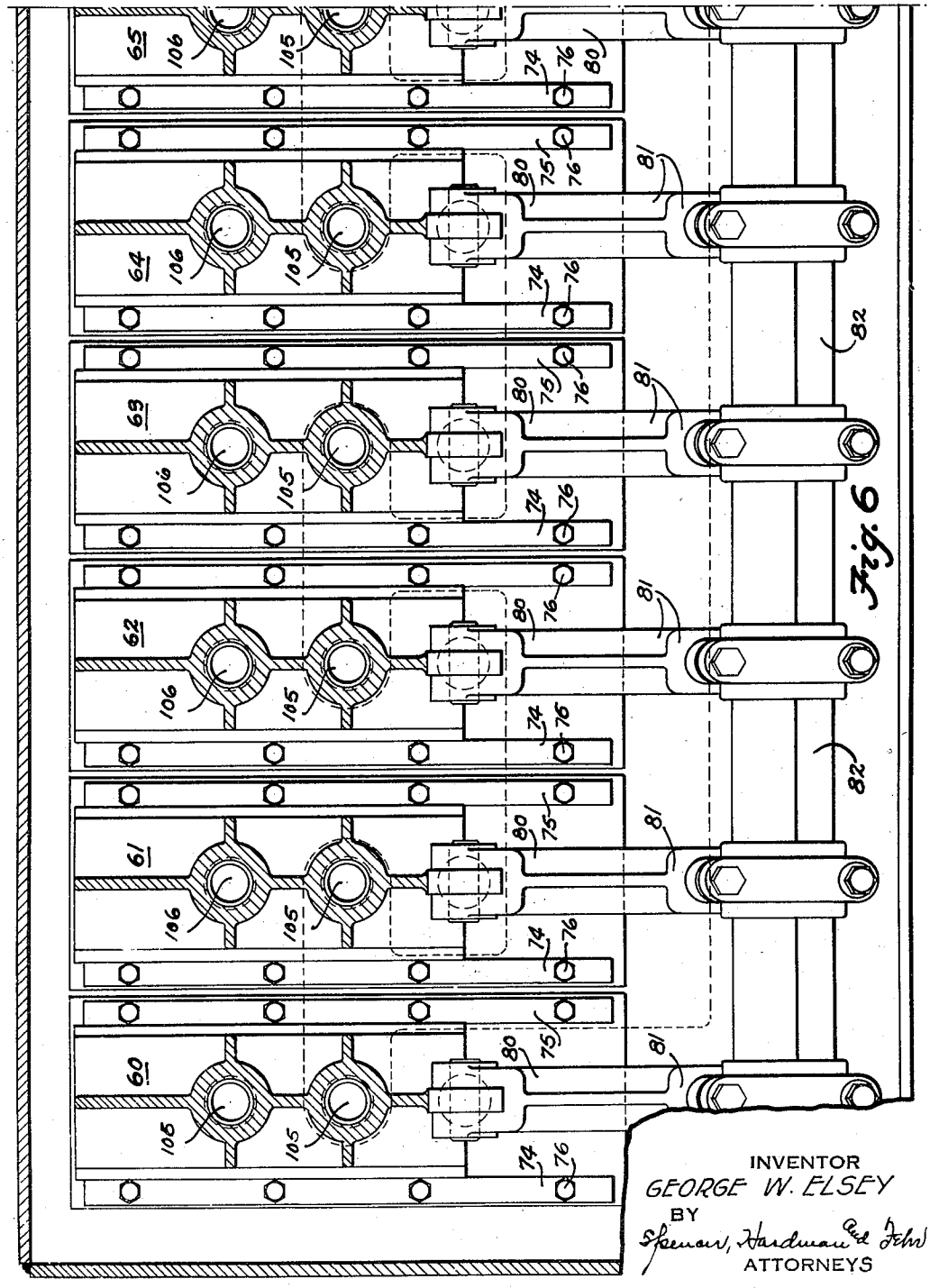


Fig. 6

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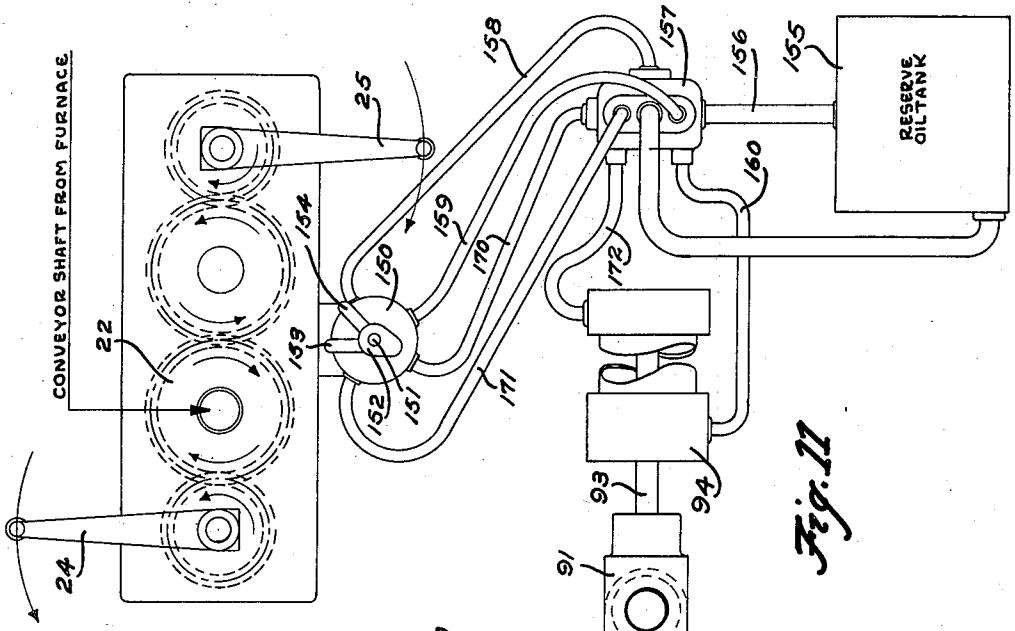


Fig. 11

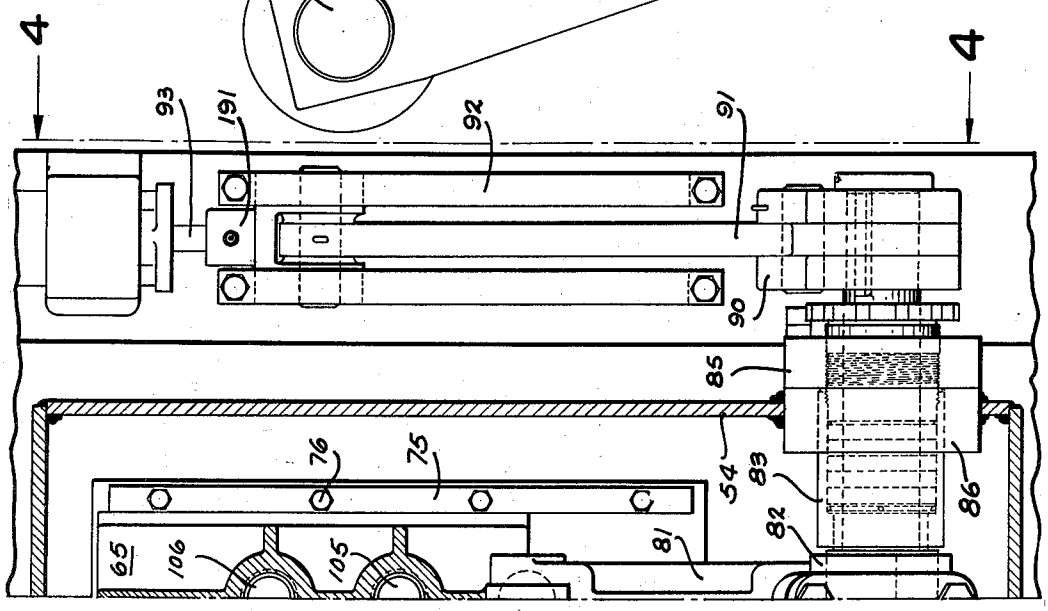


Fig. 6a

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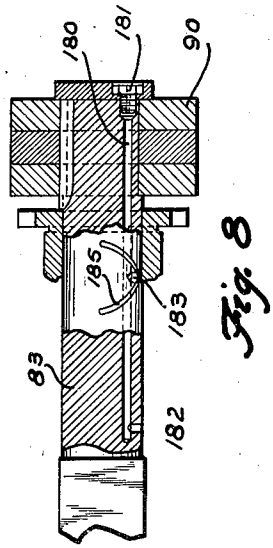


Fig. 8

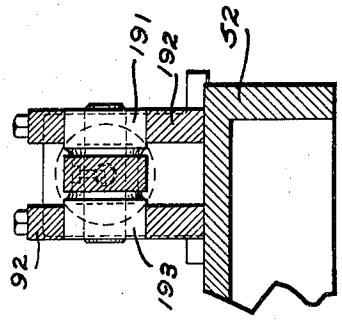
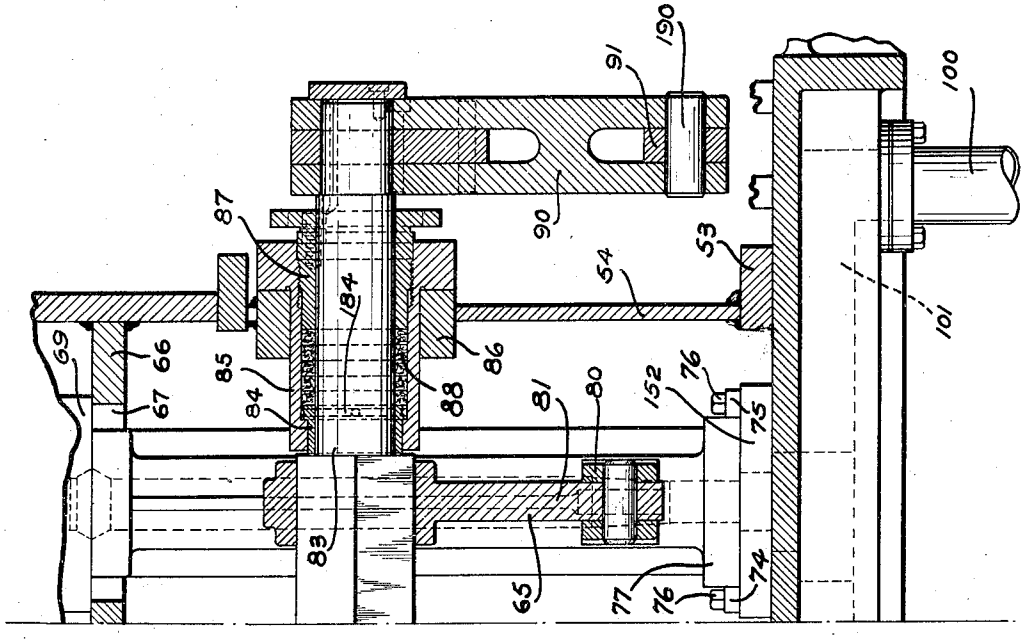


Fig. 9

Fig. 7



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UNITED STATES PATENT OFFICE

2,049,800

HEAT TREAT MACHINE

George W. Elsey, Dayton, Ohio, assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application January 21, 1935, Serial No. 2,701

17 Claims. (Cl. 266—4)

This invention relates to improvements in devices for heat-treating metallic work-pieces.

It is among the objects of the present invention to reduce to a minimum the possibility of the warping of a heat-treated work-piece while said work-piece is being cooled.

This object is attained by maintaining the work-piece in a lengthwise vertical position while it is passing through the cooling medium, thus preventing warping which usually occurs when such a work-piece is flatly introduced into the cooling medium, under which circumstances one side of the work-piece is subjected to the cooling medium while the other side is made to retain its heat for a substantially longer period.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred embodiment of one form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a diagrammatic view illustrating all of the units of the improved device in their cooperative relations.

Fig. 2 is a cross sectional side view taken substantially along the line 2—2 of Fig. 3 and illustrates the interior construction of the receiving chamber shown in Fig. 1.

Fig. 3 is a longitudinal sectional view taken substantially along the line 3—3 of Fig. 2 and shows only half of the receiving tank.

Fig. 4 is a fragmentary side view of the shuttle-containing ejector box. The operating mechanism for the moving parts within this box is clearly illustrated by this figure. The view is taken in a direction of the arrow 4—4 of Fig. 6A.

Fig. 5 is a transverse sectional view of the shuttle-containing ejector box.

Figs. 6 and 6A are correlated sectional views taken substantially along the line 6—6 of Fig. 5 and illustrate the shuttle-containing ejector box mechanism.

Fig. 7 is a sectional view taken substantially along the line 7—7 of Fig. 4.

Fig. 8 is a detail sectional view taken along the line 8—8 of Fig. 4.

Fig. 9 is another sectional view taken along the line 9—9 of Fig. 4.

Fig. 10 is a fragmentary, detail sectional view of one of the shock absorbing devices provided in the shuttle-containing ejector box.

Fig. 11 is a view showing the timing mechanism and hydraulic power valve control.

In Fig. 1 the entire assembly of the various units of the device is diagrammatically shown. It will be noted that some of the units are shown carried on the eighth floor, or at a certain level, other units on the seventh floor, or at a lower level, and still other units on the sixth floor, or at a still lower level.

Referring to Fig. 1, it may be seen that the heat-treating furnace is supported upon the eighth floor, or at the highest level. This heat-treated furnace is designated by the numeral 20 and may be of any suitable type, provided with a loading rack 21 upon which the work-pieces are placed and then mechanically carried through the furnace by power-driven means for purposes of applying heat to said work-pieces. Inasmuch as the furnace may be of any suitable standard type, no detailed showing thereof has been made and no illustration is made of the power mechanism for driving the conveyor which carries the work-pieces through the furnace. At this time it may be stated that the driving wheel or gear 22 is operated by the power means which actuates the furnace conveyor and this wheel or gear in turn drives means which rotates the actuator arms 24 and 25 respectively, the former in a counter-clockwise direction as regards Fig. 1, the latter in a clockwise direction.

At the highest level the receiving chamber of the device is also carried, this receiving chamber designated by the numeral 26 being in communication with the portion of the furnace from which the work-pieces are ejected by a series of pipes, one of which is shown in Fig. 1 and designated by the numeral 27. In the present device the furnace has six ejector tubes communicating with the receiving tank 26 through six pipes similar to the one designated by the numeral 27. However, to simplify the description, only one of these paths through which a work-piece travels will be described detailedly, for all of them are alike.

Referring particularly to Figs. 2 and 3, the receiving tank 26 is shown to be made up of sheet metal walls 28 welded together so as to make said tank fluid-tight. The ejector pipe 27, leading from the furnace, is secured to a pipe 30 fastened to the receiving tank in any suitable manner. At the opposite end or bottom of the receiving tank and in coaxial alignment with pipe 30, a member 31 is secured to the bottom wall of the tank, this member providing an inlet into said tank. A flange member 32 is secured to the upper end of the conduit 33 is attached to the member 31 by screws 34 so as to provide communication between the conduit 33 and the passage in the member 31, whereby conduit 33 may discharge

into the receiving tank. A group of rods 35, arranged in a circular manner, are secured between a sleeve 36 carried in the pipe 30 and the member 31, these rods forming a guide between the ejector pipe 27 from the furnace and the conduit 33 so that the work-piece being ejected from the furnace through the pipe 27 may fall lengthwise through the sleeve 36 into the space inside the circularly arranged rods 35 and then pass from there into the conduit 33. Two plates 39 and 40 are arranged within the receiving tank longitudinally thereof and form supports for the baffle plates 41 and 42. These baffle plates have openings provided with a plurality of inwardly extending tangs 43 which maintain and support the rods 35 in proper position so that the falling of a work-piece through the space formed by the rods will not move them out of their position. As shown in Fig. 2, plates 42 do not extend to the side walls of the receiving tank so that water flowing into said tank from the conduit 33 may flow to the outside of the longitudinal plates or supports 39 and 40, thereby practically filling the receiving tank. An overflow pipe 45 leads from tank 26 to an overflow tank 46 which is carried on the floor beneath that supporting the furnace, consequently the overflow tank is at a lower level than the receiving tank which is supported at the same level as the heat-treated furnace.

The device includes also a shuttle containing ejector box designated by the numeral 50 and shown in Fig. 1 as being suspended by brackets 51 from the same floor which supports the overflow tank. This shuttle-containing ejector box is in communication with the receiving tank by six conduits, one being designated by the numeral 33 in Fig. 1. The shuttle box is illustrated detailedly in the Figs. 4, 5, 6, and 6A. Referring particularly to the Fig. 5, the shuttle-containing ejector box 50 is shown comprising a base 52 upon which a frame 53 is secured, and to this frame there is welded the bottom edge of all of the sides 54 of the box proper. To the upper edges of these sides of the box is welded another frame 55 and upon this frame rests the side members of a super box structure 56. A lid 57 is provided for the super structure and bolts 58, interposed between the lid 57 and frame 55, rightly clamp these members upon the super structure 56 so as to seal the shuttle-containing ejector box. In this box are provided six shuttles as shown in the correlated Figs. 6 and 6A. These shuttles are designated 60, 61, 62, 63, 64, and 65 respectively. Each of these shuttles are adapted to cooperate and communicate with a respective conduit 33, it having been mentioned heretofore that six conduits lead from the receiving tank to the shuttle-containing ejector box. For the sake of brevity only one of these shuttles and its cooperating parts will be described, for all are identical.

In Figs. 5 and 7 it may clearly be seen that a crossplate 66 is secured within the super structure of the shuttle-containing ejector box. This plate is preferably attached within the box by welding the edges thereto. The plate has an opening 67 into which the upper end of shuttle 65 extends. The upper end of this shuttle has a sealing plate 69 resting upon it, this sealing plate also resting upon the cross-plate 66. Another plate 70 is rigidly attached to the upper surface of cross-plate 66, this plate 70 having an opening into which the sealing plate 69 loosely fits. Pins 71 attached to opposite sides of the opening in plate 70 extend into respective slots 72 in the sealing plate whereby said sealing plate may move only upwardly and downwardly as regards the shuttle 65, but cannot move in any other direction. Normally plates 69 rest upon the upper surface of cross-plate 66 and also upon the upper surface of the shuttle 65, however, the upward movement of the plate 69 is limited by the adjustable screws 73 threadedly carried by the cover 57. These screws 73 prevent cocking of the plate 69 if for any reason the sliding shuttle 65 should tend to cock and lift the plate 69. The weight of the plate 69 as it rests upon the top of the shuttle 65 is sufficient substantially to prevent water from flowing between the contacting surfaces of these two elements. The bottom of the shuttle 65 is slidably supported upon plate 152 which rests and is secured upon the base 52. On this plate 152 two track members 74 and 75 are secured by bolts 76, which bolts also secure plate 152 in its proper position, and it is between these two track members that the base 77 of the shuttle 65 slides, the track members acting as guides. Each shuttle has a link 80 attached to it, said link also being secured to a rocker arm 81, which rocker arm is attached to a rocker shaft 82 extending longitudinally of the shuttle-containing ejector box. It will be understood that shaft 82 has an arm 81 for each of the six shuttles within the ejector box. Shaft 82 where the arms 81 connect thereto is rectangular in shape as shown in Fig. 5, however, the end thereof extending from the ejector box is cylindrical as at 83, being supported in a bearing 84 carried within a sleeve member 85 which in turn is supported by a collar 86 attached to the side wall 54 of the ejector box. An adjustable packing gland 87 urges the packing 88 into engagement with the bearing 84, and this packing substantially prevents leaks in this journal box. The shaft portion 83 extending beyond the packing gland 87 has the arm 90 secured thereto, the free end of said arm 90 being attached to a member 91. A pair of tracks 92 and 192, vertically spaced, slidably support a cross-head member 191 to which the one end of member 91 is attached. The member 91 has a shaft 93 attached thereto. One end of a rod 93 is secured to the cross-head 191, the other end of this rod 93 is provided with any suitable piston, not shown, but slidably arranged in the hydraulic pressure cylinder 94. Inasmuch as this hydraulic pressure cylinder may be of any suitable standard type, and inasmuch as its detailed construction does not enter into this invention no detailed showing or description thereof is given, it being sufficient to say that the piston within the hydraulic cylinder 94 may be operated in one direction or the other by hydraulic presure so that the arm 90 being operatively connected with said piston by rod 93, cross-head 191 and member 91 is rotated clockwise and counter-clockwise to actuate the shuttles back and forth within the shuttle-containing ejector box.

A water supply pipe 100 is attached to the base 52 and communicates with a water conduit 101 therein. This water conduit 101 as shown in Figs. 5, 6, and 7, has a series of outlets 102 to the interior of the ejector box. Each outlet 102 is in coaxial alignment with a conduit 33 leading from the upper part of the ejector box.

As shown in Fig. 5, the shuttle has two vertical passages 105 and 106. These passages are spaced apart the same distance as the water outlet 102 is spaced from the ejector opening 107 in the base 52. When the passage 105 of the shuttle 65 coaxially aligns with the water inlet 102 in

the base 52 it is also aligned with conduit 33 leading from the ejector box. At this time the passage 106 is in communication with the ejector passage 107 in the base. Now, when the shuttle is moved toward the left as regards Fig. 5, by the operation of the shaft 82 and its arms 81, then passage 105 will align with the ejector passage 108 in the base 52 while passage 106 coaxially aligns with the water inlet port 102 and the conduit 33.

In Fig. 1 a slide 110 is shown which directs all work-pieces ejected from the ejector passages 107 and 108 of the base 52 to a receiving bin 111. This figure also shows a water pump 112, driven in any suitable manner, said water pump receiving its water supply from the over-flow tank 46 through the pipe 113 and then delivering said water under pressure through the pipe 100 to the water conduit 101 in the base 52 from which conduit the water flows into the ejector box or rather into the passages in the respective shuttles in the ejector box via the series of outlet ports 102.

In order to effect operation of the shuttles in proper time relation with the ejection of the work-pieces from the furnace, a timing mechanism actuated by the furnace operating mechanism is provided. As has been said before, the shaft 82 and its associate arms 81 which actuate the shuttles is in turn actuated by a hydraulic cylinder. The hydraulic pressure to this cylinder, that is, to the opposite sides of the piston in this cylinder, is controlled by a valve 150, which may be of any suitable standard type purchasable upon the open market. This valve has an actuating rod 151 on the outer end of which is secured a member 152 provided with diverging arms 153 and 154. Arm 153 is engageable by the rotating arm 24 driven by the furnace mechanism to move the valve into one position in which fluid pressure from the hydraulic pressure tank 155 may be directed through pipe 156 into the distributing chamber 157, hence through pipe 158 through the valve 150, pipe 159 into the distributing box 157 and then through pipe 160 into the cylinder 94 on the one side of the piston therein. Continued movement of the furnace actuating mechanism will cause arm 25 to engage arm 154 of the valve and move the member 152 of said valve to shut off the aforementioned flow of hydraulic fluid pressure, instituting the following flow: from pipe 156 into the distributor box 157, then through pipe 170, through valve 150 and pipe 171 back into the distributor box 157, thence through pipe 172 into the cylinder on the opposite side of the piston therein. From this it may be seen that as the valve 150 is moved from one into its other position, the piston will be moved in one or the other direction, thus actuating the shuttles from one position into their second position.

In Fig. 8 the method of oiling the bearing for shaft portion 83 is illustrated. An oil duct 180 is provided in the shaft accessible from the outside of the shaft by the removal of the cap screw 181. This oil duct has two side passages 182 and 183 leading therefrom. The side passage 182 directs the lubricant into an annular groove 184 in the bearing 84 as shown in Fig. 7, while the side passage 183 directs the lubricant to oil grooves 185 provided in the shaft portion 83.

The Fig. 9 illustrates the cross-head connection between the hydraulic piston and the outside arm 90 of the shuttle-shaft 82. Here the members 92, forming the upper slide members of the cross-head, are spaced from the lower slide members 192 which are supported upon the base 52 in any suitable manner. The member or cross-head slidable between these members 92 and 192 is designated by the numeral 191, oppositely disposed outwardy extending lugs 193 being provided on said member 191, which lugs are slidably carried between members 92 and 192. The arm 90 on the shaft 82 is forked and receives one end of the member 91, pin 190 securing the member 90 to said arm. The opposite end of said member 191 is secured to the shaft of the hydraulic piston in any suitable manner.

From the aforegoing the following steps in the operation of this machine may easily be understood:

The heat-treat furnace is in operation, its conveyor moving work-pieces through it and at the same time arms 24 and 25 thereof are rotated. A work-piece is ejected from the heat-treated furnace and enters into pipe 27 passing therethrough and dropping into the space between the circularly arranged rods 35, passing through the sleeve 36. As the work-piece enters lengthwise between rods 35, it strikes the water, being forced from the conduits 33 into the receiving tank and, as said workpiece continues to drop through the column of water provided in the conduit 33, it will be properly cooled, for the length of this conduit and the temperatures of the water therein are predetermined. The work-piece as it leaves the conduit passes through an opening 169 in the plate 69, into one passage of a shuttle, for instance, the passage 105.

A shock absorbing element, of any suitable design and designated by the numeral 200, is provided in the base, said shock absorber preventing bouncing of the work-piece as it reaches the bottom end of the passage of a shuttle. Now the furnace having reached a certain point in its operation, one of the arms 24 or 25 will actuate the hydraulic fluid pressure controlling switch 150 so as to direct hydraulic pressure against one side of the piston in cylinder 94, causing it to move the arm 90 attached to the shuttle shaft 83. This causes the shuttle to be shifted within the ejector box and consequently the shuttle will be moved so that the work-piece containing passage 105 will be brought into alignment with the ejector passage 108 and at the same time passage 106 of the shuttle will be moved into alignment with the conduit 33 preparatory to receiving the next work-piece which shall fall through it. Alignment of passage 105 with ejector passage 108 will permit the water in said passage 105, as well as the work-piece therein to exit from said passage 105 through the passage 108, the work-piece then falling upon the chute 110 which directs it to the receiving bin 111. Under these circumstances the water will not flow into passage 105, but the water flowing from port 102 will pass through passage 106 now in alignment therewith into the ejector box and also up through the conduit 33 into the receiving tank. The fit between the upper part of shuttle 65 and plate 69 is such that sliding movement therebetween is provided for, but water leaks are practically prevented. When the next work-piece falls from conduit 33 into passage 106 and continued movement of the furnace causes valve 150 to be shifted, resulting in the hydraulic cylinder moving the shuttle to its first position, then passage 106 containing the work-piece will be moved into alignment with the ejector passage 107 as shown in Fig. 5, while the other passage 105 is again brought into alignment with the conduit 33 for receiving the next work-piece.

To facilitate production the present machine is equipped with six shuttles and six conduits and the furnace ejects work-pieces to each in proper time, for, as has been described, the actuator of the shuttle is timed in accordance with ejections of the work-pieces from the furnace.

In Fig. 10 a type of shock absorbing device which may be used in the present machine is clearly illustrated. Here a plunger 200 extends through port 102. This plunger is supported upon a spring 201 which in turn is carried upon an immovable collar 202. The plunger 200 has a shaft 203 extending through collar 202, and to the end of the shaft is secured a piston 204 slidable within the cylinder 205. A valve 206 rests upon the upper end of the piston 204 and normally closes ports 207 in said piston head under the influence of a light spring 208. As the work-piece strikes the plunger 200 it moves the piston 204 downwardly and fluid in cylinder 205 beneath piston 204 raises valve 206 against the effect of spring 208 to permit fluid to flow from the under-side of the piston to the opposite side. The port in the piston is such that a cushioning effect is obtained and consequently the work-piece is gently permitted to come to rest at the bottom end of the passage 105 in the shuttle. Spring 201 exerting an upward thrust, the plunger 200 will gradually move the plunger and its piston 204 upward for, in response to this upward movement valve 206 closes ports 207 and a comparatively small orifice 209 in said valve permits the return flow of fluid from one side of the piston to the under-side thereof, consequently greatly retarding the movement of the piston and therefore the plunger 200 from its depressed to its normal work-piece receiving position. The orifice 209 is predetermined so that under all circumstances plunger 200 will be in its normal position before the next work-piece in that respective shaft is permitted to drop upon the shock absorbing element.

From the aforegoing it may be seen that applicant has provided a machine for cooling heat-treated work-pieces in a manner as to prevent warping thereof and has provided a cooling medium into which the work-piece is introduced and then removed, the removing mechanism being so constructed and designed and operating in such a fashion that comparatively little of the cooling medium is lost.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms may be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. In a device of the character described, the combination with a heating furnace through which work-pieces are conveyed while being heated; means providing a column of upwardly flowing water; means for introducing the heated work-piece ejected from the furnace into said column of water through which said work-piece falls and is cooled; and means for removing said work-piece from said column of water adjacent its bottom end.

2. In a device of the character described, the combination with a heating furnace through which work-pieces are conveyed while being heated; means providing a column of upwardly flowing water; means for introducing the heated work-piece ejected from the furnace lengthwise into the column of water at its upper end, said work-piece falling through said column of water and being cooled; and means for removing the work-piece from said column of water.

3. In a device of the character described, the combination with a heating furnace through which work-pieces are conveyed while being heated; a conduit supported in a substantially vertical position; shiftable means having two ducts adapted to be aligned with said conduit to form its bottom end; means for forcing water into and through the duct of the shiftable means aligned with the conduit; means for introducing the heated work-piece, ejected from the furnace, into the upper end of the conduit, the work-piece, being cooled by falling through the column of water flowing upwardly through said conduit; and means for actuating the shiftable means to eject the work-piece from the water.

4. In a device of the character described, the combination with a heating furnace having mechanism for conveying work-pieces to be heated, through the furnace; a conduit supported substantially vertically; shiftable means having two ducts adapted alternately to provide an extension for the conduit at its lower end; means for forcing a cooling fluid through the shiftable means into the conduit; means for introducing the heated work-piece, ejected from the furnace, into the upper end of the conduit, said work-piece falling through the water in said conduit and into a duct of the shiftable means; and means for actuating said shiftable means for ejecting said work-piece.

5. In a device of the character described, the combination with a heating furnace provided with a conveyor for carrying work-pieces through the furnace for heat-treating purposes, of means providing an upwardly flowing column of water; means for introducing a heated work-piece, ejected from the furnace, into said column of water, said work-piece being cooled as it falls through the water; means for removing said work-piece from said column of water adjacent its bottom end; and timing mechanism controlled by the operation of the conveyor mechanism of the furnace for controlling the operation of the last mentioned means in accordance with the ejection of work-pieces from the furnace.

6. In a device of the character described, the combination with a heating furnace provided with conveying mechanism for carrying work-pieces through the furnace for heat-treating purposes; of a conduit supported in a substantially vertical position; means providing a shiftable extension at the lower end of the conduit; means for forcing water through the conduit; means for introducing work-pieces ejected from the furnace, into the upper end of said conduit, said work-pieces being cooled as they pass through the water in the conduit; and means for actuating the shiftable extension to eject the work-piece therein while retaining the water in said conduit.

7. In a device of the character described, the combination with a heating furnace provided with conveying mechanism for carrying work-pieces through the furnace for heat-treating purposes; of a conduit supported in a substantially vertical position; means providing a shiftable extension at the lower end of the conduit; means for forcing water through the conduit; means for introducing work-pieces ejected from the furnace, into the upper end of said conduit, said work-pieces being cooled as they pass through the water in the conduit; an actuator for moving the shiftable extension of the conduit to eject

the work-piece therein while retaining substantially all of the water in the conduit; and means controlled by the conveying mechanism of the furnace for timing the actuator in accordance with the ejection of the work-pieces from the furnace.

8. In a device of the character described, the combination with a heating furnace provided with conveying mechanism for carrying work-pieces through the furnace for heat-treating purposes, of a conduit supported in a substantially vertical position; a member providing a water supply duct and an ejection passage; a shiftable member having a passage adapted alternately to align with the water supply duct and conduit and with the ejection passage; means for forcing the water from the water supply duct; means for introducing a heated work-piece, ejected from the furnace, into the upper end of the conduit, said work-piece falling through the water therein into the passage of the shiftable member; and means for moving said shiftable member from one into its other alternate positions.

9. In a device of the character described, the combination with a heating furnace provided with conveying mechanism for carrying work-pieces through the furnace for heat-treating purposes, of a vertically supported conduit; a base providing a water supply duct and an ejection passage; a shuttle having a passage, said shuttle being adapted to be actuated into two alternate positions, one in which its passage aligns with the water supply duct and conduit, the other in which its passage aligns with the ejection passage; means for introducing a work-piece ejected from the furnace, into the upper end of the conduit; and means for shifting the shuttle immediately before the workpiece is ejected from the furnace and immediately after the work-piece drops into the shuttle passage.

10. In a device of the character described, the combination with a heating furnace provided with conveying mechanism for carrying work-pieces through the furnace for heat-treating purposes, of a vertically supported conduit; a base providing a water supply duct and an ejection passage; a shuttle having a passage, said shuttle being adapted to be actuated into two alternate positions, one in which its passage aligns with the water supply duct and conduit, the other in which its passage aligns with the ejection passage; means for introducing a work-piece ejected from the furnace, into the upper end of the conduit; and means for shifting the shuttle so that its passage aligns with the conduit and water supply duct before a work-piece is ejected from the furnace and again aligns with the ejection passage after the work-piece has fallen into the shuttle passage.

11. In a device of the character described, the combination with a heating furnace provided with conveying mechanism for carrying work-pieces through the furnace for heat-treating purposes, of a vertically supported conduit; a base providing a water supply duct and two ejector passages; a shuttle slidably supported on said base and having two passages, one of said passages aligning with the conduit and water supply duct, the second with an ejector passage when the shuttle is in one position, the second shuttle passage aligning with the conduit and water supply duct and the first passage with an ejector passage when the shuttle is in the other position; means for introducing a work-piece ejected from the furnace, into the conduit; means for forcing water through the water supply duct into the shuttle passages as they align with the conduit; and means for shifting the shuttle from one position into the other in accordance with the discharge of the work-pieces from the furnace.

12. In a device of the character described, the combination with a heating furnace provided with conveying mechanism for carrying work-pieces through the furnace for heat-treating purposes, of a vertically supported conduit; a base providing three passages, one a water supply duct, the others two ejector passages; a member slidably supported upon said base and having two passages, one of which aligns with the water supply duct and the conduit while the other aligns with an ejector passage; means for introducing a work-piece, ejected from the furnace, lengthwise into the conduit through which said work-piece drops and falls into the passage of the slidable member aligning therewith; means for shifting the slidable member from one of its positions into the other; and means actuated by the conveying mechanism of the furnace for timing the means for shifting the slidable member.

13. In a device of the character described, the combination with a heating furnace through which work-pieces are conveyed while being heated; a receiving chamber; an ejector box below the level of the receiving chamber; a conduit connecting the receiving chamber and ejector box and adapted to have water flowing through it into the receiving chamber; means in the receiving chamber for directing a heated work-piece, ejected from the furnace, into said conduit; means communicating with the lower end of the conduit, for receiving the work-piece after it has dropped through the column of water flowing upwardly in the conduit; means for shifting the receiving means to eject said work-piece; and means for forcing water through said receiving means into the conduit.

14. In a device of the character described, the combination with a heating furnace provided with a conveyor for carrying work-pieces to be heated through said furnace, a receiving chamber and an ejector box in superposed relation; a conduit connecting both chamber and box and adapted to have a column of water flowing upwardly through it into said chamber; means for directing a work-piece ejected from the furnace into said conduit; a member in said ejector box, capable of being shifted into two positions, in one of which it receives the work-piece after it has dropped through the water in the conduit, in the other position said member ejects the work-piece from the box; and means for forcing water through said member into the conduit.

15. In a device of the character described, the combination with a heating furnace provided with conveying mechanism for carrying work-pieces to be heated through the furnace, of a receiving tank; an ejector box beneath said tank; a conduit providing communication between the tank and box; means in the receiving tank for introducing work-pieces, ejected from the furnace, into said conduit so that said work-pieces will fall through said conduit into the ejector box; a base for the ejector box providing three passages, one a water supply duct adapted to inject water into said box, the other two passages providing exit means through which work-pieces are ejected from said box; a shuttle member slidably supported upon the base of said box and having two passages, one of which aligns with the conduit and water supply duct, the second with the exit passage

in the base when said shuttle member is in one position and the said second shuttle passage aligns with the conduit and water supply duct and the first shuttle passage aligns with an exit passage in the base when said shuttle member is in the other position; and means for actuating the shuttle member.

16. In a device of the character described, the combination with a heating furnace provided with conveying mechanism for carrying work-pieces to be heated through the furnace, of a receiving tank; an ejector box beneath said tank; a conduit providing communication between the tank and box; means in the receiving tank for introducing work-pieces, ejected from the furnace, into said conduit so that said work-pieces will fall through said conduit into the ejector box; a base for the ejector box providing three passages, one a water supply duct adapted to inject water into said box, the other two providing passages through which work-pieces are ejected from said box; a shuttle member slidably supported upon the base of said box and having two passages, one of which aligns with the conduit and water supply duct, the second with an ejector passage when said shuttle member is in one position, and the second of said shuttle passages aligns with the conduit and duct and the said first shuttle passage with an ejector passage when said member is in the other position; means for actuating the shuttle member; and means actuated by the furnace conveyor mechanism for controlling and properly timing the last mentioned means.

17. The method of treating a metallic work-piece which consists in conveying said work-piece through a heating furnace, ejecting said heated work-piece from the furnace and introducing it into an upwardly flowing column of water so that said work-piece falls lengthwise through said water, then removing said work-piece from said column of water.

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