July 13, 1926. 1,592,661

G. H. GILMAN

HEAT TREATING MACHINE

Filed May 23, 1921 4 Sheets-Sheet 1

Fig. 1.

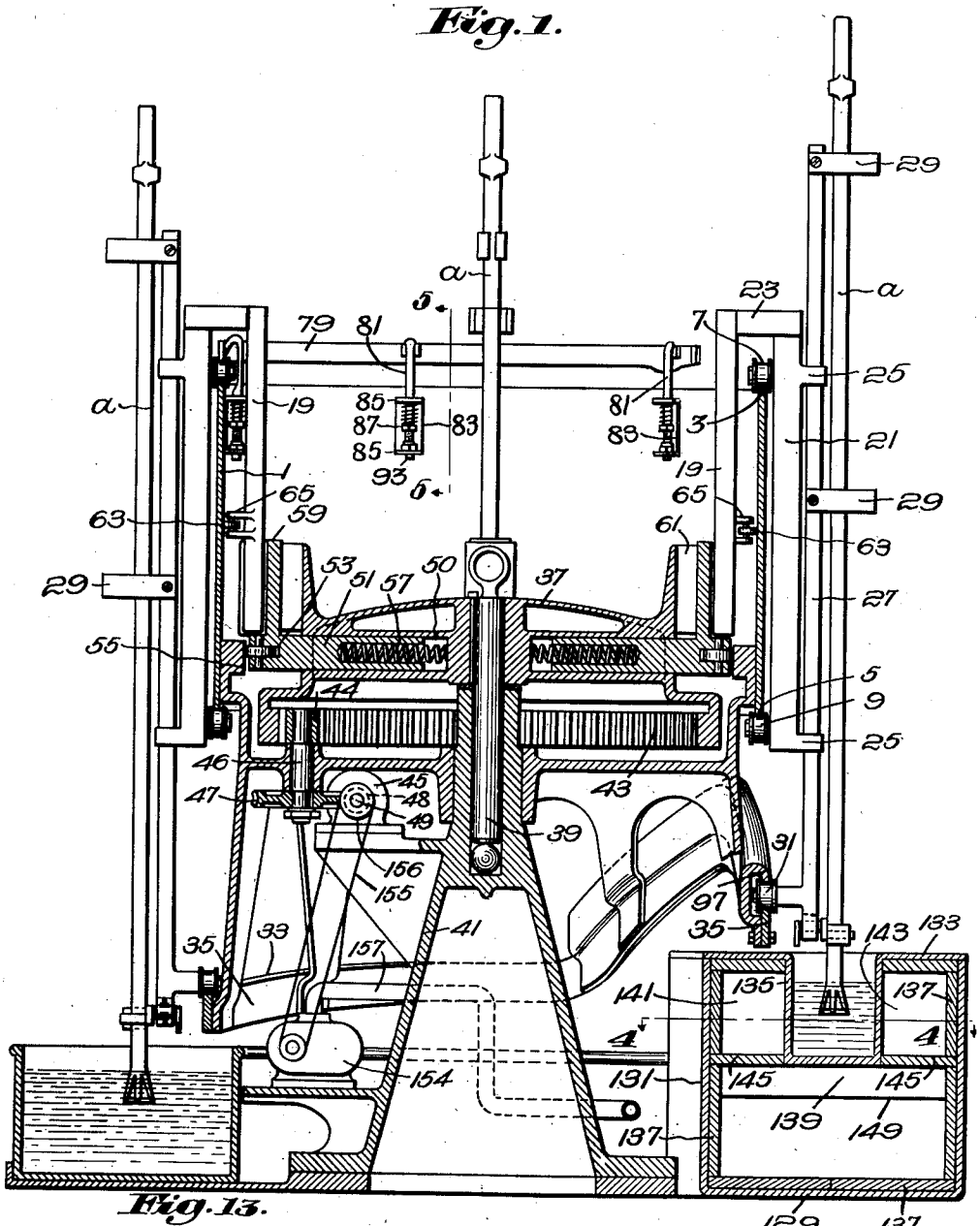
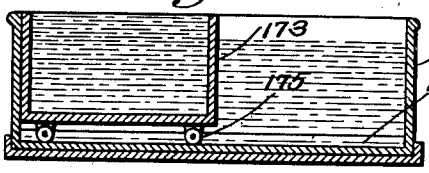


Fig. 13.



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Fig. 2.

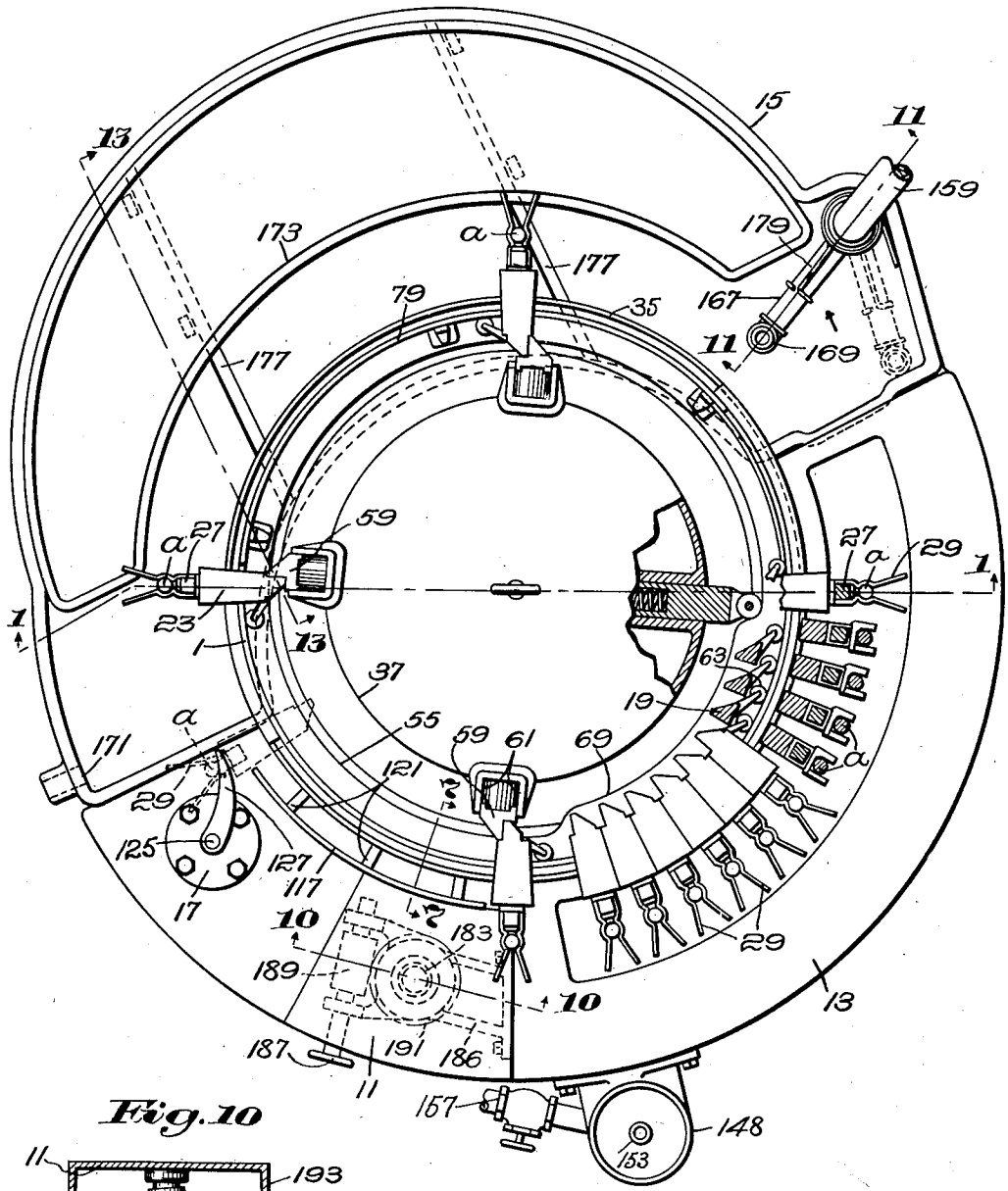
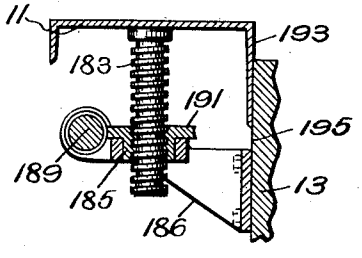


Fig. 10



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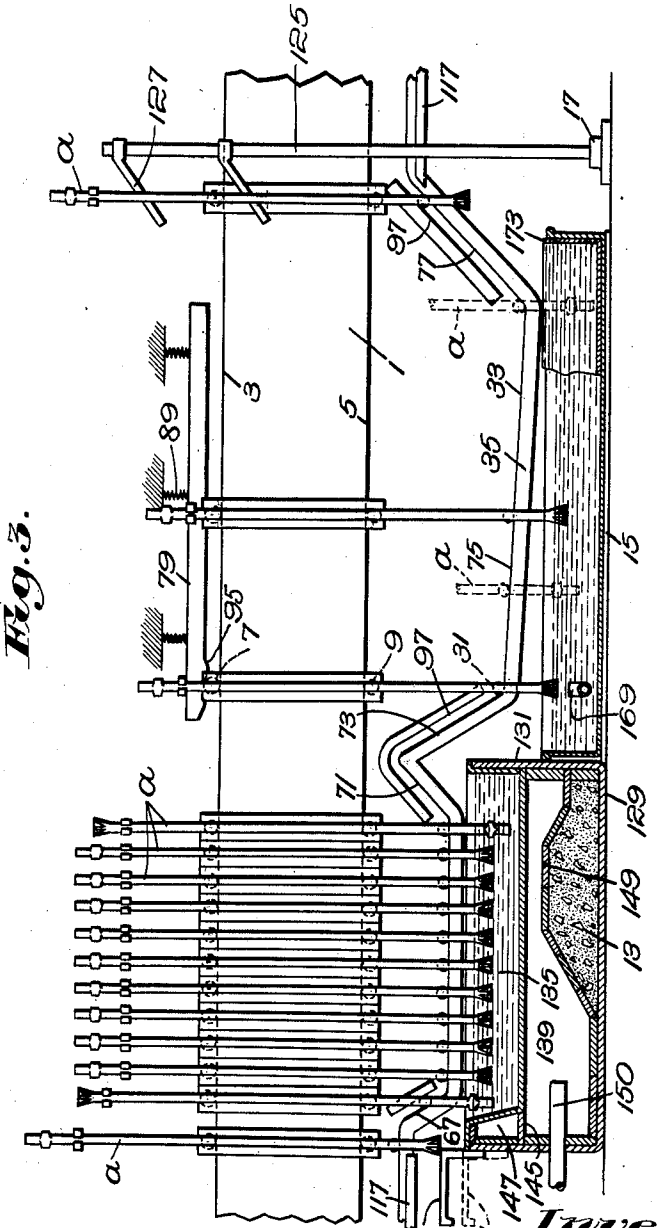
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HEAT TREATING MACHINE

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Fig. 3.



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July 13, 1926. 1,592,661

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HEAT TREATING MACHINE

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Fig. 4.

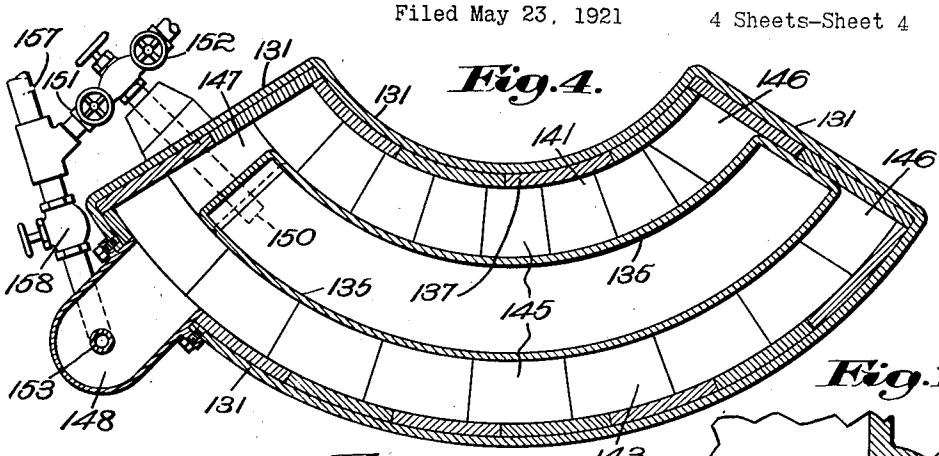


Fig. 12.

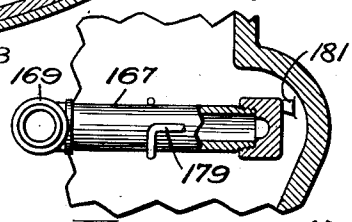


Fig. 9.

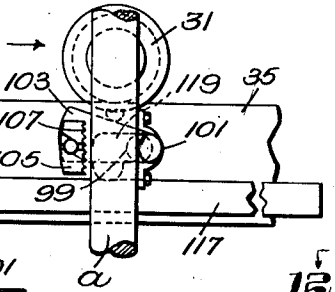


Fig. 8.

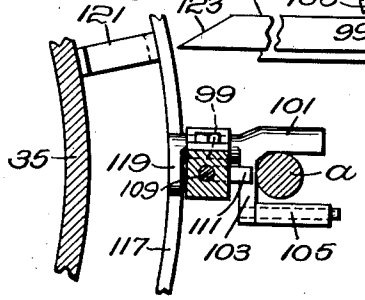


Fig. 11.

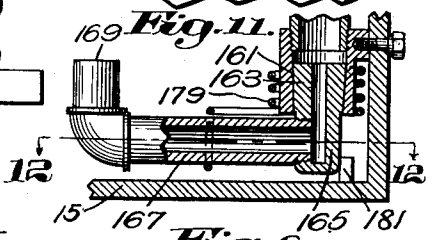


Fig. 5.

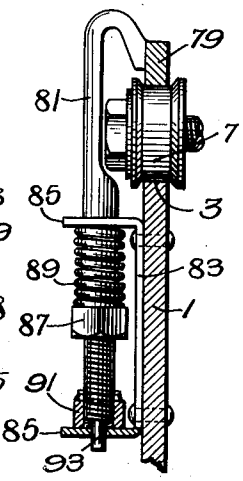


Fig. 6.

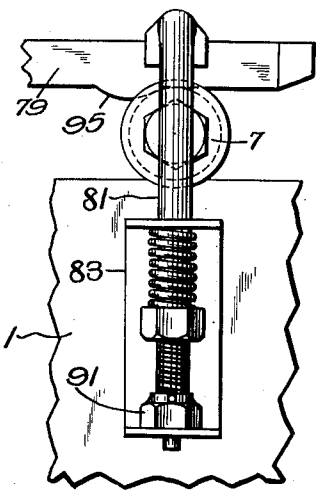
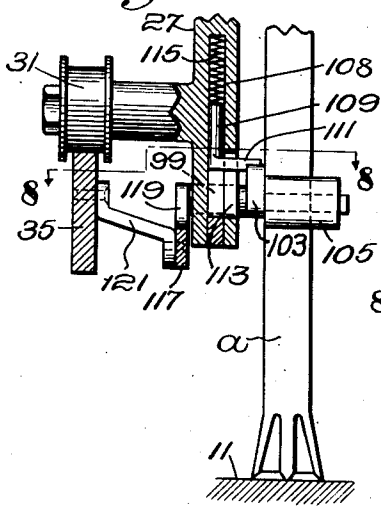


Fig. 7.



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Patented July 13, 1926. 1,592,661

UNITED STATES PATENT OFFICE.

GEORGE H. GILMAN, OF BELMONT, MASSACHUSETTS.

HEAT-TREATING MACHINE.

Application filed May 23, 1921. Serial No. 471,563.

My invention relates to heat treating machines and particularly but not exclusively to one for heat treating drill steels.

My invention will be best understood from the following description when read in the light of the accompanying drawings of one specific embodiment of my invention selected for illustrative purposes, while the scope of my invention will be more particularly pointed out in the appended claims.

In the drawings:

Fig. 1 is a section on the line 1—1 of Fig. 2;

Fig. 2 is a plan view of the machine;

Fig. 3 is a more or less diagrammatic development of the machine;

Fig. 4 is a section on the line 4—4 of Fig. 1;

Fig. 5 is a fragmentary section on the line 5—5 of Fig. 1;

Fig. 6 is a view looking at Fig. 5 from the left;

Fig. 7 is a fragmentary section on the line 7—7 of Fig. 2, with the carrier moved into the plane represented by said line;

Fig. 8 is a section on the line 8—8 of Fig. 7;

Fig. 9 is a view looking at Fig. 7 from the right;

Figs. 10 and 11 are respectively fragmentary sections on the lines 10—10 and 11—11 of Fig. 2;

Fig. 12 is a section on the line 12—12 of Fig. 11; and

Fig. 13 is a section on the line 13—13 of Fig. 2.

Referring to the drawings in which the drill steels are indicated at *a*, I have shown a plate 1 bent into the form of a cylinder and having upper and lower edges providing tracks 3 and 5 for the wheels 7 and 9 of the drill steel carriers. Circumferentially distributed around the machine, are shown, a loading table 11, a heater 13, a quenching tank 15, and a mechanism 17 for disengaging the drill steels from the carriers.

The carriers each comprise a leg 19 and an oppositely located leg 21 connected to the first mentioned by a cross bar 23, the leg 21 carrying the rollers 7 and 9, and the U-shaped structure thus formed straddling the track. The leg 21 is provided with a pair of spaced perforated lugs 25 for supporting a bar 27, the latter being square in cross-section and the perforations having a similar shape or the parts being otherwise formed to spline the bar to the lugs. Each of the bars 27 is provided with one or more spring clips 29 for engaging the drill steel, while the lower end of the bar is provided with a clamping mechanism, hereinafter described, in order that the drill steel may be securely yet detachably held by the carrier. For giving the drill steel a motion transverse to the direction traveled by the carrier the lower end of the bar 27 is shown as provided with a roller 31 supported on the track 33 afforded by the upper edge of the bar 35, the track being given an undulatory course so as to raise and lower the drill steel into and out of the various instrumentalities for heat treating the drill steel.

For propelling the carriers, I have shown interiorly of the tracks a turret 37 which is mounted on a shaft 39 carried by the pedestal 41, the turret being provided with a skirt having the internal series of gear teeth 43 in mesh with the pinion 44 driven through suitable reduction gearing by an electric motor 45. As illustrated by the drawings the lower end of the shaft 46 to which the pinion 44 is keyed carries a worm wheel 47 and the latter is driven by a worm 48 carried by the drive shaft 49 of the motor 45. The turret is further provided with cylindrical bores 50, reciprocably mounted in which are bars 51 carrying at their outer ends rollers 53 engaging the cam track 55, the rollers being held against the track by means of the compression springs 57 abutting at one of their ends the bottoms of the bores 50 and at their other ends engaging the inner ends of the bars. At the end of each bar is provided an upstanding head 59 for engaging one side of the legs 19 of the carriers in order that the latter may be pushed around the track. For guiding the head, the turret adjacent each head has a pair of upstanding guide members 61, each of which engages an opposite side of the head. For preventing tilting of the carrier under the influence of the pushing action exerted by the head each carrier is provided with a roller 63 carried by brackets 65 formed in-

tegrally with the leg 19, the roller engaging the track afforded by the interior surface of the plate 1. The leg 19 and the brackets 65 are so formed and spaced from the track that when the carriers are brought into engagement with each other over the furnace, as will hereinafter be described, each roller will project under the leg 19 of the carrier in advance of it in order not to interfere with the abutting of the carriers.

The action of the parts so far referred to is perhaps best illustrated by Fig. 3. When the carrier is passing the loading table, the operator inserts a drill steel in the carrier, and the turret, keeping the carrier moving causes the roller 31 to move down the inclined portion 67 of the track 33 and thus lower the end of the drill steel into the heater. When the steel has been moved into the heater the propeller head remains in contact with the carrier long enough to push the row of carriers above the heater forward a distance equal to the width of a carrier, and then is moved inwardly by the portion 69 of the cam track 55 to disengage the carrier and permit those over the furnace to remain stationary, the row being gradually pushed forward step by step by the addition of new carriers in the manner just described. The carrier at the head of the row is engaged by the propeller head in advance of the one pushing the row immediately after the row is pushed forward, the cam track 69 being so formed as to permit this engagement. Movement of the newly engaged carrier now causes the wheel 31 to move up the inclined portion 71 of the track 33 which moves the drill steel out of the heater, and continued movement causes the wheel to move on the downwardly inclined portion 73 of the track 35, whereupon the roller 31 runs down the incline by gravity and causes the whole carrier to advance ahead of the propelling head and to lower the drill steel into the quenching fluid. The drill steel and its carrier now remain stationary until the propeller head catches up with the carrier and again engages it. The drill steel now moves through the quenching tank, the roller passing over the slightly downwardly inclined portion 75 of the track 35 so as gradually to increase the immersion of the drill steel. When the roller 31 reaches the end of the quenching tank it moves up the incline 77 and lifts the steel out of the tank, and when near or at the top of said incline, the steel is disengaged from the carrier, as will hereinafter be explained, and the empty carrier again is moved over the loading table to receive a new drill steel.

For checking the carrier as the wheel 31 moves down the incline 73 I may provide a suitable brake, and as shown this brake takes the form of a bar 79 carried by a plurality of arms 81 resiliently supported on the plate 1. The support for the arms as shown is in the form of a U-shaped bracket 83 having upper and lower flanges 85 perforated to receive the bar. The lower end of the bar 81 is screw-threaded for engagement with the nut 87 which forms an abutment for a spring 89 having its opposite abutment on the facing surface of the flange 85. By adjusting the nut 87 the tension of the spring 89 can be varied, and for the same purpose and for determining the distance between the bar 79 and the track 3, on the screw-threaded portion of the bar is an adjustable head in the form of a nut 91. Beyond the screw-threaded portion, the bar is reduced in diameter as indicated at 93, this portion fitting the perforation in the lower bracket 85 to form a lower guide for the bar.

As illustrated by Figs. 3 and 6, the lower surface of the bar 79 is provided with a bulged portion 95, which acts as a stop to insure that the carrier will come to rest at the bottom of the incline, and to insure that the carrier will not roll ahead of the propelling head the bar 79 is extended along the track 3 for a distance corresponding to the inclined portion 75 of the track 35. For preventing the jumping of the wheel 31 off the track 33 I may provide at the inclined portions, or throughout the entire length of the track, the guard rails 97 Figs. 1 and 3.

The clamping means hereinbefore referred to at the lower end of the bar 27 herein comprises the rock shaft 99 provided with an extension 101 and an integral lever 103, the latter carrying at its outer end and in pivotal relation thereto the jaw 105. The surface of the jaw facing the extension is provided with the teeth 107, and when the jaw is moved downward by turning of the rock shaft the steel is gripped between this surface and the projection 101. In the end of the bar 27 is formed a bore 108 in which is slidably mounted a plunger 109 provided with a toe 111 resting on the top of the lever 103, the toe extending through a slot 113 communicating with the bore. In the bore and in engagement with the upper end of the plunger 109 is a compression spring 115 causing the toe 111 constantly to press on the lever 103 to cause the jaw 105 to tend to move into its drill steel engaging position. For moving the jaw out of steel engaging position I have shown a bar 117, the upper surface of which provides a cam track for the cam lever 119 formed on the end of the rock shaft opposite the extension 101, said bar being carried by the track 35 on suitable brackets 121. The end of the bar 117 first met by the carrier when moving in the direction of the arrow shown by Fig. 9 is beveled as indicated at 123.

When the lever 119 meets the beveled portion it rides on the cam track to move the jaw out of engagement with the drill steel. The opposite end of the bar is squared so that the lever will suddenly drop and cause the jaw to grip the steel.

The disengaging mechanism 117, heretofore referred to, as illustrated comprises a stationary standard 125 carrying hook shaped arms 127, the ends of which are adapted to enter the space between the drill steel and the bar 27 and by motion of the carrier to pull the drill steel out of the clips 29. This occurs while the clamp at the bottom of the bore is still in engagement with the drill steel in order that the upper end of the drill steel may be tilted outward to cause it to fall, and while falling pivot in the clamp, so that when the jaw 105 is disengaged from the drill steel the drill steel will fall away from the machine, and for this purpose the beveled end of the bar 117 is in position to release the jaw after the drill steel has been pulled out of the clips.

The heater is arcuate in shape, conveniently having its center line conforming to the path of the drill steels. As illustrated it comprises a casting having a bottom 129 and the side and end walls 131. Supported on the upper edges of the walls 131 are the flanges 133 of the trough-shaped lead pot 135 which extends into the casting as is illustrated in Figs. 1 and 3. With the exception of the heating surfaces of the lead pot, the parts are lined with refractory material, for example, fire-brick 137, and dividing the interior of the casting into a lower flue 139 and upper flues 141 and 143 are partitions 145 of refractory material extending transversely from the walls of the casting to the bottom portion of the trough. The upper flues are placed in communication with the lower flue by means of the openings 146 at one end of the partitions, and the other ends of the flues 141 and 143 are connected to each other by a transverse flue 147 formed around the end of the trough. The end of the flue 143 adjacent the flue 147 is connected to a stack 148. The lower flue is provided with a bridge wall 149 and burner 150. The products of combustion from the burner pass along the flue 139 to the openings 146 where they enter the flues 141 and 143 and traversing these flues finally pass into the stack 148. The trough 135 is filled with material, kept molten by the heat imparted thereto from the flues, this material preferably being lead or other metal or alloy having a relatively low melting point and lending itself to easy regulation of temperature.

The burner 150 for the furnace conveniently is of the oil pulverizing type having a valve controlled air supply connection indicated at 151 in Fig. 4 and a similarly controlled oil supply connection indicated at 152. The stack I may provide with a draft forcing means, and as shown I place in the base of the stack a nozzle 153 having an upturned end which when the nozzle is supplied with air will act to induce a draft by ejector action. For supplying the air for the burner and stack I have shown a blower or other pump 154 geared by means of a belt 155 to the pulley 156 carried on the end of the shaft 49 of the electric motor 45. The discharge pipe 157 of the blower leads around the pedestal of the machine to a point adjacent the furnace where it is connected to the air intake of the burner and to the valve 158 controlling the amount of air passing to the draft nozzle.

In order to vary the time the drill steels are subjected to the heat treating instrumentalities any suitable means may be provided to vary the speed of the pinion 44. As shown the motor is intended to be of the variable speed type and the blower to be of sufficient capacity to supply the necessary amount of air at the lowest motor speed. It is obvious however that the blower may be driven by a separate motor or that other gearing means may be provided for driving the pinion affecting the speed of the blower. For a given temperature of the heater the time a drill steel must remain in the heater to be heated to the temperature at which it is to be quenched is a direct function of the mass of the end portion of the drill steel, that is to say, a drill steel with a large bit will heat more slowly than one with a small bit, and consequently by varying the speed of the pinion 44 the operator may secure the proper quenching temperature of various sizes of bits without changing the temperature of the heater.

As illustrated the quenching tank 15 is provided with an inlet connection 159 in communication with an interiorly tapered socket 161, in which is swiveled the tapered end 163 of the nipple 165, to the latter of which is secured the pipe 167 having the upwardly directed outlet portion 169. This outlet portion 169, as shown by Figs. 2 and 3, is located directly under the drill steel when it comes to rest at the end of the incline lowering the same into the quenching liquid. This causes the tip of the heated cutting end of the drill steel, lowered into the quenching liquid, to be subjected to the cold water projected against it, which will harden the tip of the cutting end. The quenching tank is further provided with an outlet connection 171, the water flowing from the inlet 159 to the outlet 171 in order that the drill steel may be subjected to running water, which is found to be of advantage. The gradual immersion of the heated portion following the hardening of the tip gives a tough backing to the cutting end.

Under some conditions it is desirable to quench the drill steel in a liquid other than water, and for this purpose I herein arrange interiorly of the tank 15 a second tank 173 for containing oil, or if desirable any other quenching liquid. The tank 173 is provided with rollers 175 resting on the bottom of the tank 15 at the remotely opposite sides of guides 177 in order that the tank 173 may be moved and guided into the path of the drill steel, the tank for this purpose being made arcuate in shape. To permit the movement of the tank 173 into this position the intake pipe 167 is permitted to swivel in the socket 161 when the tank 173 pushes against it, and for causing the pipe to move into its proper position when the tank 173 is moved away from this position I provide the torsion spring 179 and the stop 181, the latter engaging the back of the nipple 165 in the position illustrated by Fig. 12 and being carried by the bottom of the tank 15.

In the treatment of drill steels, I find it practical to heat the cutting end, bit, or point, as it is variously called, for about the length of four inches and to dip it into the quenching fluid initially to a depth of about five-eighths of an inch and gradually to immerse the remainder. For treating the shanks it is advisable to heat the drill steel for about twice this length and to plunge as much of it as possible into the quenching liquid with the initial movement. For quenching the shank I may use the oil tank 173, and if necessary, have the level of oil higher than the level of the water in order that the drill steel will be plunged immediately to the full length of the heated portion. When treating the shank with water the intake pipe 169 may be moved into its dotted position shown by Fig. 2 and secured in that position in any suitable manner in order that the shank will not strike the intake pipe. When treating the drill steel with oil it will be noticed that the water flowing through the tank 15 acts to keep the oil cool.

The loading table 11 herein is made adjustable in order to gage the position of the drill steel on the carrier and thus determine the amount of the end of the steel heat treated. Any suitable means for adjusting the table may be provided, and as shown by Fig. 10 the same is mounted on the screw-threaded standard 183 carried in the nut 185. The nut is rotatably supported in a bracket 186 carried by the end of the furnace and may be rotated by turning a hand wheel 187 which is connected to a worm 189 also mounted on the bracket and meshing with a worm wheel 191 made integral with the nut. With this construction any suitable means for preventing the table 11 from turning when the nut is rotated may be provided, and as shown the exterior surface of the flange 193 of the table abuts the end surface 195 of the furnace.

It will be observed that with the loading table in the full line position illustrated by Fig. 3, if the end of the drill steel is heated for a length of four inches and initially plunged into the tank to a depth of five-eighths of an inch, and the table is then lowered four inches for treating the shank, the end of the drill steel will then be heated for a length of eight inches and will be initially plunged four and five-eighths into the liquid. With the table in its lowered position, if the level of the liquid in one tank is three and three-eighths inches higher than the level of the liquid in the other, and the higher level liquid is used for quenching the shank, the heated portion of the shank will be plunged initially to the full length of its heated portion.

Although I have described for purposes of illustration one specific embodiment of my invention it will be understood that I am not limited thereto, but that wide deviations may be made therefrom without departing from the spirit of my invention.

Claims—

1. In a heat treating machine for the ends of drill steels, a heat treating instrumentality, a conveyor for moving the drill steels to be treated, and having means for holding the drill steels thereon with their ends freely exposed for action thereon of said instrumentality, and means for moving said drill steels lengthwise relatively to said conveyor without removing them therefrom to bring their ends into the presence of said instrumentality.

2. In a heat treating machine for the ends of drill steels, a heat treating instrumentality, a conveyor for the drill steels to be treated moving along a definite path relative to said instrumentality, said conveyor having means for holding the drill steels thereon with their ends freely exposed for action thereon of said instrumentality, and means for moving said drill steels relatively to said conveyor without removing them therefrom to bring their ends into the presence of said instrumentality.

3. In a heat treating machine for the ends of drill steels, a heat treating instrumentality, a conveyor for the drill steels to be treated and moving along a definite path relative to said instrumentality, said conveyor having a relatively movable part for carrying the drill steels to be treated, and means for causing such relative movement to bring the ends of the drill steels into the presence of said instrumentality.

4. In a heat treating machine for the ends of drill steels, heat treating instrumentalities, a conveyor for the drill steels to be treated, and having means for holding the drill steels thereon with their ends freely

exposed for action thereon of said instrumentalities, means for moving said conveyor along a path running from one instrumentality to the other, and means for moving the drill steels relatively to said path without removing them from said conveyor to move their ends into and out of the presence of said instrumentalities.

5. In a heat treating machine for the ends of drill steels, heat treating instrumentalities, a conveyor having a body and a relatively movable part for carrying drill steels to be treated in substantially vertical position with their ends freely exposed for action thereon of said instrumentalities, means for moving the body of said conveyor along a horizontal path running from one instrumentality to the other, and means for causing the relative movement of said part for vertically moving the drill steels for effecting movement of their ends into and out of the presence of said instrumentalities.

6. In a heat treating machine, heat treating instrumentalities, a track, a second track having an undulatory path relative the first track, a conveyor supported on said first track, a drill steel carrier carried by said conveyor for movement relative thereto and supported on said second track, and means for propelling said conveyor and carrier along said tracks whereby said drill steels are moved into and out of the presence of said instrumentalities.

7. In a heat treating machine, a plurality of heat treating instrumentalities arranged in end to end relation, a track at a constant level above said instrumentalities, an undulatory track, a conveyor having a part supported on the first track and relatively movable part for carrying the articles to be heated supported on the undulatory track, and means for causing said conveyor to move along said tracks for advancing, raising and lowering said articles whereby to effect subjecting said articles successively to the action of said instrumentalities.

8. In a heat treating machine, a plurality of heat treating instrumentalities arranged in end to end relation, means providing a pair of spaced parallel tracks at a constant level and running from one instrumentality to the other, a member supported on said tracks, means for causing said member to move along said tracks, a member for carrying a drill steel, means for attaching said member to the first member for relative movement thereto, and an undulatory track supporting said member carrying said steel.

9. A machine for heat treating the ends of drill steels, having in combination, a heater, a quenching tank, a conveyor for drill steels traversing said heater and quenching tank, said conveyor carrying said drill steels for movement relatively thereto, and means for moving said drill steels relatively to said conveyor to cause their ends after being subjected to said heater to be placed in the quenching liquid in said quenching tank.

10. A machine for heat treating the ends of drill steels, having in combination, a heater, a quenching tank, a conveyor for drill steels traversing said heater and quenching tank, said conveyor carrying said drill steels for movement relatively thereto, and means for moving said drill steels relatively to said conveyor to cause the tips of the ends of said steels after said ends are heated in said heater to be immersed abruptly in the liquid in said quenching tank and said ends then to be immersed gradually in said liquid.

11. In a heat treating machine, a heat treating instrumentality, a closed track, a drill steel carrier mounted on said track for conveying the drill steels relatively to said instrumentality, a revoluble pusher for said carrier and mounted inside the space enclosed by said track, and means carried adjacent the track and cooperating with said pusher for causing said pusher to at times disengage said carrier.

12. In a heat treating machine, a heat treating instrumentality, a track, a plurality of carriers for the articles to be heated mounted on said track for conveying the articles relatively to said instrumentality, means for pushing said carriers, means for preventing tilting on said track of said carriers under the influence of the pushing action, and said last named means being so disposed as to permit said carriers to be brought in such position that one abuts the other.

13. In a heat treating machine, a heat treating instrumentality, a track, a carrier for the articles to be treated mounted on said track for conveying the articles relatively to said instrumentality, a pusher for said carrier, means for causing said carrier to move ahead of said pusher, and a stop for causing said carrier to come to rest and remain stationary until said pusher catches up to it.

14. In a heat treating machine, a heat treating instrumentality, a track, a carrier for the articles to be treated mounted on said track for conveying the articles relatively to said instrumentality, a pusher for said carrier, means for causing said carrier to move ahead of said pusher, and a resilient stop for causing said carrier to come to rest and remain stationary until said pusher catches up to it.

15. In a heat treating machine, a heat treating instrumentality, a track for conveying the articles to be treated relatively to said instrumentality and having a downwardly inclined portion, a carrier for the

articles to be treated mounted on said track, means for causing said carrier to run down said inclined portion, and a stop for causing said carrier to come to rest at the end of said inclined portion.

16. In a heat treating machine, a heat treating instrumentality, a track for conveying the articles to be treated relatively to said instrumentality and having a downwardly inclined portion, a carrier for the articles to be treated mounted on said track, means for causing said carrier to run down said inclined portion, and a friction brake for checking the speed of said carrier.

17. In a heat treating machine, a heat treating instrumentality, a track for conveying the articles to be treated relatively to said instrumentality and having a downwardly inclined portion, a carrier for the articles to be treated mounted on said track, means for causing said carrier to run down said inclined portion, and a combined friction brake and stop for said carrier for checking and arresting motion of said carrier.

18. In a heat treating machine, a heat treating instrumentality, a track for conveying the articles to be treated relatively to said instrumentality and having a downwardly inclined portion, a carrier for the articles to be treated and mounted on said track, means for causing said carrier to run down said inclined portion, means acting as a brake for said carrier, and a stop for bringing said carrier to rest.

19. In a heat treating machine, a heat treating instrumentality, a track for conveying the articles to be treated relatively to said instrumentality and having a downwardly inclined portion, a carrier for the articles to be treated mounted on said track, means for pushing said carrier along said inclined portion for advancing and moving said articles vertically relatively to said instrumentality, and a friction brake for preventing said carrier from moving faster than said pusher.

20. In a heat treating machine, a heat treating instrumentality, a track for conveying the articles to be treated relatively to said instrumentality and having a downwardly inclined portion, a carrier for the articles to be treated and mounted on said track, means for pushing said carrier along said inclined portion, and means preventing said carrier while traveling over said portion from moving ahead of said pusher.

21. In a heat treating machine, a heat treating instrumentality, a track for conveying the articles to be treated relatively to said instrumentality, a carrier mounted on said track, means for pushing said carrier along the track, and a brake for said carrier.

22. In a heat treating machine, a heat treating instrumentality, a track for conveying the articles to be treated relatively to said instrumentality, a carrier mounted on said track, means for pushing said carrier along the track, and means for preventing said carrier moving ahead of said pusher.

23. In a heat treating machine, a heat treating instrumentality, a track for conveying the articles to be treated relatively to said instrumentality, a carrier having wheels mounted on said track, means for pushing said carrier along the track, and a brake for said wheels.

24. In a heat treating machine for drill steels, a track having a downwardly inclined portion, a carrier for said drill steels having a wheel riding on said track, a pusher for pushing said carrier along said track, and a member resiliently held in spaced relation to said track and parallel thereto for engaging said wheel whereby to act as a brake for said carrier preventing it from moving ahead of said pusher.

25. In a heat treating machine, a furnace, a quenching tank, a conveyor for moving the articles to be treated through said furnace and quenching tank, and an adjustable gauge for determining the position of said articles on said conveyor relatively to the furnace and quenching tank.

26. In a heat treating machine for the shank and point of drill steels, a furnace, a quenching tank, a carrier for conveying said steels through said furnace and quenching tank, means affording a gauge for positioning the steel on said carrier when treating said shank, and means affording a gauge for differently positioning said steel when treating said point.

27. In a heat treating machine for drill steels, a heater, a quenching tank, and means for conveying said steels through said furnace and quenching tank, said means providing for the treatment of a greater length at the shank end of said steel and for the treatment of a lesser length at the point end of said steel.

28. In a heat treating machine for drill steels, a heater, and means for raising and lowering said steels into and out of said heater and providing for the heating of a greater length at the shank end of said steel and for the heating of a lesser length at the point end of said steel.

29. In a heat treating machine for drill steels, a quenching tank, and means for raising and lowering said steels into and out of said tank and providing for the quenching of a greater length at the shank end of said steel and for the quenching of a lesser length at the point end of said steel.

30. In a heat treating machine for the shank and point of drill steels, a quenching tank, and means for raising and lowering said steels into and out of said tank and providing for the quenching of the previously

heated shank end of said drill steels for a greater length than the previously heated point of said drill steels.

31. In a heat treating machine, a carrier for drill steels or the like, means for clamping said steel to said carrier, and said means permitting said steels while clamped therein to pivot relatively of said carrier during removal.

32. In a heat treating machine for drill steels, a heat treating instrumentality for treating the ends of the drill steels, a conveyor moving in a fixed path relatively to said instrumentality for moving the drill steels through said instrumentality, means on said conveyor for holding the drill steels thereon, a gauge for contacting the ends of the drill steels to be treated for determining their position on said conveyor, and means for adjusting said gauge relatively to said conveyor for varying the position of the drill steels relatively to said conveyor.

33. In a heat treating machine, a carrier for drill steels or the like, spaced means on said carrier for gripping said steel at spaced points along its length intermediate its ends, and means for disengaging one of said means from said steel before another is disengaged.

34. In a heat treating machine, a carrier for drill steels or the like, spaced means on said carrier for gripping said steel at spaced points along its length intermediate its ends, means for disengaging one of said means from said steel and pushing the adjacent portion of the steel away from the carrier and for afterwards disengaging another of said means.

35. In a heat treating machine, a carrier, means for moving said carrier along a definite path, a means for holding a drill steel on said carrier, other means for holding a drill steel on said carrier comprising means for gripping said steel spaced longitudinally of the steel from the first mentioned holding means, means for disengaging the steel from said first mentioned holding means and pushing the adjacent end of the steel away from said path, and means for afterwards disengaging the steel from said gripping means.

36. In a heat treating machine for drill steels, a quenching tank, a conveyor for moving the steels in substantially vertical position with their ends in the liquid in said tank, means on said conveyor for holding a steel thereon comprising means releasably engaging said steel at spaced points intermediate its ends and permitting said steel to tilt relatively to said conveyor about the lowermost of said spaced points when said steel is otherwise disengaged from said conveyor, and means for disengaging said steel from said holding means after said steel has been quenched, said means effecting release of said steel at said lowermost point after said steel has been otherwise disengaged from said conveyor and tilted.

37. In a heat treating machine for the ends of drill steels, a lead-pot, a quenching tank, means for moving the drill steels to place their ends only into said lead-pot to heat them and for afterwards removing said ends from said lead-pot and moving them into and through said quenching tank to cool them.

38. The method of heat treating drill steels which consists in heating the end thereof in a bath of molten lead, then plunging the end so heated for a predetermined distance in quenching liquid and afterwards gradually immersing the remainder of said heated portion in said liquid.

39. In a heat treating machine, a longitudinally extending trough for molten metal, a burner beneath said trough, a flue conducting the products of combustion beneath said trough to one end thereof, a stack and a return flue at the side of said trough connecting the first flue to said stack.

40. In a heat treating machine, means for heating the end only of a rod like article to be treated, and means providing for selectively quenching the heated end of said article in liquids of different characteristics.

41. In a heat treating machine, means for heating the end only of a rod like article to be treated, and means providing for selectively quenching the heated end of said article in either an aqueous liquid or in oil.

42. In a heat treating machine, means for heating the end only of a rod like article to be treated, and means providing for selectively causing the heated end of said article to be plunged into any of a plurality of quenching tanks to cool it.

43. In a heat treating machine, a conveyor for previously heated drill steels, and means for selectively causing said steels to pass through any of a plurality of coolers to quench them.

44. In a heat treating machine, means for heating an article to be treated, a plurality of quenching tanks containing quenching liquids at different levels, and means for causing the heated article to be plunged into either tank.

45. In a heat treating machine, a plurality of tanks containing quenching liquids, means for moving a previously heated drill steel through a definite path while quenching it, and at least one of said tanks being movable to enable it to be placed in or removed from the path of said steel.

46. In a heat treating machine, means for conveying previously heated drill steels, a tank in the path of said steels, a second tank inside the first and being movable to permit it to be moved into or out of the path of the drill steels.

47. In a heat treating machine, means for conveying previously heated drill steels, a tank in the path of said steels and having a water inlet and outlet, a second tank inside the first and being movable to permit it to be moved into or out of the path of the drill steels.

48. In a heat treating machine, a tank having an inlet and an outlet, means for placing the previously heated ends of drill steels in said tank over said inlet and allowing them to remain for a predetermined time and then removing them from said inlet.

49. In a heat treating machine, a tank having an inlet and an outlet, means for placing the tips of previously heated ends of drill steels in said tank over said inlet and allowing said tips to remain there for a predetermined time, said means then moving said steels away from said inlet toward said outlet while gradually lowering the remainder of the heated ends into said tank.

50. In a heat treating machine for drill steels, a furnace for heating the end portions of said steels, a quenching tank, an inlet and an outlet for quenching fluid for said quenching tank, said inlet adapted to project quenching fluid lengthwise of said drill steels when the latter are placed in said tank, and means for removing said steels from said furnace and allowing them to remain stationary relative to said inlet for a predetermined time in position to have the quenching fluid from said inlet projected against the ends only of their heated portions while the remainder of their heated portions are positioned above the liquid in said tank, and then gradually to immerse said steels in said quenching fluid progressively to quench the remainder of said heated portions.

51. The combination with a quenching tank containing a liquid for quenching previously heated ends of drill steels and having a vertically directed inlet opening and an outlet opening for the quenching liquid; of a conveyor for placing the drill steels in vertical position over the liquid in said tank and allowing them to remain stationary with the tips only of their heated ends immersed in said liquid over said inlet opening, and for afterwards removing said steels from their position over said inlet opening and gradually immersing in said liquid the remainder of the heated ends.

52. The combination with a quenching tank containing a liquid for quenching previously heated ends of drill steels and having an inlet and an outlet for quenching fluid, of means for placing the drill steels vertically over the liquid in said tank and allowing them to remain stationary with the tips only of their heated ends in position to have the liquid entering the tank by way of said inlet projected against said tips, and for then moving said steels away from said inlet toward said outlet while gradually immersing in said liquid the remainder of their heated ends.

53. In a heat treating machine, a heater, a conveyor for moving the articles to be heated, a pump for said heater, means for driving said conveyor and pump in fixed speed relation to each other at variable speeds, and said pump being of such capacity that its output is within the maximum of its requirements at its lowest speed.

54. In a heat treating machine, a fluid consuming heat treating instrumentality, a pump for said fluid, a conveyor for the articles to be treated, means for driving said conveyor and pump in fixed speed relation to each other at variable speeds, and said pump being of such capacity that its output is within the maximum of its requirements at its lowest speed.

55. In a heat treating machine for the ends of drill steels, the combination with a heater and a cooler, of a conveyor for moving the drill steels for progressively subjecting their ends only to said heater and cooler, and means for driving said conveyor at different speeds.

56. In a heat treating machine for the ends of drill steels, a heater, a cooler, means for moving said steels to bring their ends only into the presence of said heater and for removing said ends from the presence of said heater after they are heated and subjecting them to said cooler, and means for varying the time said ends are subjected to said heater.

57. In a heat treating machine for the ends of drill steels, a heater, a quenching tank, conveyor means for moving the ends of the drill steels through said heater and tank successively, means for driving said conveyor at different speeds for accommodating the mass of the ends of said steels to the heating capacity of said heater, and said tank being of sufficient length to permit effective quenching of said steels at all speeds of said conveyor.

58. In a heat treating machine for the ends of drill steels, a heater, a quenching tank, conveyor means for moving the ends of the drill steels through said heater and tank successively and at a greater speed through said tank than through said heater, and means for varying the effective speed of travel of said steels through said heater.

59. In a heat treating machine for the ends of drill steels, a heater, means for moving said drill steels step by step with their ends in said heater and removing them from said heater after they are heated, and means for varying the time said ends of said steels are in said heater.

60. In a heat treating machine for the ends of drill steels, a heater, a quenching tank, means for moving drill steels step by

step in a row with their ends in said heater and removing drill steels from the end of said row to said quenching tank after they are heated while adding new drill steels to the opposite end of said row, and means for varying the time said ends are in said heater.

61. In a heat treating machine having a furnace provided with an air operated burner, a conveyor for the articles to be treated, a source of power supply, reduction gearing operatively connecting said source to said conveyor, and an air pump for said burner operatively connected to said source independently of said reduction gearing.

In testimony whereof, I have signed my name to this specification.

GEO. H. GILMAN.