April 5, 1932. J. A. KINNEY 1,852,528

HEAT TREATMENT MECHANISM

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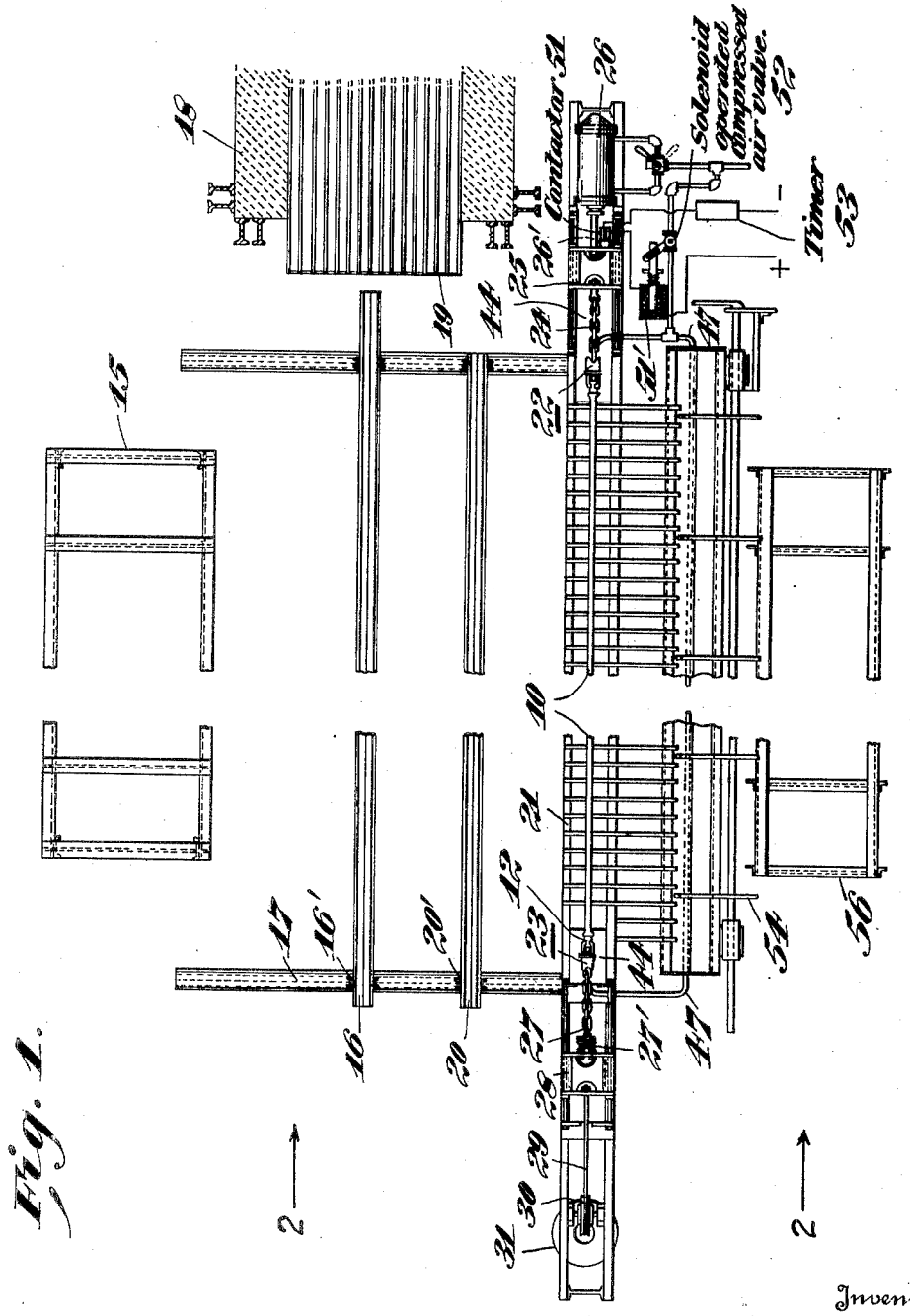


Fig. 1.

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Fig. 2.

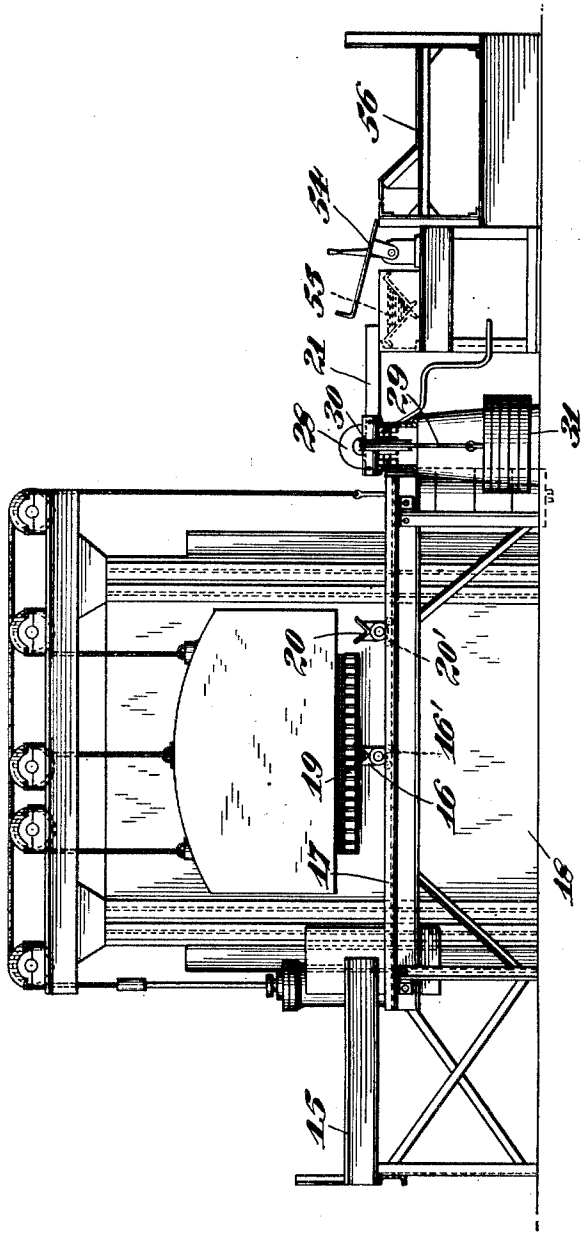


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Fig. 4.

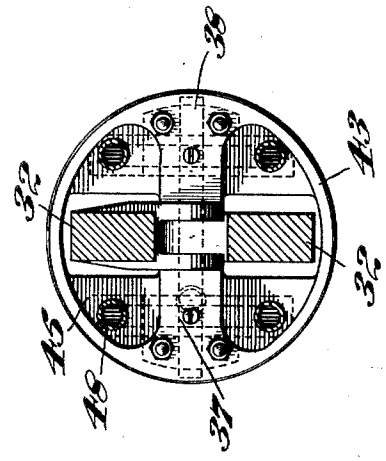



Fig. 5.

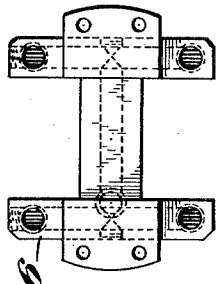
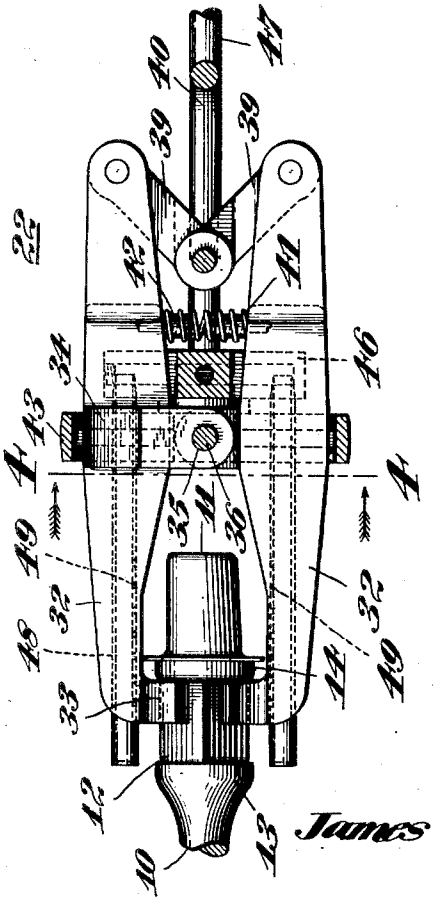



Fig. 3.

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# UNITED STATES PATENT OFFICE

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## HEAT TREATMENT MECHANISM

Application filed August 4, 1930. Serial No. 473,094.

My invention relates to mechanism for the heat treatment of rods; more particularly it relates to mechanism for subjecting rods to tension while being heat treated.

I shall first briefly outline a process of heat treatment of sucker rods and then shall set forth the particular structure which is especially adapted to subjecting the rods to tension while normalizing the principal portion of the sucker rod and quenching the end.

Referring to the drawings:

Fig. 1 is a plan view of the equipment used;

Fig. 2 is an end view looking in the direction of the arrows 2—2 of Fig. 1;

Fig. 3 is a detail longitudinal view of the gripping and quenching mechanism;

Fig. 4 is a cross section of the same mechanism taken on the line 4—4 of Fig. 3; and

Fig. 5 is a detail view of the quenching apparatus.

Now proceeding to a description of the mechanism and the method of its application: The sucker rod 10, having pin end 11, wrench square 12 and with the thickened portion 13 between the wrench square and the shank proper of the rod and collar 14 between the wrench square and the pin end 11, is rolled from the stock stand 15 into charging trough 16. This trough is mounted upon trolleys 16′ adapted to ride upon trackways 17. The trough is moved into position opposite grooves 19 of heating furnace 18 and the rod pushed from the charging trough into the furnace. Here the rod is heated for a period of about forty-five minutes to give it a temperature of from say 1550 to 1600° F., substantially uniform from end to end of the rod. Drawing trough 20, mounted upon trolleys 20′ and sliding upon trackways 17, is moved into position opposite the rod in furnace 18 and the rod drawn into the trough. The trough is then moved to table 21.

Here the rod is gripped at its ends in devices 22 and 23, device 22 is adapted to grip one end of sucker rod 10 and device 23 the other end. Device 22 is connected by means of chain 24 with cross head 25 mounted on piston 26′ of air cylinder 26. Device 23 is connected by means of chain 27 and swivel 27′ to cross head 28 to which is attached cable 29 passing over pulley 30 and connected to yieldable restraining means such as weight 31.

Devices 22 and 23 are essentially the same in structure; therefore a description of one of them will suffice for both. Arms 32 have rod gripping fingers 33. These arms are provided at an intermediate region with lugs 34 which contain openings 35 whereby the arms may be pivotally mounted in opposing relationship on pin 36, which latter is mounted in the inwardly projecting lugs 37 of supporting body 38. Pivoted to the outer ends of arms 32 are links 39, which latter are pivotally connected to clevis 40. To clevis 40 of device 22 is attached one end of chain 24 and to clevis 40′ of device 23 is attached an end of chain 27. By means of compression spring 41, placed between arms 32 and held in position by bosses 42, arms 32 normally tend to effect a gripping action on the rod by gripping fingers 33.

Supporting bodies 38, which support devices 22 and 23, are provided with circular flanges or tires 43 which rest upon smooth plates 44. Webs 45 of bodies 38 are provided with circular holes through which pass nozzles 48 of the end quenching mechanism.

Each of the quenching devices comprises a manifold 46 which is connected with a source of compressed air by means of pipe 47. Connected with manifold 46 are nozzle pipes 48 which are adapted to pass through the holes in web 45. Pipes 48 are provided with openings 49 disposed in proximity to the end regions of the sucker rod, whereby air may be streamed upon wrench squares 12 and pin ends 11 of the sucker rod.

Devices 22 and 23 are brought into position at the ends of rod and arms 32 pressed together against the action of spring 41 to open the gripping elements 33 and these are placed in position upon the wrench square 12 at each end of the rod, the pressure of spring 41 serving to effect a gripping engagement of fingers 33 upon the rod. Air is admitted to cylinder 26 and cross head 25 is carried suddenly to the right, as viewed in Figs. 1 and 3, jerking the rod in the same direction and elevating the weight 31. This

jerking action is very important as it serves very effectively to eliminate any kinks or other conditions tending to prevent straightness in the rod. At the same time, due to the raising of the weight from a position of rest, the rod is placed under a substantial tension. For a rod of cross section such as in the present example and of the particular composition and with the particular temperatures involved, about 1000 lbs. has been found suitable for weight 31.

The placing of the apparatus and rod under tension as just outlined, serves to actuate the toggles containing links 39 to produce a very effective gripping of fingers 33 upon the ends of the rod.

The predetermined longitudinal motion of cross head 25 serves to operate contactor 51 which closes the circuit through solenoid 51′ and thereby serves to open air valve 52 to admit air to manifold 46 and thus to produce a flow of air through openings 49 of nozzle pipes 48 to effect a rapid cooling of the end regions of the sucker rods including pin ends 12, wrench squares 13 and collars 14. The air flow continues until timer mechanism 53 in the same circuit opens the circuit through the solenoid thereby causing valve 52 to close. The time of the quenching operation will vary somewhat but should be sufficient to permit practically the entire mass of the end regions which are receiving the flow of air to cool below the critical range. Following the quenching operation the principal mass of the rod, at the end of the quench is still above the critical range and the residual heat in the rod serves to effect a "drawing" of the quenched ends.

Tension is maintained on the rod until the entire mass thereof has passed through the critical range. When the rod has cooled below the critical range the gripping mechanism is released from the end of the rod which is allowed to cool to a somewhat lower temperature on table 21.

While still at an elevated temperature, however, say at a temperature of from 600 to 700° F. the rod is moved from table 21 onto dipping rack 54 whereby the rod is dipped into a bath of tar 55 and then raised therefrom while still at an elevated temperature to permit the tar to "burn on". The rod is then discharged onto stand 56.

Having thus described my invention what I claim and desire to secure by Letters Patent is:

1. In a mechanism for subjecting a rod to tension, a gripping member for each end of rod, yieldable restraining means attached to the gripping member at one end of the rod and means attached to the gripping member at the other end of the rod to exercise force on said rod in opposition to that exerted by said restraining means.

2. In a mechanism for subjecting a rod to tension, a gripping member for each end of the rod, a weight attached to the gripping member at one end of the rod, and means operatively connected to the gripping member at the other end of the rod to suddenly apply force to the rod in a direction opposite to that exerted by said weight.

3. In a mechanism for subjecting a rod to tension, a gripping member for each end of the rod, yieldable restraining means attached to the gripping member at one end of the rod, and a swivel connection between the gripping member and the restraining means.

4. In a mechanism for subjecting a rod to tension, a gripping member for each end of the rod, yieldable restraining means attached to the gripping member at one end of the rod, a swivel connection between the gripping member and the restraining means, and a circular supporting member for the gripping mechanism adapted to bear upon the smooth surface.

5. In a mechanism for subjecting a rod to tension, a gripping member for each end of the rod, yieldable restraining means attached to the gripping member at one end of the rod, a swivel connection between the gripping member and the restraining means, and a circular supporting member for each of the gripping members.

6. In a mechanism for subjecting a rod to tension, a gripping member for each end of the rod, a weight attached to the gripping member at one end of the rod, and means attached at the other end of the rod for suddenly moving the rod against action of the weight.

7. In a rod heat treatment mechanism, a gripping member for each end of the rod, a weight attached to the gripping member at one end of the rod, means attached at the other end of the rod for suddenly moving the rod against action of weight, and cooling means effective upon a predetermined longitudinal movement of an end of the rod for applying cooling fluid to the ends of the rod.

8. In a rod heat treatment mechanism, a gripping member for each end of a rod, a weight attached to the gripping member at one end of the rod, and means attached to gripping member at the other end of the rod for suddenly moving rod against action of weight, and cooling means effective upon movement of rod for applying cooling fluid to ends of rods, and means for timing flow of fluid.

9. In a mechanism for subjecting a rod to tension, a gripping member for each end of the rod, a weight attached to a gripping member at one end of the rod, and means flexibly connected to the gripping member at the other end of the rod for exerting force on the rod in a direction opposite to that exerted by said weight, a swivel connection between said weight and the gripping member, and a circu-

lar supporting member for each of said gripping members adapted to bear upon a smooth surface.

10. In a mechanism for subjecting a rod to tension, a gripping member for each end of the rod, a weight attached to a gripping member at one end of the rod, and means connected to gripping member at the other end of the rod for exerting a straightening force on the rod in a direction opposite to that exerted by said weight, a swivel connection between said weight and the gripping member, circular supporting members for both of said gripping members, adapted to bear upon a smooth surface, and means for normally tending to render the gripping means effective upon application of such straightening force.

11. In a mechanism for subjecting a rod to tension, a gripping member for each end of the rod, means attached to the gripping member at one end of the rod adapted to exert a pull on the rod when the rod is moved lengthwise in one direction, and mechanism attached to the gripping member at the other end of the rod to move the rod to render said means effective, whereby the rod may be placed under longitudinal tension.

12. In a mechanism for subjecting a rod to tension, a gripping member for each end of the rod, a weight, adapted, normally to be independently supported, attached to the gripping member at one end of the rod and means normally attached to the gripping member at the other end of the rod for moving the rod longitudinally to suddenly lift the weight from its supported position and thereby to suddenly place the rod under longitudinal tension.

13. In a machine for subjecting a rod to tension, a gripping member for each end of the rod, means attached to each of the gripping members for effecting a pull on the rod in opposite directions, and a swivel between one of said gripping members and said means.

In testimony whereof I hereunto affix my signature.

JAMES A. KINNEY.