Nov. 17, 1925. 1,561,577

O. C. TRAUTMAN

QUENCHING DEVICE

Filed April 2, 1924 2 Sheets-Sheet 1

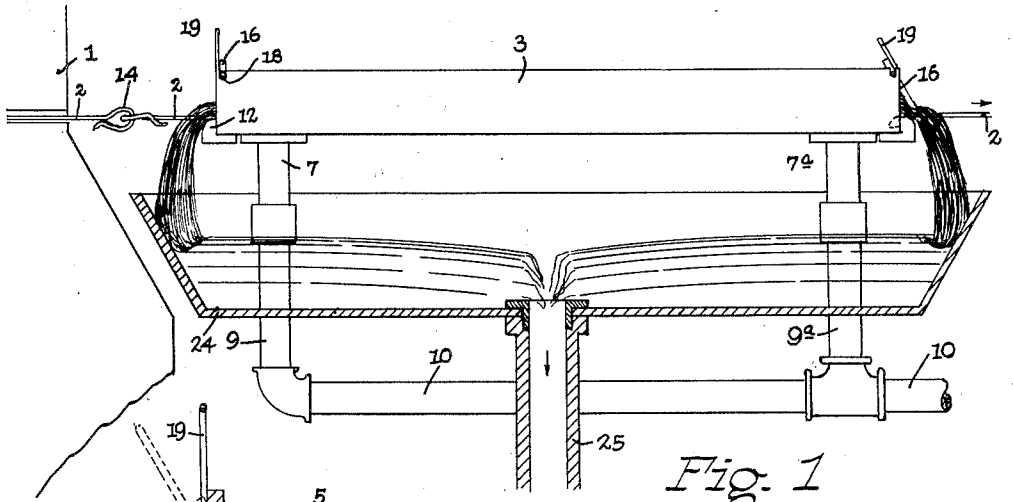


Fig. 1

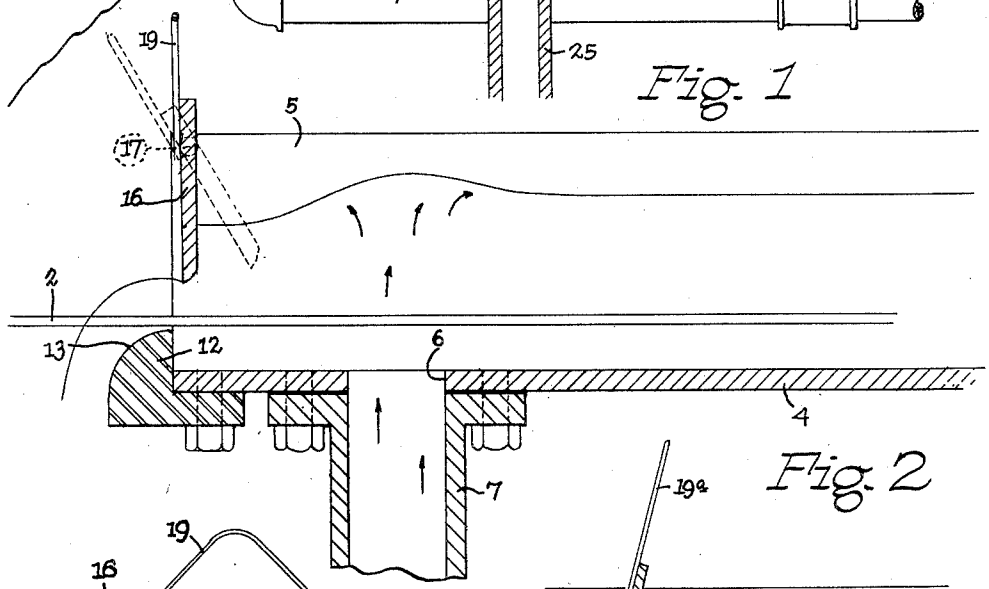


Fig. 2

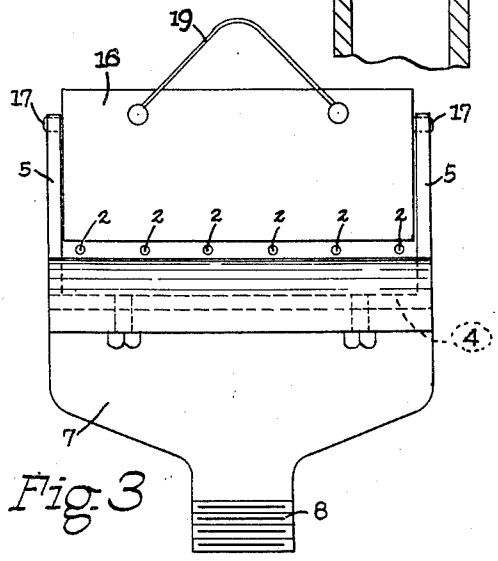


Fig. 3

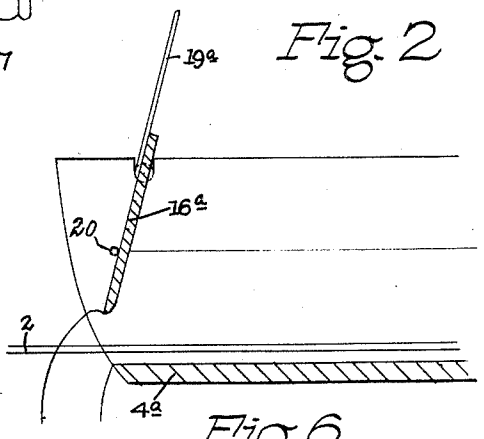


Fig. 6

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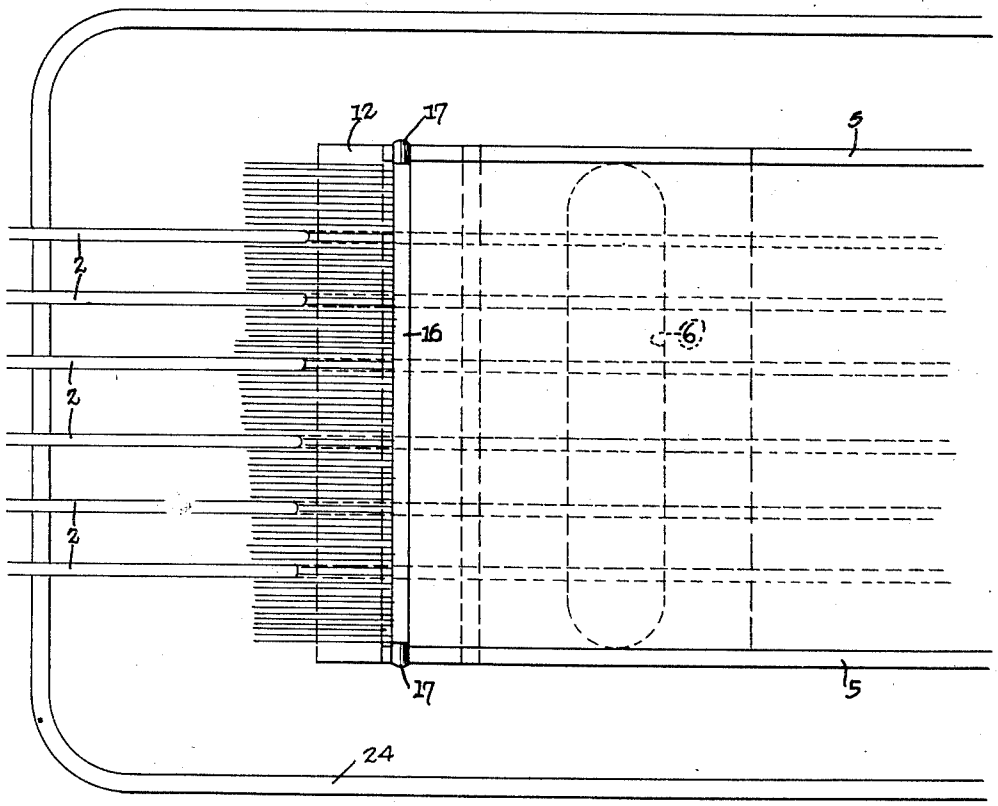


Fig. 4

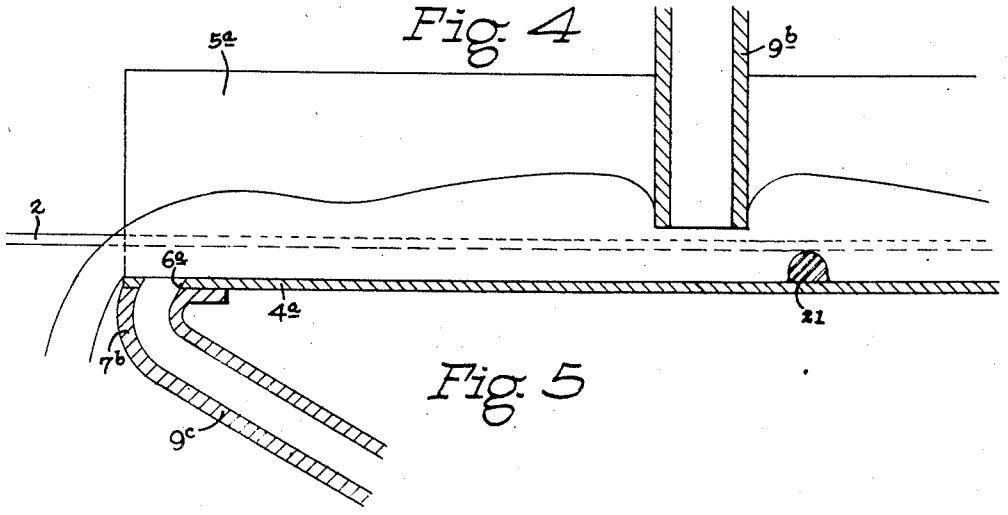


Fig. 5

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UNITED STATES PATENT OFFICE.

OSCAR C. TRAUTMAN, OF LAKEWOOD, OHIO.

QUENCHING DEVICE.

Application filed April 2, 1924. Serial No. 703,648.

To all whom it may concern:

Be it known that I, OSCAR C. TRAUTMAN, a citizen of the United States of America, and a resident of Lakewood, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Quenching Devices, of which the following is a full, clear, and exact description.

This invention relates to the treatment of metal wires, strips, and rods by heat and cold whereby they are hardened, softened, or "tempered" depending upon the nature of the metal and the nature of the treatment, and the object of the invention is the provision of improved means whereby such a wire or rod may be submerged quickly in a deep bath of oil or other liquid kept at an accurately controlled temperature whereby it may be "quenched." Such wires or strips may vary in thickness from the finest wires up to rods of half an inch in diameter, and in shape from round as in machine springs to flat as in clock springs. They are drawn gradually through a heating furnace of any suitable type whereby they are heated to a predetermined temperature and then plunged into a quenching bath. In order to produce a uniform product it is necessary to control accurately the temperature of both rod (or wire) and quenching liquid. This implies that the rod or wire must pass from the furnace directly to the quenching liquid, since contact with any other object would change the temperature; and that the rod or wire must be plunged instantly into a substantial depth or body of quenching liquid, since if it meet only a thin sheet of liquid, or a spray or froth, or even if it enter a mass of liquid on a long slant the quenching will be so gradual as not to produce its expected result and the effective temperature of that portion of the liquid which first meets the oncoming wire will be so uncertain that control of the process will be impossible and the product variable in quality. All these difficulties increase greatly with increase in the size of the wire, since the amount of heat necessary to be abstracted increases with the square of the radius of the wire; also the large wires or rods must be drawn through the apparatus in a straight line since their stiffness precludes any bending.

I have provided certain improvements in the quenching apparatus whereby frothing of the oil or other quenching liquid is prevented and whereby a horizontally moving rod or wire is submerged instantly in a substantial body of quenching liquid of a known and controllable temperature; wherein wear of the parts is avoided and metallic contact delayed until after the quenching is effected; wherein the occurrence of knots, kinks, and inequalities in the wire shall not be detrimental. Other features of novelty and advantage will become apparent as the description proceeds.

In the drawings accompanying and forming a part of this application I have shown certain physical forms in which my invention can be embodied, although it will be understood that these drawings are intended as merely illustrative of the principles of my invention and not limiting as to the particular forms therein depicted.

Fig. 1 is a side elevation of one form of my improved quenching apparatus in operative relation with a heating furnace, certain parts being shown in section; Fig. 2 is an enlarged section of one end of the trough shown in Fig. 1; Fig. 3 is a left hand elevation of the parts shown in Fig. 2; Fig. 4 is a top plan view of the parts shown in Fig. 2 together with the receiving tray; Fig. 5 is a sectional view showing a modified form of trough embodying the more essential parts of my improvements; and Fig. 6 shows a modified type of gate which may be used either with or without other damming means.

Describing by reference characters the parts shown in these drawings, 1 denotes a furnace of any suitable or desired type from which the rods or wires 2 issue continuously in a substantially horizontal direction. These wires pass through a trough 3 located as close to the furnace as safe and convenient, said trough comprising a bottom 4 and side walls 5—5, the top being generally and preferably left open. Near its receiving end the bottom of this trough is preferably formed with an elongated slot 6 which extends substantially from side to side of the trough and with this communicates a similarly wide and narrow fitting 7 provided with a suitable neck 8 to which is connected the liquid supply pipe 9. A second supply pipe is also provided at some part of the trough removed from its receiving end. In Fig. 1 this second supply pipe consists

of a second fitting 7^a similar to the fitting 7 and located adjacent the opposite end of the trough and connected by a pipe 9^a with the common supply pipe 10. This arrangement makes the trough symmetrical; but so far as the essential feature of my invention is concerned this second conduit might be located at any point between the slot 6 and the opposite end of the trough, and may either rise through the bottom of the trough or descend from above as shown at 9^b in Fig. 5, although I prefer to submerge its mouth below the normal level of the liquid in the trough to prevent splashing and bubbles. Suitable quenching liquid such as oil at a known and controlled temperature is forced through the pipe 10 by suitable pumping means (not shown). This liquid welling up through the slot 6 constitutes in effect a kind of dam which hinders the escape of the liquid contained in the middle part of the trough. The liquid entering the trough through the other supply pipe 9^a or 9^b assists in maintaining a sufficient depth of liquid in the trough. In case the supply pipes are only two in number and symmetrically arranged as shown in Fig. 1, the liquid issuing from each serves the double function of supplying the trough and damming the outlet.

In Figs. 1 to 4 inclusive I have shown the damming action of this inflowing liquid stream as supplemented by a weir plate 12 bolted across the lower part of the opening. This plate, when used, can be made of any suitable shape and attached in any desired way, although I have shown it as having a rounded upper surface 13 which is advantageous as permitting knots and joints in the wire which as shown at 14 in Fig. 1 are sometimes very negligently made, to pass over the same without catching. This weir plate, when used at all, is preferably made of such height that the wires or rods 2 will pass freely over the same without touching, yet is also preferably made of very hard metal to prevent its becoming worn into hollows and notches in case contact should accidentally occur, since such notches, by producing a large area of metallic contact, might change the quenching effect.

The damming effect may also be increased, either in addition to the inflowing liquid at slot 6, or in substitution therefor, by means of a movable gate 16 here shown as having trunnions 17—17 at its ends fitting loosely in notches 18 formed in the side walls 5—5. I have also shown this gate as provided with a handle 19 whereby it can be operated or removed. The depth of the gate is such as to cause it to depend into contact with the issuing stream, and different gates are preferably provided for different depths of liquid and sizes of rod or wire. Thus when the rod or wire is of considerable size, requiring a large amount of oil to quench it properly a smaller gate is used, thereby providing for a rapid outflow of liquid as shown in the full lines in Fig. 2; whereas when smaller wires are being quenched less liquid is required and a gate of greater depth employed. The gate shown in Fig. 2 is made of sufficient weight so as not to be displaced materially by the liquid behind it, yet sufficiently freely movable to be displaced by knots or kinks in the rods or wires. The gates 16^a shown in Fig. 6 is made so light as normally to be forced outwardly against suitable stops 20 carried by the sides of the trough.

In Fig. 5 I have illustrated another simple arrangement of parts embodying in modified form the more essential features of my inventive idea. In this arrangement I have shown the bottom 4^a of the trough as formed close to the receiving end with a slot 6^a which is inclined inwardly so as to direct the stream of liquid issuing therefrom somewhat towards the body of the trough and against the direction of the issuing liquid, thereby enhancing its impeding effect. I have shown the fitting 7^b employed with this slot as inclined to correspond therewith and to make a convenient connection with the pipe 9^c. I have also shown a second pipe 9^b arranged to supply an additional body of quenching liquid to the interior part of the trough. By suitably adjusting the relative amounts of liquid introduced through the conduits 9^b and 9^c it is possible so to delay the outflow at the moment of its escape as to produce in the trough a comparatively deep body of liquid issuing from the end in a stream having a minimum of velocity along a horizontal component whatever may be its velocity along a vertical component. A suitable spacing block 21 may be used to hold the wire out of accidental contact with the trough-bottom.

Another mode of effecting this result is shown in Fig. 6 wherein the sole damming means I have shown is the comparatively light gate 16^a. In this case I have shown the bottom 4^a of the trough as terminating short of the gate so that the direction of the face of the oil stream may be sharply inclined at the point where the wires enter the same. This, indeed, is characteristic of all the forms here shown and is an important feature of my invention since it is on account of this that sudden quenching is obtained in a large body of cold liquid. The liquid discharged from the trough is caught in a suitable tray 24 provided with a discharge pipe 25 whence the liquid passes to a suitable cooling device (not shown) after which it is again pumped into the trough.

The mode of treatment of the opposite or discharging end of the trough is sub-

stantially immaterial. It is only important that the rods or wires enter abruptly a large volume of quenching liquid. After reaching the temperature of that liquid they may emerge either abruptly or gradually. The trough shown in Fig. 1 is substantially symmetrical at its two ends, but I have intentionally omitted any illustration of the opposite ends of the trough in the remaining views to signify it is immaterial how these are treated.

I have used the expression "damming means" as covering alike the liquid sheet, the weir plate or the gate, and these may be used either separately or together, and many other changes can be made since I do not restrict myself in any wise except as particularly recited in my several claims.

Having thus described my invention what I claim is:

1. A quenching bath for the purpose described comprising a substantially horizontal trough, means for delivering cold quenching liquid continuously thereto, and means at the receiving end of said trough for producing a deep and unbroken outflow of such liquid with a minimum initial velocity along a horizontal component.

2. A quenching bath for the purpose described comprising a substantially horizontal trough, means for damming the receiving end thereof, and means for delivering a continuous supply of cold quenching liquid to said trough at a level below that of the liquid as restrained by said damming means.

3. A quenching bath for the purpose described comprising a substantially horizontal trough and means for delivering cold quenching liquid thereto, said means comprising one or more conduits which discharge upwardly through the bottom of the trough.

4. A quenching bath for the purpose described comprising a substantially horizontal trough and means for delivering cold quenching liquid thereto, said means including an upwardly discharging conduit located in the bottom of the trough near the receiving end.

5. A quenching bath for the purpose described comprising a substantially horizontal trough having its bottom formed near its receiving end with an elongated slot which extends substantially from side to side of said trough, means for delivering cold quenching liquid continuously to the bottom part of said trough at a distance from said slot, and means for delivering cold quenching liquid through said slot to impede the outflow of liquid from said trough and maintain a substantial depth of liquid near the end of said trough.

6. A quenching bath for the purpose described comprising a substantially horizontal trough, means for damming the bottom part of said trough near the receiving end to delay the outflow of liquid, means for delivering quenching liquid continuously to an interior part of the trough, and a movable gate mounted near the receiving end of the trough and depending into contact with the issuing stream.

7. A quenching bath for the purpose described comprising a trough adapted to have a substantially horizontal wire drawn therethrough, means for delivering cold quenching liquid continuously to said trough, and a weir plate secured to the end of said trough over which the escaping liquid pours.

8. A quenching bath for the purpose described comprising a trough adapted to have a substantially horizontal wire drawn therethrough, means for delivering cold quenching liquid continuously to said trough, and a pivoted gate located at the receiving end of said trough and overhanging said wire.

9. A quenching bath for the purpose described comprising a trough adapted to have a substantially horizontal wire drawn therethrough, and means for delivering cold quenching liquid continuously to said trough near the entering end and also at a distance from said entering end, whereby each entering stream impedes outflow of liquid entering by the other stream.

10. A quenching bath for the purpose described comprising a trough adapted to have a substantially horizontal wire drawn therethrough, means for delivering cold quenching liquid continuously to said trough at a distance from its entering end, and means for delivering more cold quenching liquid to the entering end of said trough in a direction to impede the escape of the first liquid.

11. A quenching bath for the purpose described comprising a trough adapted to have a substantially horizontal wire drawn therethrough, means for delivering cold quenching liquid continuously to said trough and a metal spacing device submerged in the liquid whereby the wire is kept away from the bottom of the trough, said device so located relative to the end of the trough which the wire enters as not to be contacted by the wire until after the latter has traversed a substantial amount of quenching liquid.

In testimony whereof, I hereunto affix my signature.

OSCAR C. TRAUTMAN.