

V. & V. E. ROYLE.
ELECTRIC TEMPERING FURNACE.
APPLICATION FILED MAY 12, 1908.

943,272.

Patented Dec. 14, 1909.

3 SHEETS—SHEET 1.

Fig. 1.

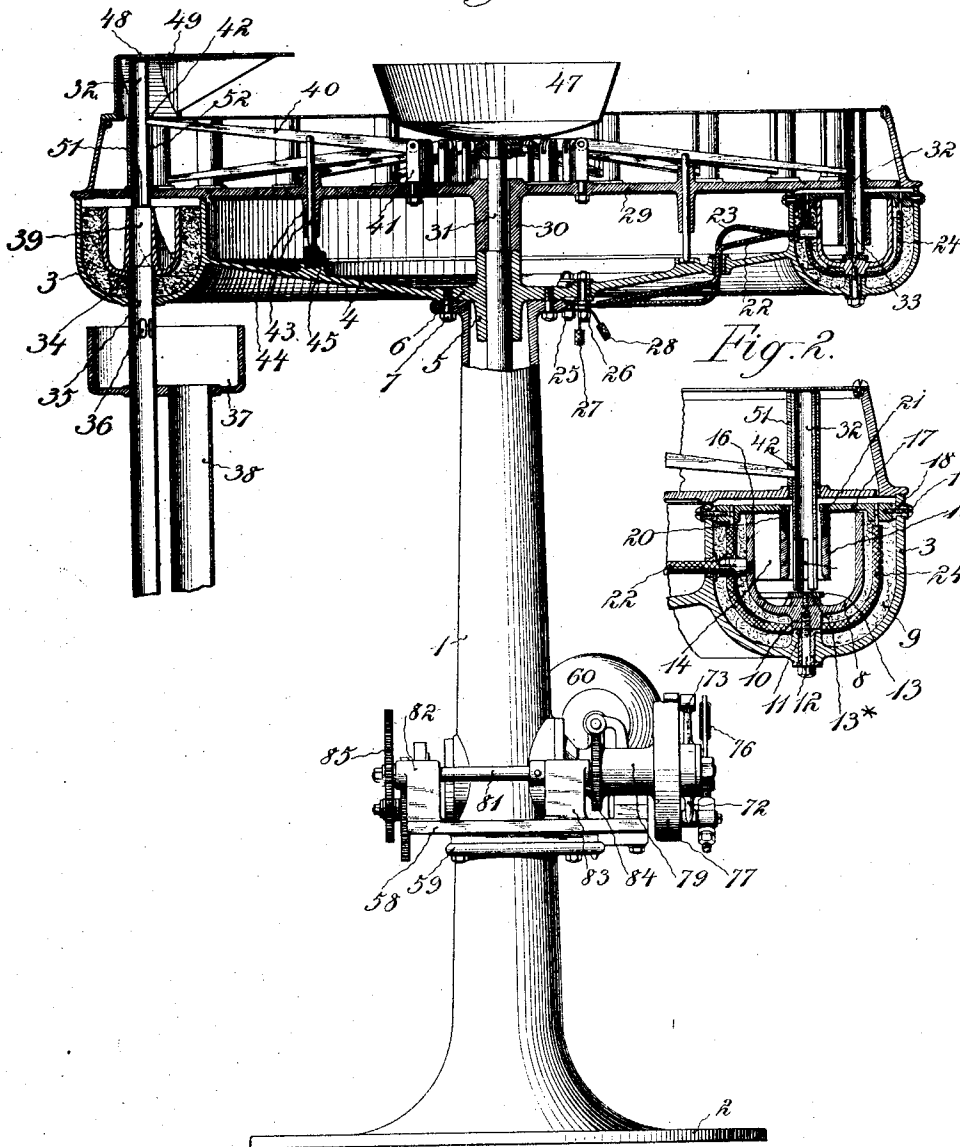
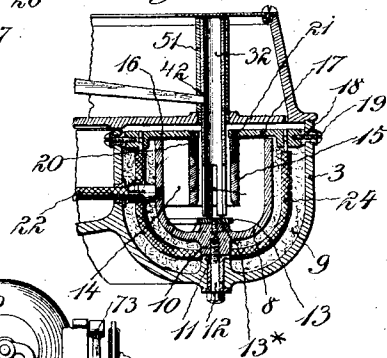


Fig. 2.



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3 SHEETS—SHEET 2.

Fig. 3.

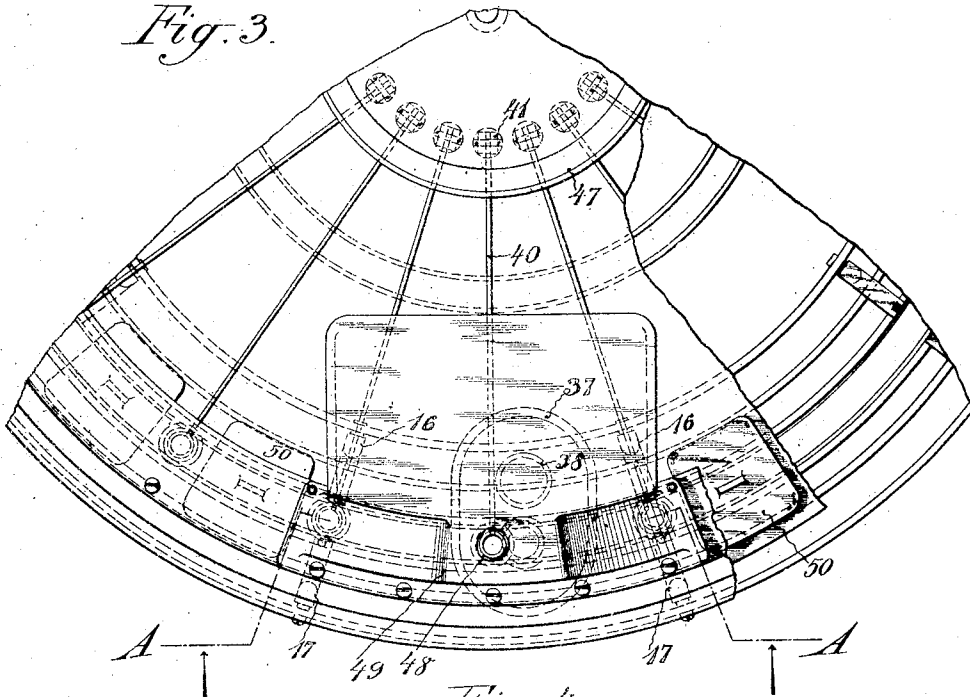
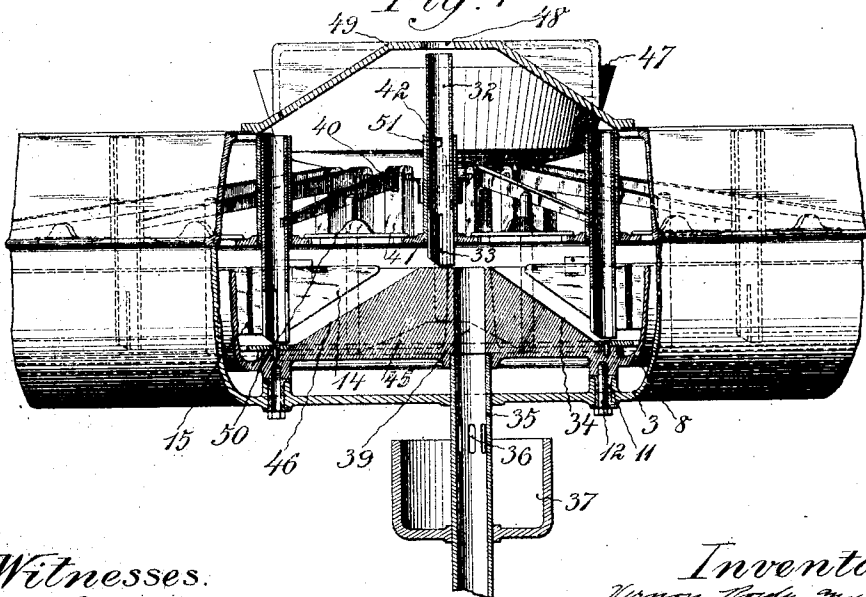


Fig. 4



Witnesses.

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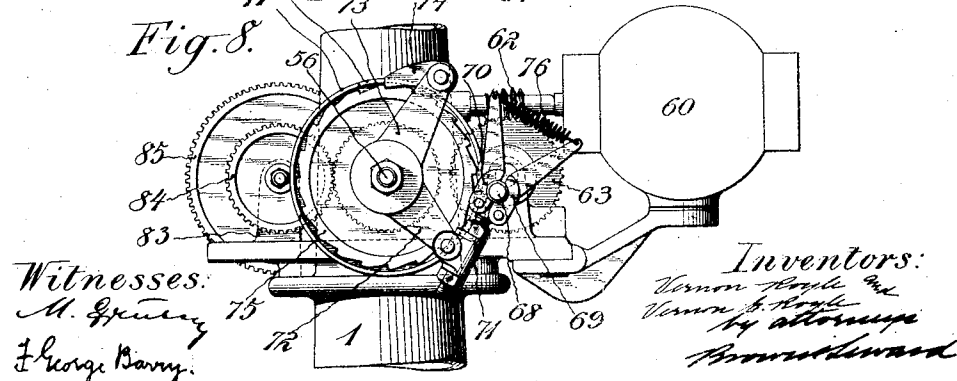
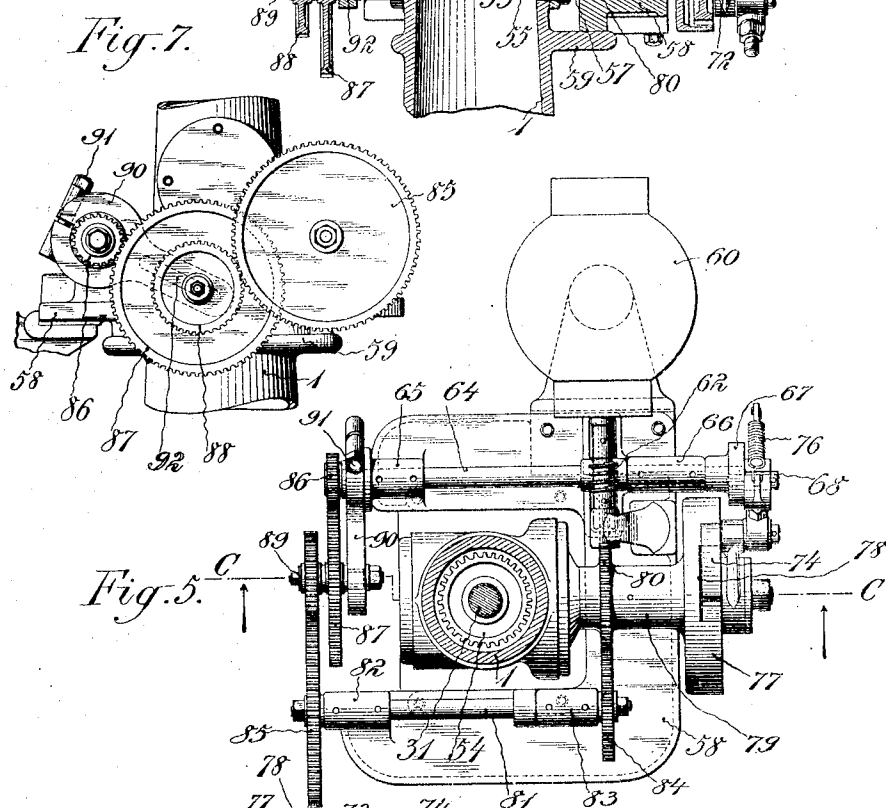
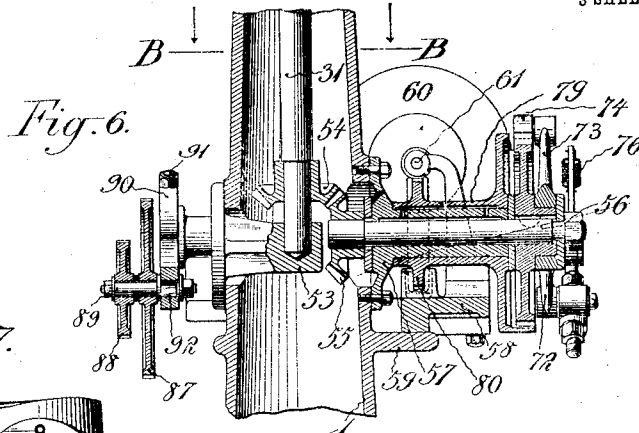
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

VERNON ROYLE AND VERNON E. ROYLE, OF PATERSON, NEW JERSEY.

ELECTRIC TEMPERING-FURNACE.

943,272.

Specification of Letters Patent.

Patented Dec. 14, 1909.

Application filed May 12, 1908. Serial No. 432,415.

To all whom it may concern:

Be it known that we, VERNON ROYLE and VERNON E. ROYLE, citizens of the United States, and residents of Paterson, in the county of Passaic and State of New Jersey, have invented a new and useful Electric Tempering-Furnace, of which the following is a specification.

This invention relates to a tempering furnace and more particularly to a tempering furnace commonly known as an electric fusible salt furnace, the object being to provide effective means for handling tools and regulating their submission to the action of the fusible salt with great accuracy and, at the same time, providing for the automatic stopping of the action of the tool carrier when from any cause a tool becomes jammed.

A practical embodiment of our invention is represented in the accompanying drawings, in which—

Figure 1 is a view of the furnace in side elevation partly in section, Fig. 2 is an enlarged view in detail showing a partial section at the point where the electric conductors are connected with the walls of the salt retaining vessel for fusing the same, Fig. 3 is a partial top plan view on an enlarged scale partly broken away, Fig. 4 is a view of the same in side elevation partly in section, the section being taken on the line A—A of Fig. 3, Fig. 5 is a transverse section in the plane of the line B—B of Fig. 6, showing the motor and the operating mechanism connected therewith in top plan, Fig. 6 is a vertical section in the plane of the line C—C of Fig. 5, Fig. 7 is a partial elevation at the left hand side as the drawing is held in reading, and Fig. 8 is a partial elevation on the opposite side.

The furnace is conveniently supported upon a hollow pillar 1 having a laterally extended base 2.

The furnace casing is annular in form and conveniently U-shaped in cross section, the annular U-shaped casing denoted by 3 being connected by a web 4 with a hub 5, the flange 6 of which is bolted by means of bolts 7 to the flanged top of the pillar 1.

The casing 3 of the furnace has located within and spaced therefrom the furnace proper which is annular in form and U-shaped in cross-section, the space between

the furnace and casing being filled with an insulating non-heat-conducting material 9, for instance, asbestos.

The furnace wall 8 is supported from the casing 3 by means of lugs 10 depending from the bottom of the furnace which rest upon a non-heat-conducting insulating washer 11, a fastening bolt 12 extending through the washer 11 into the lug 10. The furnace 8 is further provided on the upper side of its bottom with a smooth faced track 13 along which the tool carriers slide as will hereinafter appear. The track 13 is spaced from the bottom of the furnace 8 by means of lugs 13' to permit the circulation of the salts beneath the track to maintain the temperature of the track substantially the same as that of the salts.

Two annular plates 14, 15, depend within the furnace spaced from each other and from the furnace walls and held in position by means of suitable bridge pieces 16, 17, made fast to the casing 3. These bridge pieces 16, 17, are insulated from the casing 3 by means of insulating washers 18 which surround the fastening screws 19 but are electrically connected with the plates 14 and 15 by means of screws 20, 21, which fasten them to the bridge pieces.

The space between the annular plates 14 and 15 is sufficient to permit the tool holder to travel around freely between them.

The electric current is brought into contact with the salts in the furnace by connecting one conductor 22, for instance the positive, with the furnace wall, and the negative conductor 23 with the bridge pieces 16, 17, by means of a branch conductor 24 which passes from the bridge piece 16 through the insulating material 9 to the bridge piece 17.

The conductors 22, 23, may lead from binding posts 25, 26, fixed in the web 4 or flange 6 in proximity to the top of the pillar 1 to which the current may be transmitted by suitable line wire 27, 28.

A table 29 is mounted by means of a central hub 30 on the hub 5 and is keyed to the shaft 31 which extends downwardly within the pillar 1 where it is connected up to a suitable step by step rotating mechanism which will be hereinafter particularly described. The table 29 rotates in a horizontal plane and carries with it the tool holders

in such numbers as may be desired, twenty more or less. These tool holders, denoted by 32, consist of open ended tubes of sufficient size to receive a tool therein with a free sliding movement, the lower ends of the tubes being provided with a series of vertical slots 33 for the purpose of exposing the tool therein to the fused salts when the tool holder with tool therein is lowered into the bath of fused salts in the furnace. It is intended that the several tool holders shall, when in operation in the salt bath in the furnace, rest on and slide along the smooth track 13 at the bottom of the furnace and when it is desired to withdraw them from the bath within the furnace they are caused to ride up an incline 34 and to permit the tool therein to drop into a receiving tube 35 which is supplied with a cooling bath in any well known or approved form not shown herein, the cooling bath being kept at a certain height within the tube 35 by permitting it to overflow through openings 36 in the tube 35 into a basin 37 from the bottom of which it is returned by means of a pipe 38.

As the tool holder 32 passes over the top of the receiving tube 35 to deposit the tool therein, it would have a tendency to fall by gravity into the receiving tube 35 or into the socket extension 39 of said tube if the holder were not positively supported at that point by other means than by the track 13 along which it has been allowed to slide while carrying the tool in the bath.

To temporarily support the tool holders as they pass over the receiving tube 35, arms 40 are provided, one for each tool holder, the arms being pivoted at their inner ends to suitable supports 41 near the center of the table 29 and having their outer ends connected by means of a rocking joint with the tool holders 32. This connection may be simply made by permitting the outer end of the arm 40 to engage a slot 42 in the wall of the holder.

Each of the arms 40 has depending therefrom a rod or pin 43 which extends downwardly through an elongated bearing 44 in the table and which, just as the tool holder is about to pass over the top of the receiver, rides up an incline 45 on the web 4 and positively holds the arm 40 and tool holder suspended during the short interval while it passes over the receiver. After the tool holder has passed the receiver, (see Fig. 4) it is allowed to travel down an incline 46 corresponding to the incline 34 and carries the tool which is placed therein just after the tool holder passes into the receiver 35 down into the bath for tempering.

The supply of tools to be tempered may be conveniently deposited in a work receptacle 47 supported on the top of the shaft 31 within convenient reach of the operator and they may be taken from the pan 47 and placed by

the operator in the tool holders just as the latter pass the receiving tube 35. For this purpose a hole 48 is formed in a table 49 under which the tool holders travel as they come up the incline 34, pass the receiving tube 35 and go down the incline 46.

For the purpose of gaining access to the interior of the furnace at frequent intervals throughout its length, the top of the furnace which is formed by the table 29, is provided intermediate of each two consecutive tool carriers with a trap door 50.

To guide the tool holders in their vertical reciprocating movement, the table 29 is provided with upwardly extending tubular bearings 51 in which the tool carriers slide, the wall of the tubular bearing 51 being provided with a vertical slot 52 on the side toward the arm 40 for the purpose of permitting the free end of the latter to move up and down with the tool carrier.

The shaft 31 which extends down within the pillar is stepped in a foot block 53 inserted through an opening in the side of the pillar and made fast to the pillar and is provided with a bevel gear 54 near its foot, which gear intermeshes with a bevel gear 55 on a horizontal shaft 56 mounted in a bearing 57 bolted to the side of the pillar.

A U-shaped supporting table 58 rests upon a flange 59 projecting laterally from the pillar, the branches of the U-shaped table being located on opposite sides of the pillar. This table 58 supports an electric motor indicated at 60, the shaft 61 of the motor extending transversely to and above the shaft 56 and provided with a worm 62 which engages a worm wheel 63 located on a shaft 64 extending transversely to the motor shaft and below it and supported in suitable bearings 65, 66 on the table 58.

The shaft 64 has mounted at or near one end thereon a crank wheel 67, the wrist pin 68 of which is embraced by a pair of expansible jaws 69, 70, on a pitman 71.

The pitman 71 is connected with one arm 72 on a bell crank lever fulcrumed on the shaft 56 at or near its outer end, the other arm 73 of said bell crank lever carrying a gravity pawl 74 adapted to engage a ratchet wheel 75 fixed to rotate with the shaft 56.

The expansible jaws 69, 70, which embrace the wrist pin 68 are held in operative adjustment with respect to the pin by a spring 76, the tension of the spring being sufficient to hold the jaws in operative relation to the wrist pin when the strain upon the crank wheel is normal but when the strain is abnormal, due to any unusual hindrance in the rotation of the vertical shaft 31, the jaws 69 and 70 will spread permitting the wrist pin to escape from its seat and it will work idly between the jaws alternately passing out of and into its seat until the abnormal strain upon the vertical shaft 31 is removed. This

will effectually prevent damage to the gear from any unintentional wedging or jamming of the tool carriers.

The pawl 74 is permitted to engage the ratchet wheel 75 only at intervals, the time between such intervals being determined by the rate of rotation of a shield 77 which surrounds the ratchet wheel and prevents the tool from coming in engagement with the teeth of the ratchet wheel save only where the shield 77 is cut away as at 78 to permit the pawl to drop through temporarily into engagement with the ratchet wheel. The shield 77 is fixed to or integral with a sleeve 79 mounted to rotate on the shaft support 57, the latter being provided with a central cylindrical portion for the purpose of forming a smooth bearing for the sleeve. The sleeve 79 also has fixed to or formed integral therewith, a spur gear 80 by which motion is transmitted to the shield 77 from the shaft 64 as follows:—A shaft 81 is supported in suitable bearings 82, 83, on a branch of the table 58 and on the side of the pillar 1 opposite that on which the shaft 64 is located, the shaft 81 carrying at or near one end a spur wheel 84 in mesh with the wheel 80 and at the opposite end a spur gear 85. The shaft 64 has at or near its end, a pinion 86 and a shifting gear is interposed between the pinion 86 and the spur gear 85 to transmit a faster or slower motion to the gear 85 and hence to the shield 77 as may be desired. The shifting gear consists of a larger spur gear 87 and a smaller spur gear 88, the two mounted on a common short shaft or axle 89 supported in a bracket 90 fixed to an extension of the bearing 65. The spur gear 87 is in a position to intermesh with the pinion 86 and the spur gear 88 in a position to intermesh with the spur gear 85.

The bracket 90 is in the form of an arm and has one end engaged with the extension on the bearing 65 split and provided with a bolt 91 to clamp it to or release it from the bearing 65 while the body of the arm bracket 90 is provided with an elongated slot 92 in which the shaft or axle 89 is clamped so that the wheels carried by the shaft or axle 89 may be moved bodily toward and away from the center of the shaft 64, concentric with which the arm 90 is fixed. For instance, if a wheel smaller than the wheel 87 were to be put in its place and a wheel greater than the wheel 88 were to be put in its place, the wheels 87 and 88 would be removed and when the others were placed in position, the shaft 89 would be adjusted along the slot 92 until the wheel which took the place of the wheel 89 intermeshed with the pinion 86 and the shaft 89 then secured in the slot and the bracket arm would then be swung on its support to bring the wheel which was substituted for the wheel 88

into engagement with the spur wheel 85 and then the bolt 91 would be tightened to hold the parts in assembled adjustment. By thus shifting the gear 87, 88, and replacing it with other gear, a faster or slower motion may be imparted to the shield 77 while the motor shaft 62 and the shaft 64 driven thereby maintains a constant rate of speed thereby permitting the pawl 74 to engage the ratchet wheel 75 at more or less frequent intervals and hence imparting a step by step movement of the vertical shaft 31 which carries the tool holders along within the furnace at a more rapid or less rapid rate as may be desired to produce the most advantageous hardening effect upon the tools.

The operation of the several parts has been so particularly described in connection with the foregoing explanation that a detailed description of the operation is deemed unnecessary. In general, the operation is as follows:—The tools are taken by the operator from the tray or pan 47 and placed in the tool holders 32 as the tool holders pass under the opening 48 and the gear having been set to keep the tools in contact with the fusible salts within the furnace the desired length of time, they will be carried around within the furnace by the travel of the tool holders along the rim until they are one after another dropped into the receiver conduit 35 just before the tool holder reaches a position below the opening 48 to receive another tool. In order that the movement of the tool holder over the mouth of the receiver conduit may be sufficiently slow to afford the tool time to drop free from the tool holder into the receiver conduit under the influence of gravity, the stroke of the crank wheel 67 is so timed that the more rapid part of said stroke and its action upon the pawl 74 will take place just before the receiver reaches the opening 39 while the slower part of the stroke will take place while the tool holder is passing over the conduit.

It is obvious that changes might be resorted to in the form and arrangement of the several parts without departing from the spirit and scope of our invention; hence we do not wish to limit ourselves strictly to the structure herein shown and described, but

What we claim is:—

1. An electric tempering furnace comprising an endless receptacle for fusible salts, means for applying an electric current thereto and means for automatically passing tools one after another into and out of the receptacle.

2. An electric tempering furnace comprising an annular receptacle for fusible salts, means for applying an electric current thereto and means for automatically passing tools one after another along within the receptacle and out of the receptacle.

3. An electric tempering furnace comprising an annular receptacle for fusible salts, means for applying an electric current thereto, the said receptacle being provided with a central track along the bottom thereof, tool holders arranged to travel along the track and means for operating the tool holders.

4. An electric tempering furnace comprising an annular receptacle for fusible salts, means for applying an electric current thereto, tool holders arranged to travel consecutively along the bottom of said receptacle, means for lifting the tool holders at the limit of their travel and a receiver conduit through which the tools pass from the tool holders.

5. An electric tempering furnace comprising an annular receptacle for fusible salts, the said receptacle being provided with trap doors for gaining access to the interior thereof at frequent intervals, means for applying the electric current to the receptacle, open ended tool holders arranged to travel along within the receptacle, means for lifting the tool holders at the termination of their travel and a receiver conduit through which the tools pass from the tool holders.

6. An electric tempering furnace comprising an annular receptacle for fusible salts, means for applying an electric current thereto, a rotating table forming a cover for the receptacle and provided with socket bearings, vertically reciprocating tool holders located in said socket bearings in position to move vertically into and out of the salt receptacle, means for rotating the table, means for lifting the tool holders at the termination of their travel and a receiver conduit into which the tools pass from the tool holders.

7. An electric tempering furnace comprising an annular receptacle for fusible salts, means for applying an electric current thereto, a track along the bottom of the receiver on which the tools travel, the track being provided with an incline, a receiver conduit located at an elevated portion of the incline, a series of open ended tool holders arranged to travel along the said track and means for holding the tool holders elevated as they

pass over the mouth of the said receiver conduit.

8. An electric tempering furnace comprising an annular receptacle for receiving fusible salts, means for applying an electric current thereto, open ended tool holders arranged to travel within the furnace, a receiver conduit over the mouth of which the tool holders pass, radial vertically vibrating arms having their free ends engaged, one with each tool holder, and cams arranged to support the arms and hence the tool holders during the passage of the tool holders over the mouth of the receiver conduit.

9. An electric tempering furnace comprising an annular receptacle for receiving fusible salts, means for applying the electric current thereto, open-ended tool holders arranged to travel along within the receptacle, a receiver conduit and means for retarding the advance movement of the tool holder as it passes over the mouth of the receiver conduit.

10. The combination with a receptacle for receiving the tools to be tempered, tool carriers arranged to move along the receptacle; a rotary shaft for operating the tool carriers and means for rotating the shaft, of means for automatically disconnecting the shaft from the driving power when the shaft presents an abnormal resistance to the driving power.

11. An electric tempering furnace, comprising an annular receptacle for receiving fusible salts, means for applying the electric current thereto, a track spaced from and located along the bottom of the annular receptacle for supporting the tools during the tempering operation and means for entering tools along said track within the mass of fusible salts.

In testimony, that we claim the foregoing as our invention, we have signed our names in presence of two witnesses, this 30th day of April, 1908.

VERNON ROYLE.
VERNON E. ROYLE.

Witnesses:

HEBER ROYLE,
ARTHUR B. HUNT.