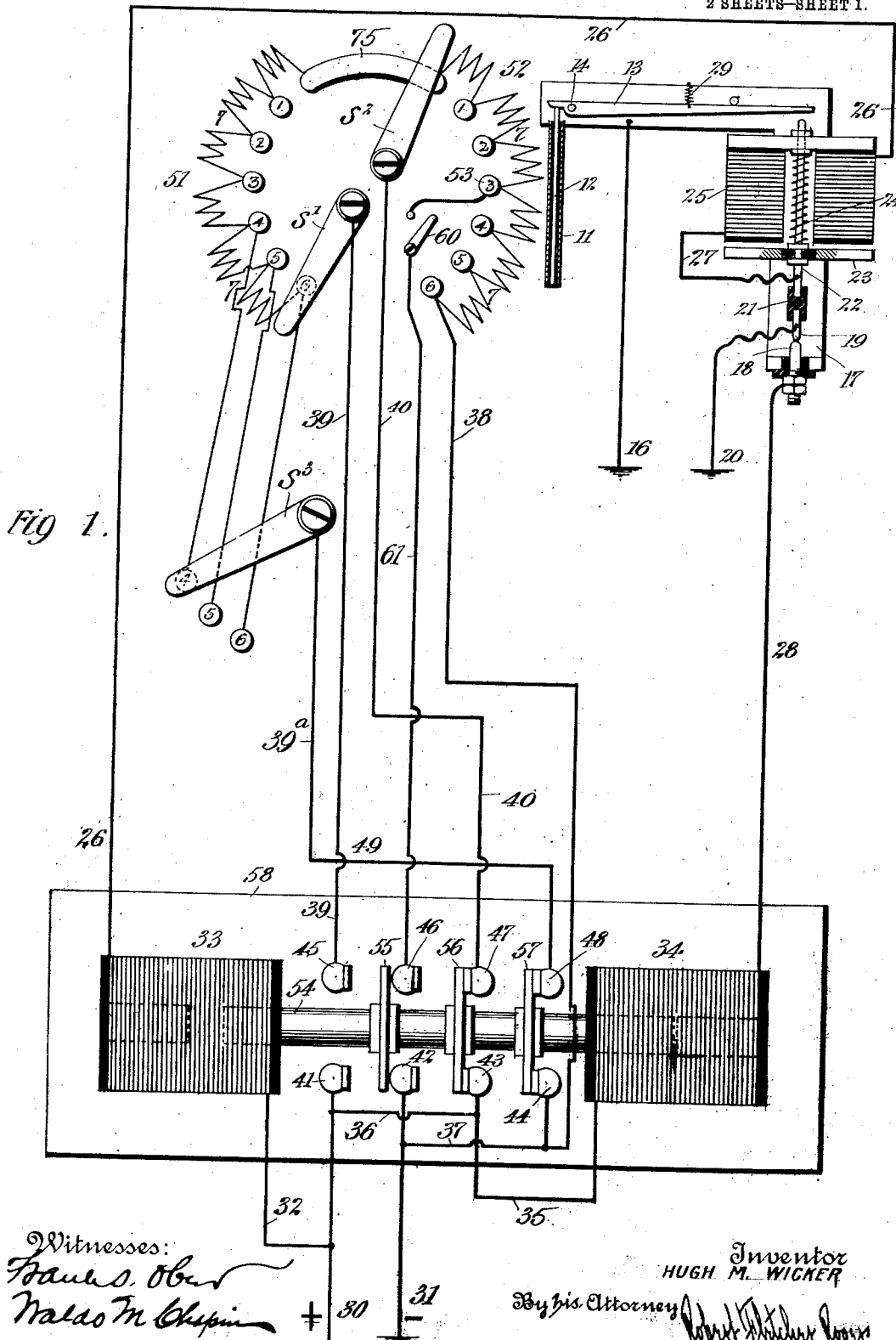


H. M. WICKER.
ELECTRICAL HEATING APPARATUS.
APPLICATION FILED MAY 27, 1908. RENEWED DEC. 24, 1912.

1,061,433.

Patented May 13, 1913.

2 SHEETS-SHEET 1.



H. M. WICKER.

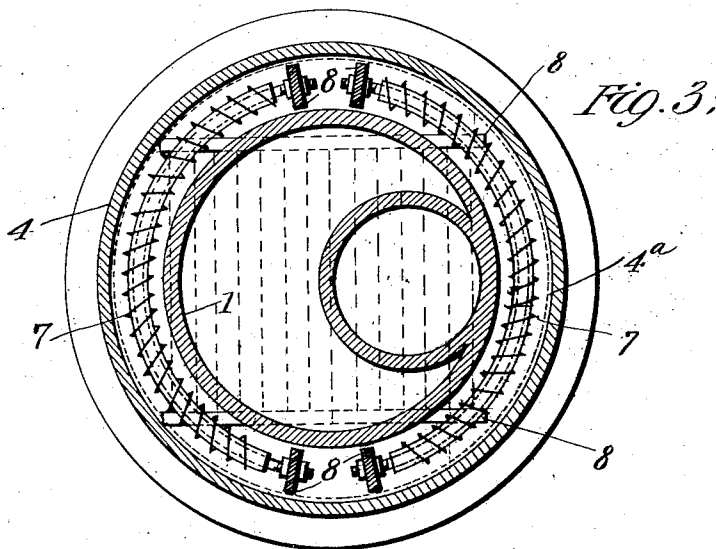
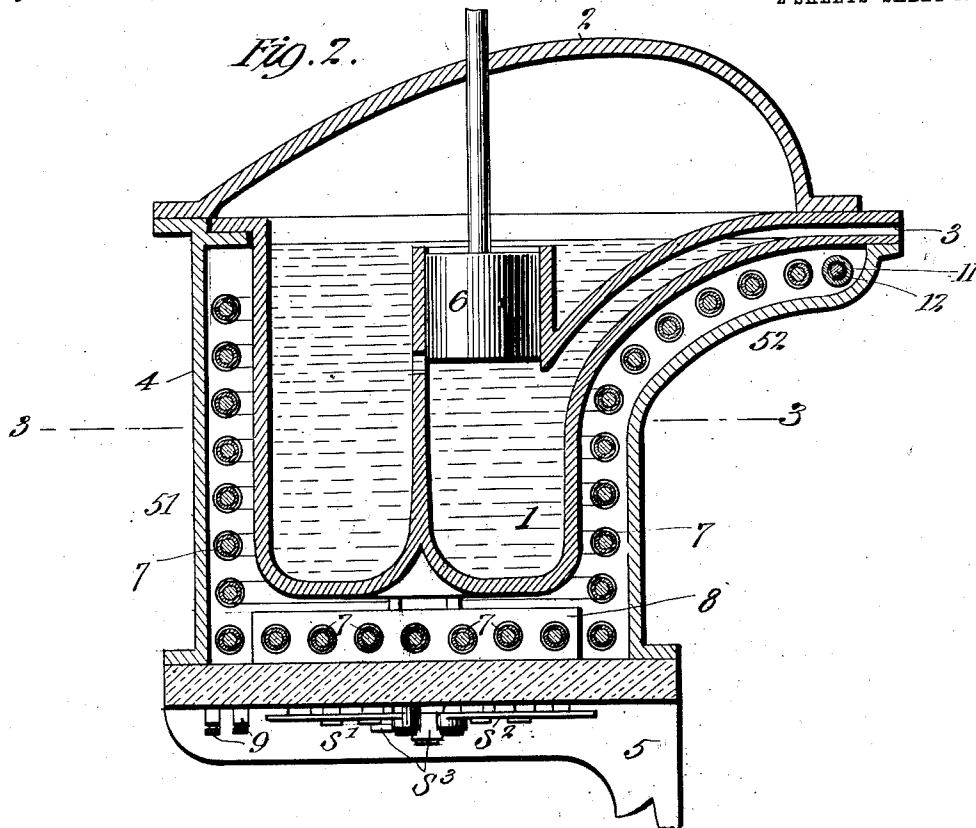
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Witnesses:

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Inventor:
HUGH M. WICKER,

By his Attorney *Robert W. Rogers*

UNITED STATES PATENT OFFICE.

HUGH M. WICKER, OF NEW YORK, N. Y.

ELECTRICAL HEATING APPARATUS.

1,061,433.

Specification of Letters Patent.

Patented May 13, 1913.

Application filed May 27, 1908, Serial No. 435,276. Renewed December 24, 1912. Serial No. 738,477.

To all whom it may concern:

Be it known that I, HUGH M. WICKER, a citizen of the United States, residing at the borough of Brooklyn, city of New York, in the county of Kings and State of New York, have invented certain new and useful Improvements in Electrical Heating Apparatus, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to electric heating apparatus, and more particularly to that class thereof provided with thermostatic or equivalent automatic controlling means whereby the heat is varied to suit the conditions.

The apparatus consists of a plurality of individual heating groups, which groups are suitably connected, and are also provided with devices whereby the heating effect of the several groups may be varied relatively to each other.

In my preferred embodiment the automatic control is secured by altering the connections of the several groups from parallel to series, or vice versa, to produce the desired effect. As before stated, I also provide means whereby the individual capacity and extent of the several groups may be relatively altered and adjusted at will,—this latter adjustment, however, being independent of the automatic control previously referred to.

It is obvious that my invention may be applied in various forms and for many different purposes, and I have selected, by way of example and as a means of illustrating it, its application to the melting pot of a linotype machine.

Referring to the drawings: Figure 1 is a diagrammatic view of the electrical apparatus and circuits of the controlling mechanism; Fig. 2 is a vertical sectional view of a linotype melting pot with my invention applied thereto; and Fig. 3 is a horizontal sectional view thereof on the line 3—3 in Fig. 2.

The melting pot 1 is provided with a cover 2 and a spout 3, and surrounded by a jacket 4, which is preferably of cast-iron lined with asbestos, or other heat resisting material, as indicated by the dotted line 4^a (see Fig. 3). The centrally arranged plunger 6 serves to force the molten metal out from the spout 3 in the customary and well-

known manner. The several parts described are mounted upon a portion of the frame 5 of the linotype machine. These various features form no part of my invention and may be of any desired or approved construction.

Within the air-tight space between the melting pot 1 and the jacket 4, I place a number of heating coils 7 in any desired grouping, and so arranged that they are supported upon insulators out of contact with the casing. Attached to the bottom of the pot 1 are binding posts 9 through which the current is led to the heating coils. The heating elements may also be of any desired or approved character, and as shown comprise curved iron or steel rods, which are insulated by asbestos sleeves. These rods are threaded at their ends, where they are provided with two nuts, one on each side of a steel supporting rib 8, through which the ends of the rods are passed and to which they are thus rigidly held in the proper position. Outside of and around the insulating sleeves are mounted spiral heating coils of high resistance, which are located in such a way as to be out of contact with the pot which they surround. When the current is supplied the heat produced in these coils is transmitted to the pot 1 and to the type metal therein contained.

The heating coils 7 are divided into two general sections or groups 51 and 52, the group 51 being applied to the main portion of the pot 1, and the group 52 being located in proximity to the spout or discharging nozzle 3. The reason for this division of the heating coils into a plurality of sections is that a far greater amount of heat energy is required for melting the metal than for preserving it in molten condition. In the practice of my invention I ordinarily employ both groups 51 and 52 for melting the metal, and then subsequently reduce the heating capacity of the group 51 to such an extent that only enough heat is imparted to the pot to preserve the metal in molten condition. Due, however, to the fact that the spout or nozzle 3 is not protected from the surrounding air, and to the fact that there is a further tendency to reduce its temperature because of its periodical contact with the colder metal parts of the mold, and because the metal that passes therethrough is thus apt to become chilled and therefore to

produce imperfect castings, it is essential to maintain the heat of the spout or nozzle even after the heat of the coils of group 51 is reduced. I have therefore provided a control whereby this result will be secured with the least expenditure of electric energy, and for this purpose I employ an automatic means, preferably a thermostat, which acts not only to produce the result mentioned, but also to preserve the metal in correct condition and at the proper temperature.

The particular form of thermostat to be employed constitutes no part of my invention. I have preferably located it in immediate proximity to the spout or nozzle 3, where it will be most susceptible to changes in the temperature, and, as illustrated in the drawings, it consists of an aluminum or other metal rod 12, secured in an iron tube 11. One end of the rod 12 rests upon the shorter end of a lever 13, fulcrumed at 14 to the frame of the machine. A spring 29 connected to the longer end of the lever normally holds it in its retracted position and against the end of the rod 12. In proximity to the long end of the lever 13 is arranged an electro-magnet 25, provided with an armature 23, which is supported by, but insulated from, a brass plunger 22, which projects into the path of the long arm of the lever 13. The armature 23 and plunger 22 are normally held in their retracted positions by the spring 24. The plunger 22 carries at its opposite end a block of insulating material 21, on which is fastened a contact piece 19. This piece 19 is normally grounded, as at 20, preferably through the frame 17 of the machine. The frame 17 is provided with an insulated contact piece 18, which is located in position to contact with the piece 19 when the parts are in their normal positions.

The main circuit controlling device comprises a base 58 on which are mounted a pair of opposed solenoids 33 and 34, provided with a common plunger 54, which is adapted to be moved by either solenoid. On this plunger 54 are mounted three metallic disks or conductors 55, 56 and 57, insulated from the plunger and spaced equally thereon, as shown in Fig. 1. Also mounted on the base 58 and projecting upwardly therefrom on opposite sides of the plunger 54 and disposed in the paths of the disks or conductors 55, 56 and 57 are four pairs of studs, 41 and 45, 42 and 46, 43 and 47, and 44 and 48. When the parts described are in the position shown in Fig. 1, the pairs of studs 43 and 47, and 44 and 48, are connected respectively by the disks 56 and 57, these connections being due to the position of the plunger 54, which has been occasioned by the action of the solenoid 34. When, however, the solenoid 34 is thrown

out of circuit, and the solenoid 33 is in circuit, the plunger 54 is moved in the opposite direction, and at this time the pairs of studs, 41 and 45, and 42 and 46, are then connected respectively by the disks 55 and 56.

As previously described, the heating coils 7 are connected together in two groups, 51 and 52. The group 51 is connected at one end to the contact piece 75, to which is also connected the group 52, and which thus serves as a connection therebetween when the two groups are employed in series. The groups 51 and 52 are also provided with a series of internal contact pieces, 1, 2, 3, 4, etc., whereby a greater or fewer number of the coils 7 may be cut into or out of operation in the manner subsequently to be described. A switch piece S^1 is arranged to contact with any one of the interior contact pieces of the group 51, and normally rests upon the extreme contact piece 6 thereof, as shown in the drawing. A switch S^2 is also provided, which is arranged to contact with the piece 75, or with any one of the interior contact pieces of group 52 (see also Fig. 2). The various circuit connections will be best understood from the description of the operation of the apparatus which now follows: The current enters the apparatus at the point 30 and leaves it at the point 31, where it is preferably grounded. In the position shown in Fig. 1, the current enters at 30 and passes thence through wire 36, stud 43, disk 56, to stud 47, through wire 40, to switch S^2 and contact piece 75, where it divides, part passing through the group 51, switch S^3 wire 39^a, wire 49, stud 48, disk 57, stud 44, and wire 37, to ground at 31,—and the other part passing from piece 75, through group 52, wire 38, wire 37, to ground at 31. If the switch S^3 is turned so as to bring it in contact with stud 6, the two groups of heating coils 51 and 52 are connected in parallel, and their heating effect is therefore at the maximum. This is the condition which is desired for the purpose of melting the metal in the pot. It is to be here noted that there is a further connection from the wire 30 through wire 32, magnet 33, wire 26, magnet 25, and wire 27, to plunger 22, but as this stud is insulated in the normal position of the parts, the circuit is open.

The metal having been raised to the desired temperature, and it being simply necessary to keep it in its proper condition and at the same time to preserve the high temperature of the spout or nozzle 3, an automatic regulation is effected by the action of the thermostat previously described. At this time the rod 12 of the thermostat has expanded sufficiently to bear against and move the short end of lever 13. The long end of said lever is thus thrown over into engagement with the end of plunger 22.

This action completes the circuit through the magnets 33 and 25, last traced, as it provides a ground through the frame of the machine to 16, and the magnets 33 and 25 are therefore energized. The magnet 25 then attracts its armature 23 (the elasticity of the lever 13 allowing it to bend sufficiently to permit the slight movement required), and thereby separates the contact pieces 18 and 19, comprising a part of the circuit now to be traced. These pieces 18 and 19 when in contact form the ground connection for a circuit as follows,—from wire 30, through wire 36, wire 35, magnet 34, wire 28, contact pieces 18 and 19, to ground at 20. When the last mentioned parts are in circuit the magnet 34 is energized and the plunger 54 occupies the position shown in Fig. 1. But when this circuit is broken by the separation of the contact pieces 18 and 19, as above described, the magnet 34 becomes deenergized, and the magnet 33 is energized, thus drawing the plunger 54 over into its reverse position. In this reverse position, as previously described, the pairs of studs 41 and 45, and 42 and 46, are respectively connected by the disks 55 and 56, and the connection previously existing between the pairs of studs 43 and 47, and 44 and 48, is broken. The heating circuit may now be traced as follows,—from wire 30, stud 41, disk 55, stud 45, wire 39, switch S^1 , group 51, contact piece 75, group 52, wire 38, and wire 37, to ground at 31. In this position of the parts it will be seen that the two groups of heating coils 51 and 52 are in series, and that the change from the parallel to the series connection thereby largely reduces their combined heating capacity. This reduced amount of heat, however, is nevertheless sufficient for the purpose of maintaining the metal in its molten condition. If at any time the temperature drops below this point, the thermostat acts to restore the parallel arrangement of the groups 51 and 52, thus increasing the heat to the desired extent, and, generally speaking, the thermostat acts as an automatic controller to preserve the metal in its proper condition, and, as before pointed out, it is preferably located at the mouth of the pot, which is the critical point from which the general temperature should be regulated.

As previously described, the switch S^1 is adapted to contact with the interior contact pieces 1, 2, 3, 4, etc., of the group 51. If it be desired to increase the amount of heat obtained from this group 51, when it is in the series connection, this may be effected by moving the switch S^1 so as to cut out any desired number of the heating coils 7 thereof, by bringing the switch S^1 into contact with one of the interior contact pieces 1, 2, 3, 4, etc., instead of leaving it

in connection with the last contact piece of the series, which is its normal position. In this manner the extent of the group 51 is diminished, and the heating capacity of the remainder increased, and by a proper selection of the contact points, the heat of the pot toward the mouth piece may be varied, while in the series position. Another result that arises from this manipulation of the switch S^1 is the relative alteration in the heating effect of the respective groups 51 and 52. For instance, if the switch be brought into contact with the interior point 3 of group 51, three sets of elements are cut out and three remain, and the extent of the group is diminished to one-half, decreasing its resistance and increasing the heat of the remainder. As the group 52 is in series with group 51 at this time, it follows that the heating effect of group 52 will be correspondingly increased, and that the proportions may be thus varied at will. I also provide a switch 60 adapted to be operated to contact with a connection 53 to one or other of the interior contact pieces 1, 2, 3, 4, etc., of the group 52,—the contact piece 3 being the one selected by way of example for illustration in the drawings. By closing this switch 60, I am enabled to cut out all of the higher numbered interior contact pieces, as the switch 60 through wire 61, stud 46, disk 56, and stud 42, passes to ground at 31.

The provision of the switch 60 is rendered desirable by the fact that the group 52, when in series as previously described, normally grounds through the extreme contact point thereof, wire 38 and wire 37, at 31, and the provision of the switch 60 permits the grounding of group 52 at an interior point, thus shortening the group with the general results and advantages therein involved and as previously described in connection with switch S^1 . I also provide switches to control the extent and point of application of the several groups when connected in parallel. Thus, the switch S^2 may be brought into connection with any of the interior contact points 1, 2, 3, 4, etc., of the group 52, and the connection of the switch S^2 in this manner has the effect of shifting the connection of the wire 40 to various positions within the group 52, thereby shortening or lengthening the group 52 with results somewhat similar to those already described. I also provide a switch S^3 , which contacts with the remoter contact points 4, 5, 6, etc., of group 51, or with similar contact points connected thereto, as shown diagrammatically in Fig. 1. The nearer contact points 1, 2, and 3 are omitted in this arrangement to prevent unduly short circuits. This switch S^3 is employed also in the parallel arrangement, and is connected by the wire 39 to stud 48, disk 57, stud 44, and wire 37, to

to ground at 31. By the use of the switch S³ I am therefore enabled to ground the group 51 from the selected interior contact points thereof when in parallel, thus shortening the group and correspondingly increasing the heating capacity of the remainder, as well as shifting the heating effect to the desired point.

The apparatus described not only affords me full and complete manual control over the extent and capacity of the several heating groups, but also enables me to locate their application at the desired points and in the most advantageous positions, and it will be noted that this manual control is entirely independent from the general thermostatic regulation previously described.

Having thus described my invention, what I claim and desire to secure by Letters Patent of the United States is as follows:

1. In an electric heating apparatus, the combination of a plurality of heating groups comprising each a plurality of connected heating coils or elements, means for connecting said groups in parallel, and means for connecting an element of one group in series with the elements of the other group while preserving the parallel connection of the groups.

2. In an electric heating apparatus, the combination of a plurality of heating groups comprising each a plurality of connected heating coils or elements, means for connecting said groups in parallel, and means for connecting an element of either group in series with the elements of the other group while preserving the parallel connection of the groups.

3. In an electric heating apparatus, the combination with a plurality of heating groups of automatic controlling means whereby the heating effect of the several groups is varied by shifting their connection from parallel to series or vice versa.

4. In an electric heating apparatus, the combination with a plurality of heating groups of thermostatic controlling means whereby the heating effect of the several

groups is varied by shifting their connection from parallel to series or vice versa.

5. In an electric heating apparatus, the combination with a plurality of heating groups of automatic controlling means whereby the heating effect of the several groups is varied by shifting their connection from parallel to series or vice versa, together with further means whereby the heating effect of the several groups may be varied relatively to each other.

6. In an electric heating apparatus, the combination with a plurality of heating groups of automatic controlling means whereby the heating effect of the several groups is varied by shifting their connection from parallel to series or vice versa, together with further means whereby the points of application of the several groups may be varied relatively to each other.

7. The combination of an electric heating apparatus comprising a plurality of heating groups, a linotype pot, and thermostatic controlling means whereby the heating effect of the several groups is varied by shifting their connection from parallel to series or vice versa, the said thermostatic means being mounted in proximity to the spout or nozzle of the pot.

8. An automatic controlling device, comprising a pair of electro-magnets, the first of which is normally in circuit and energized, a member adapted to be actuated by either of the said magnets, and a third magnet in circuit with the second of the pair of magnets, but which circuit is normally open, together with a thermostatic device to close the latter circuit, thus energizing the second and third magnets, the third magnet acting to deenergize the first magnet by interrupting its normal circuit.

In testimony whereof I have affixed my signature in presence of two witnesses.

HUGH M. WICKER.

Witnesses:

K. L. RAUTER,
GEORGE L. MOORE.