

F. M. VOGEL.
ELECTRIC HEATING DEVICE.
APPLICATION FILED JUNE 15, 1912.

1,128,081.

Patented Feb. 9, 1915.

2 SHEETS-SHEET 1.

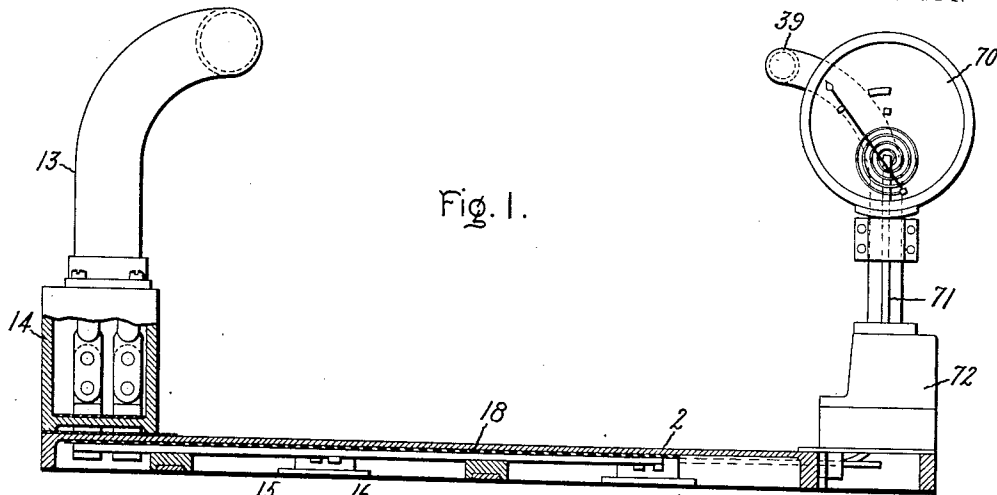


Fig. 1.

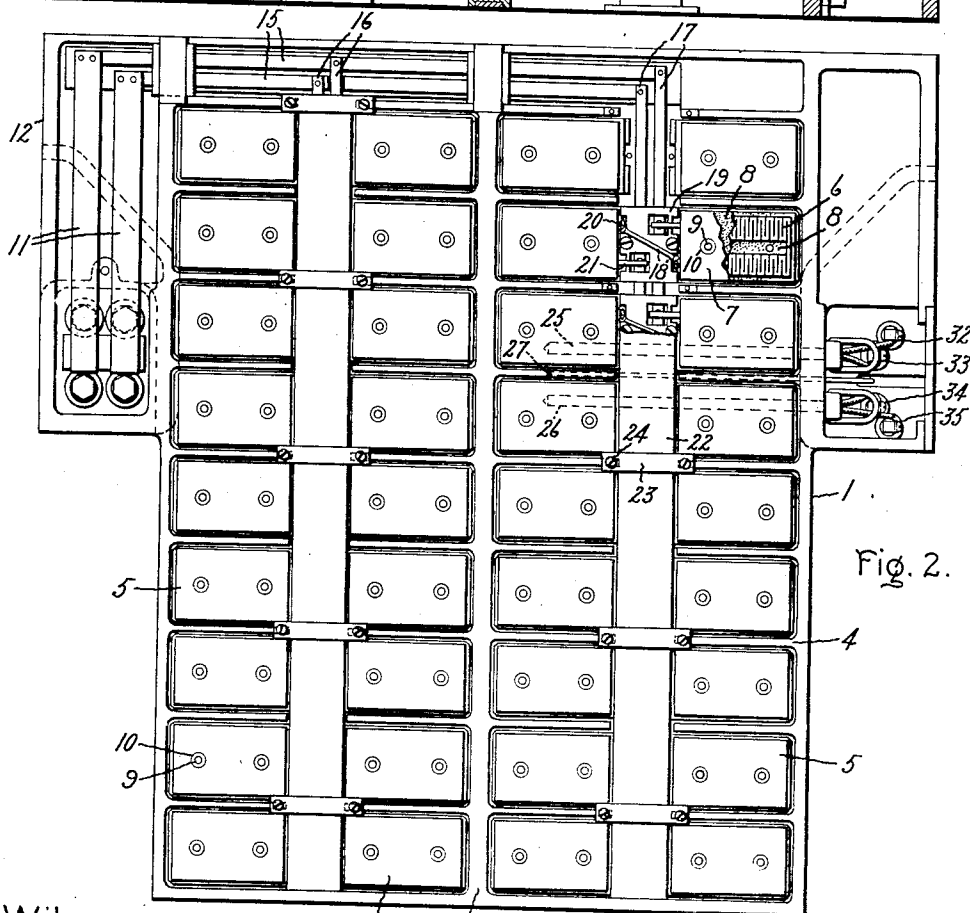


Fig. 2.

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Fig. 3.

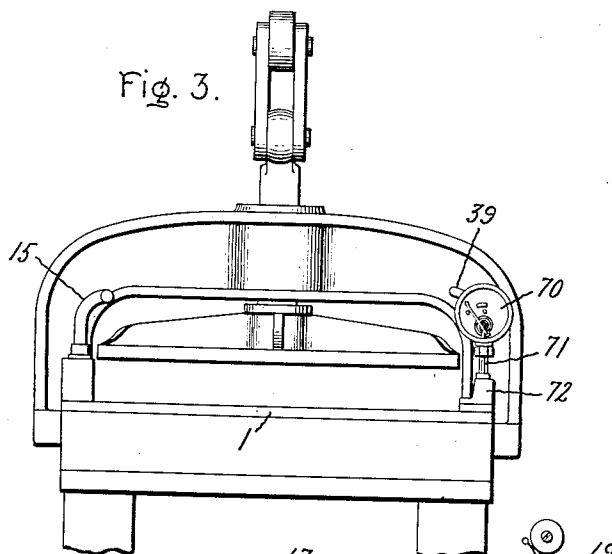
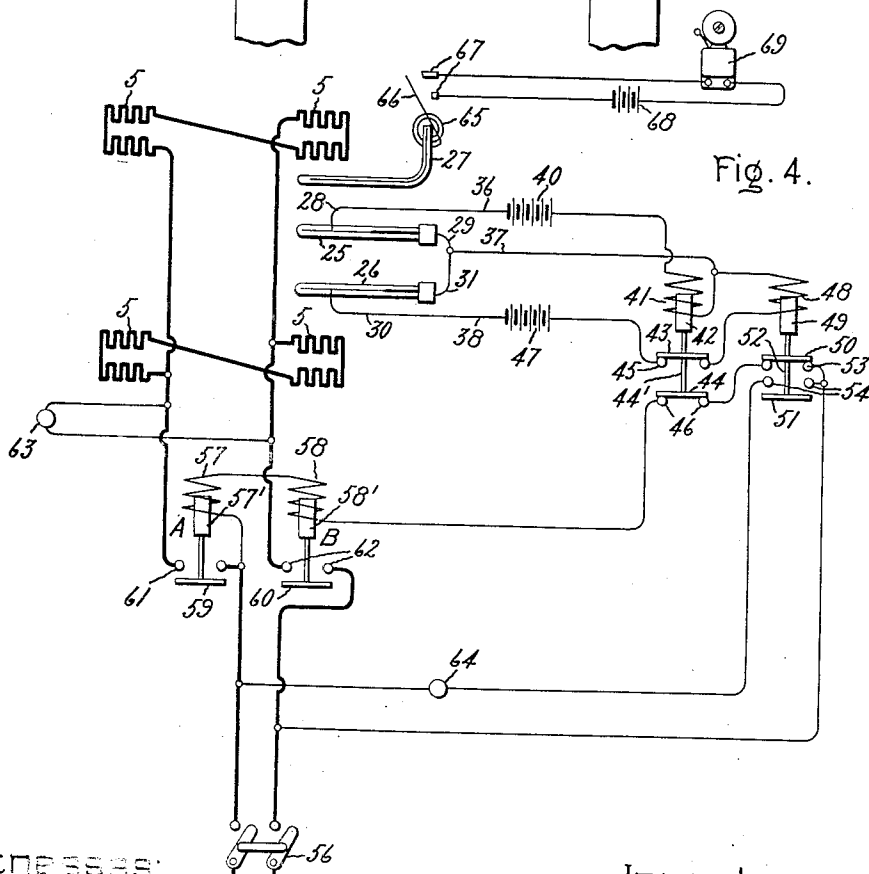


Fig. 4.



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UNITED STATES PATENT OFFICE.

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ELECTRIC HEATING DEVICE.

1,128,081.

Specification of Letters Patent.

Patented Feb. 9, 1915.

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To all whom it may concern:

Be it known that I, FREDERICK M. VOGEL, a citizen of the United States, residing at Pittsfield, county of Berkshire, State of Massachusetts, have invented certain new and useful Improvements in Electric Heating Devices, of which the following is a specification.

My invention relates to electric heating devices and more particularly to devices of that character which are used in operations such as matrix drying.

As is well known, the matrix drying operation takes place immediately following the pressing of the damp matrix against the type form. The drier is mounted in the press, the type form is placed on top of it and over the type form are placed blankets. Means are provided for applying pressure to the matrix and the blankets absorb the moisture arising from the same during the drying operation. It is highly important in newspaper work that this operation be accomplished in a brief time. Every second between the time that the contents of the paper have been determined and that when the paper is ready for sale is extremely valuable, and to shorten the time required for the various operations entering into the printing of the paper has been the constant endeavor of newspaper publishers. It has been the common practice to utilize steam for drying the matrix. The time taken in drying the matrix in this way is necessarily greater than that taken in drying it by other such as electrical means because the temperature which can be obtained by means of steam is comparatively low. More time is also necessary in the case of steam to bring the apparatus to a working temperature. However, steam heating has been adhered to on account of its safety. The type being in contact with the matrix, if the temperature of the heating device should rise above the fusing point of the said type it is apparent that the type would be destroyed. This would of course occasion great delay. The fact that electric resistance heating units are apt owing to short circuits and to fluctuations of the line voltage, to become unduly heated and thus unduly raise the temperature of that part of the drier in which the unit is located has

prevented the electrical heating means from coming into more general use. Where the said electrical heating means has been used it has not been possible to use very high temperatures or very much electrical energy because a considerable factor of safety had to be allowed.

The object of my invention is to produce an electric matrix drier by means of which a much higher temperature may be utilized than in steam driers and which will be so equipped with temperature controlling means that any danger from such higher temperature will be obviated.

A further object of my invention is to produce a device of the aforesaid nature which will not be rendered useless on account of the breaking down of the heating means in a part of the same and thus to prevent possible loss of time necessary to replace such part.

A further object of my invention is to produce a device which may be substituted for the devices of this kind which are in common use, such as the steam drying means, substantially without changing the presses in which these devices are used that, should it become impossible to utilize the electric heating means on account of a cessation in the supply of current or because of the devices getting out of order, it will be possible to utilize a steam or other well known drier.

I attain the above stated objects by means of a drier comprising a frame the upper surface of which is of the proper shape to receive the type form and the lower surface of which contains a plurality of electric heating units. The said heating units are preferably arranged substantially in parallel so that if a small number of the same are rendered inoperative owing to short circuits or other reasons, this will not interfere materially with the operation of the device. Preferably I divide the units into groups of two or more, the members of each group being connected in series and the groups being in multiple. The connection between the units of a group comprises a fuse strip which is preferably of zinc. If the temperature in a particular portion of the drier becomes too high for any reason or the current flowing through the units located in

said portion be too high, the fuse will blow thus cutting the said units out of circuit and allowing the temperature to fall.

In order to control the temperature of the device as a whole I utilize thermostatic devices which will open the supply circuit upon the occurrence of an abnormal temperature and preferably in connection with these devices I employ means for indicating by signals the condition of the apparatus. I prefer to utilize two thermostatic devices set at slightly different temperatures for controlling the circuit breakers of the device so that if one fails to operate, the other will do so. In the circuit of the thermostatic device which is set at the lower temperature I include an incandescent lamp, preferably white. In the circuit of the higher temperature device, I include a red lamp. As long as the white lamp is burning the device is operating within safe limits. The red light only burns momentarily when the higher temperature device is brought into operation. In order to further safeguard the device I employ an additional indicating thermostatic device which will give an audible signal when a predetermined temperature has been reached.

Various thermostatic devices may be employed for the purposes above stated but I prefer to employ devices comprising thermometer tubes which are preferably set in the frame of the drier. In these thermometer tubes are mounted contacts which are included in the circuits of the relays which control the circuit breaking devices. The upper contact of one of the thermometer tubes is set a little higher than that of the other and the relay circuits of the thermometer tubes are so connected that, upon the failure of the lower temperature device to operate, the other device will operate and will operate at such time only.

My invention will be more clearly understood after reference to the accompanying drawing in which—

Figure 1 is a transverse vertical section of my drier plate; Fig. 2 is a bottom plan view partly broken away; Fig. 3 is a front elevation of a press in which my device may be mounted; Fig. 4 is a diagrammatic view showing the drier, its supply circuit and the circuits for the various protective devices comprised in the apparatus.

In the drawing 1 is a frame which may be a machined casting. The upper surface 2 of the said frame is preferably flat. The bottom surface of the said frame is divided into a plurality of recesses by means of a longitudinal rib 3 and transverse ribs 4. Within the said recesses are detachably mounted electrical heat resistance units 5. These units as shown in Fig. 2 comprise punched resistance strips 6. These strips are preferably composed of high resistance

metal such as that described in Dempster Patent No. 901,428. The said resistance strips are mounted in sheet metal casings 7 between which and the strips is placed insulating material such as mica preferably in the form of sheets 8. The said units are fastened to the studs 9 projecting from the bottom of the drier frame by means of nuts 10. A large number of units is preferably used. I have shown in the drawing a drier equipped with thirty-six units. Electric current is supplied to the said units through the bars 11 which are preferably mounted in an offset portion 12 of the frame. Connection is made from an external source of energy to said bars through conductors passing through the conduit 13 which is connected detachably to the box 14 mounted upon the upper surface of the drier frame. Connected to the bars 11 and extending transversely of the frame are the conductors 15. Connected to the said conductors and extending longitudinally of the frame are the conductors 16 and 17. The conductors 15 are located in a channel formed at the end of the frame while the conductors 16, 17 are located in channels extending longitudinally of the frame and the arrangement may be such that each of the conductors 16 and 17 supply half of the heating units. Suitable insulation 18 which may be sheet mica is placed between the top of conducting bars 11, 15, 16 and 17 and the under surface of the frame. On each side of the channels in which are located the conductors 16, 17 are located the heating units 5. There are thus two sections of the same which are connected in parallel. Each of the sections is divided into nine groups of two each. The groups are connected in parallel to the conductors 16 and 17. The units composing each group are connected in series by means of fusible strips 18' which are preferably of zinc. Insulating blocks 19 serve to insulate the strips 18' from the conductors 16 or 17 and are cut away so as to allow connection with the terminals 20 and 21 of the units with the said conductors. The said parts are preferably covered by the insulating strips 22 which preferably extend the entire length of the longitudinal channels and are held in place by means of clamps 23 which are detachably fastened to the ribs of the frame by screws 24.

Should the temperature in any part of the matrix drier abnormally increase for any reason, the fuses 18' connecting the units which are located in that particular part of the drier will blow. This will obviate the danger without substantially interfering with the operation of the apparatus as a whole. The structure is such that a defective unit may be readily removed and a perfect one substituted therefor.

Preferably at one side of the frame and

extending almost to the middle line thereof are three holes in which are located three thermostatic thermometer tubes 25, 26 and 27. These thermometer tubes are preferably so mounted that they may be withdrawn readily. As shown diagrammatically in Fig. 4 the thermometer tubes 25, 26 are provided with conductors 28 and 29, 30 and 31 respectively, leading from the same. These conductors as shown in Fig. 2 are connected to the binding posts 32 and 33, 34 and 35 respectively. From the said binding posts conductors lead through conduit 39. These conductors are indicated in Fig. 4 as 36, 37 and 38. The conductor 36 is connected to one terminal of the battery 40. The other terminal of said battery is connected to the solenoid 41 of any suitable double pole switch. The conductor 37 is connected to the other terminal of the said solenoid. Within the solenoid 41 is the core 42 to which is attached the bars 43, 44 by means of insulating post 44'. When the core is in its normal position the said bars bridge contacts 45 and 46 respectively. The conductor 38 leads from the upper contact of thermometer 26 to one terminal of the battery 47. The other terminal of the said battery is connected to one of the contacts 45. Connected to the other contact is solenoid 48 which in turn is connected to conductor 37. The solenoid 48 when energized is adapted to elevate the core 49 to which is attached the conducting bars 50 and 51 by means of the insulating post 52. The bar 50 in the normal position of the apparatus bridges contacts 53 while bar 51 is out of contact with 54.

Current is supplied to the heating units 40 through mains 55 upon throwing the switch 56. The contactors A and B having shunt windings 57 and 58 are located in the mains. To the cores 57' and 58' of the contactors are attached bars 59 and 60 which are adapted upon being elevated by their respective solenoids to bridge contacts 61 and 62 respectively. The solenoids 57 and 58 in series are connected with one of the terminals 46. The other of the terminals 46 is connected to one of the terminals 53 and the other terminal 53 is connected to one of the mains. Four of the heating units 5 are shown connected in circuit. The white lamp 63 is connected in shunt with that portion of the circuit on which the heaters are located and is adapted to remain lighted while the heaters are in operation. The red lamp 64 is in shunt with the main line and is adapted to be lighted when the conducting bar 51 bridges the contacts 54.

The showing of parts in Fig. 4 is merely conventional. It is to be understood that any suitable device known to the art may be used where a device is conventionally shown.

By closing the switch 56 the solenoids 57, 58 are actuated to close the contactors A and B, thus completing the circuit through the heaters and at the same time the lamp 63 is lighted. When the temperature reaches a predetermined point, say 375° F., the mercury in the thermometer tube 25 will reach the contact terminal of conductor 28. This completes the circuit from the battery 40 through the solenoid 41 and the core 42 is elevated thus breaking the connections between the contacts 45 and 46 and interrupting the circuit in which the solenoids 57 and 58 are located, and also breaking the circuit of the relay 48 and rendering the same inoperative when the thermostatic device 25 has closed the circuit of the relay 41 and the relay has thus been effectively energized. The said solenoids are deenergized causing the cores 57' and 58' to drop thus breaking the supply circuit of the heaters and at the same time causing the lamp 63 to be extinguished. After the current has been thus cut off, the temperature of the drier will fall rapidly. As soon as the temperature falls below the point for which the thermometer 25 has been set the supply of current to the solenoid 41 will be interrupted on account of the battery circuit being broken and the core 41 will drop causing the contacts 46 to be again bridged. This will cause the solenoids 57, 58 to be again energized and the heater supply circuit to be again completed. If for any reason the thermometer 25 or related parts do not act properly and the drier reaches the temperature for which the thermometer tube 26 has been set, say 390° F., the circuit will be completed from the battery 47 through the solenoid 48. This will elevate the core 49 thus breaking the circuit of the solenoids 57 and 58 and causing the supply circuit to be interrupted. At the same time the conducting bar 51 will bridge the contacts 54 thus completing the circuit in which the red lamp 64 is located. The lighting of this lamp will indicate to the operator that something is wrong with the system of which the thermometer tube 25 forms a part.

The thermometer tube 27 forms part of an additional thermostatic protective apparatus. This is of the indicator type as shown diagrammatically in Fig. 4. As will appear from the diagrammatic showing the expansion of the air in the tube 27 due to abnormal increases in temperature will tend to straighten the tube 65. When the temperature reaches, say 400° F., this expansion will force the indicator needle 66 against the contacts 67 which will complete a circuit containing the battery 68 and the alarm bell 69 causing the latter to ring. In Figs. 1 and 3 the indicating dial thermometer is designated by the numeral 70 and is mounted adjacent to the conduit 39 leading

to the other thermometer tubes. The thermometer tube 27 is preferably connected to the tube 71 extending through the hollow boss 72 upon which are supported the external parts of the indicating device.

The indicating thermometer may be set for a temperature slightly higher than the other thermometers. Should the latter fail to perform their functions, the alarm sounded by the indicating thermometer would apprise the operator of this fact.

My device may be used in either direct or alternating current systems. The only change which must be made in changing from one of said systems to the other is in the circuit breakers A and B.

Various modifications may be made in the above described apparatus without departing from the spirit of my invention, the scope of which is set forth in the following claims.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. A device adapted to be used in operations such as matrix drying comprising a frame, a plurality of electrical resistance heating units each detachably mounted therein, said units being connected in series into groups, said connection comprising a fuse and the said groups being connected in parallel.

2. A device adapted to be used in operations such as matrix drying comprising electrical resistance heating units, a thermostatic device and a relay controlled thereby for cutting off the current upon the occurrence of a predetermined temperature, a second thermostatic device adapted to cut off the current upon the failure of the first device to act, said latter thermostatic device including means for giving a signal upon its being energized.

3. A device adapted to be used in operations such as matrix drying comprising a frame, a plurality of electrical resistance heating units mounted therein, thermostatic devices comprising a pair of thermometer tubes mounted in said frame, electrical con-

tacts in said tubes set at slightly different temperatures, relays connected to said contacts for opening the supply circuit to the drier and a supplemental thermostatic device mounted in said frame adapted to give a signal when the device reaches a predetermined temperature.

4. A device to be used in operations such as matrix drying comprising a frame, electric resistance heating units mounted therein, two thermostatic devices set at different temperatures for cutting out the heating units, and means operated in response to the actuation of the first thermostatic device for rendering the second inoperative.

5. A device to be used in operations such as matrix drying comprising a frame and resistance units mounted therein, means comprising a relay for controlling the circuit of said heating devices, means comprising a thermostatic device for causing said relay to open the circuit of the heating units, means comprising a second thermostatic device for causing said relay to open the circuit of the heating elements, and means responsive to an effective actuation of the first means for rendering the second inoperative.

6. A device adapted to be used for an operation such as matrix drying comprising a plurality of separately connected electric resistance heating units, in which device variations in temperature are liable to occur in different parts of the device, means responsive to an abnormal temperature produced by a limited number of the heating units in a portion of the device for cutting those units out of circuit, and means responsive to an abnormal temperature of the device as a whole for cutting off the supply of energy to the entire device.

In witness whereof, I have hereunto set my hand this eleventh day of June, 1912.

FREDERICK M. VOGEL.

Witnesses:

ANNIE R. NUGENT,
CHARLES S. MEYS.