March 28, 1944. E. O. MORTON 2,345,413

STEAM IRON

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FIG. 1.

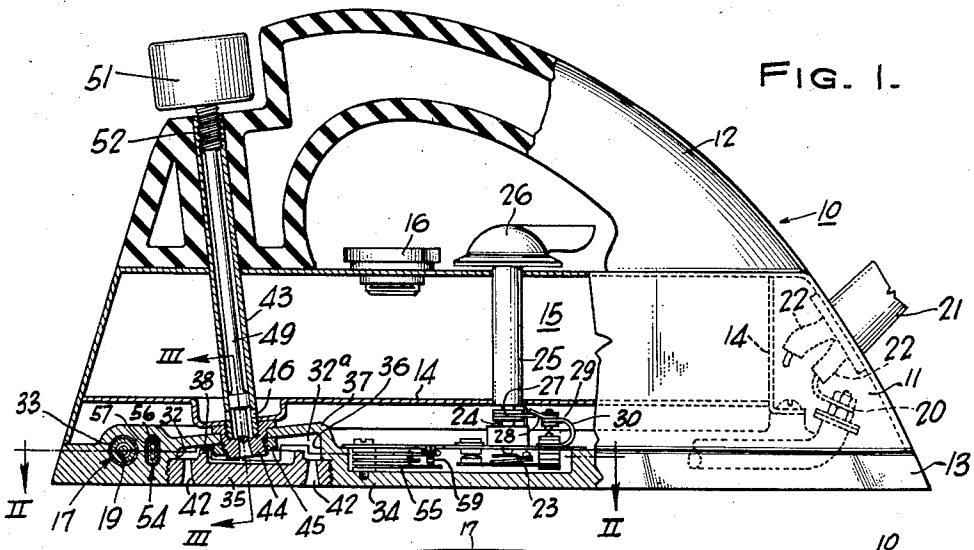
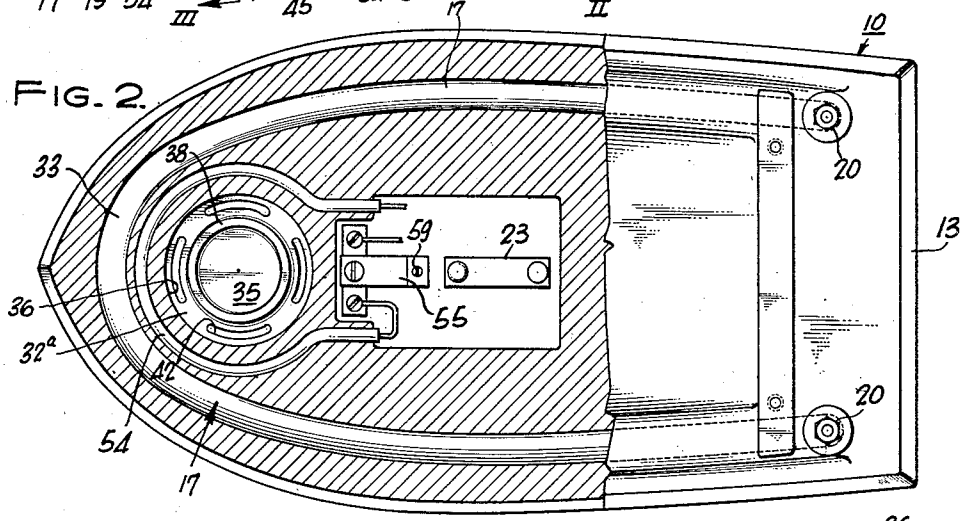


FIG. 2.



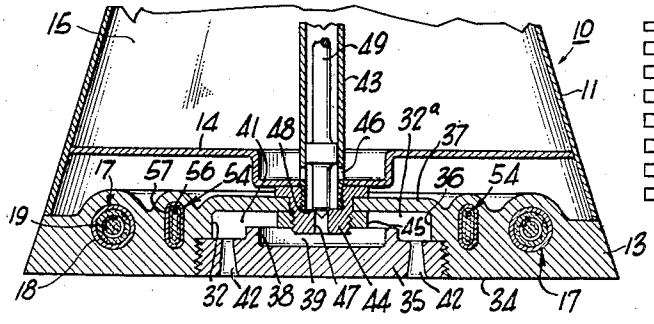


FIG. 3.

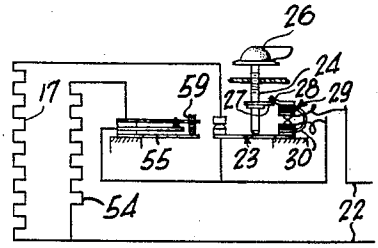


FIG. 4.

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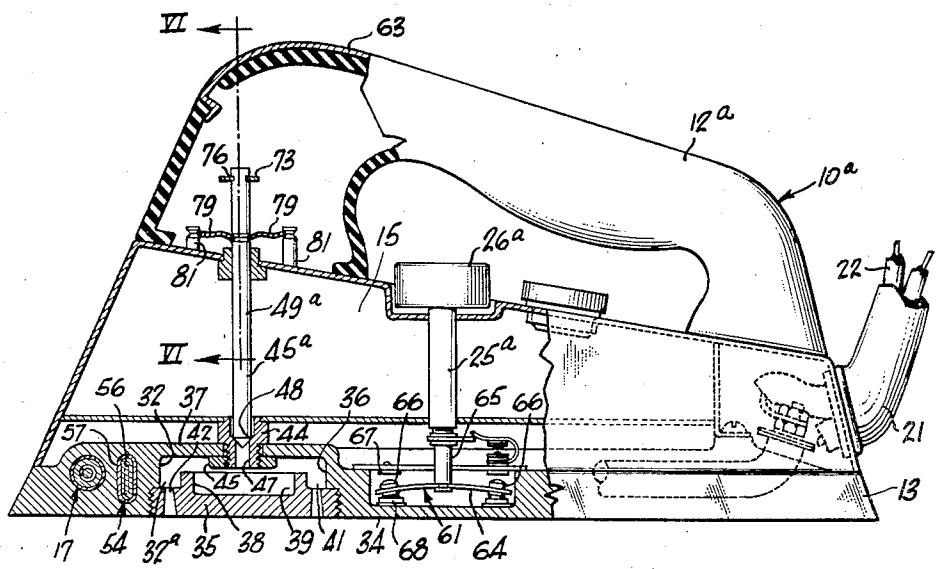

FIG. 5.

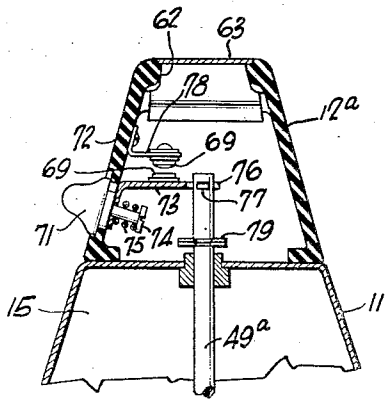

FIG. 6.

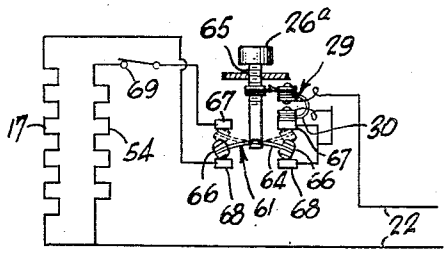

FIG. 7.

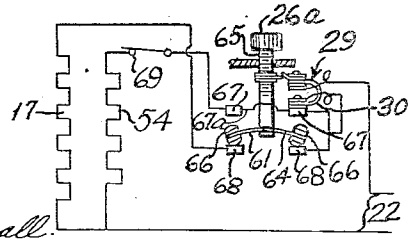

FIG. 8.

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UNITED STATES PATENT OFFICE

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STEAM IRON

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Application May 20, 1941, Serial No. 394,258

9 Claims. (Cl. 38—77)

This invention relates to steam irons and more particularly to that type of steam iron which is provided with a main heater for heating the soleplate and ironing surface of the iron and an auxiliary heater for supplying heat to the steam generator of the iron, and it has for an object to provide an improved steam iron of the character set forth.

It is a further object of the invention to provide a construction of steam iron in which the steam generator of the iron will be maintained hot enough to assure that the water supplied thereto will be converted into steam.

These and other objects are effected by the invention as will be apparent from the following description and claims taken in connection with the accompanying drawings, forming a part of this application, in which:

Fig. 1 is a side view, partly broken away along the longitudinal center, of a steam iron made in accordance with the present invention;

Fig. 2 is a top plan view of the soleplate of the iron shown in Fig. 1, broken away along the line II—II of Fig. 1;

Fig. 3 is a fragmentary sectional view of the iron shown in Fig. 1, the section being taken substantially along the line III—III of Fig. 1;

Fig. 4 is a schematic wiring diagram of the electrical circuits employed in the iron illustrated in Figs. 1 to 3, inclusive;

Fig. 5 is a view similar to Fig. 1 of a modified form of the invention;

Fig. 6 is a fragmentary sectional view taken substantially on the line VI—VI of Fig. 5 to illustrate certain details of construction;

Fig. 7 is a schematic wiring diagram of the electrical circuits employed in the iron illustrated in Figs. 5 and 6; and

Fig. 8 is a schematic wiring diagram similar to that shown in Fig. 7 and showing a slightly modified circuit arrangement.

Referring to the drawings and particularly to Figs. 1 to 4, inclusive, there has been illustrated an electrically-heated steam iron indicated generally by the reference character 10. The iron 10 comprises a body including a cover or shell 11 having a handle 12 secured to the top thereof and a metal soleplate or base 13 attached to the bottom thereof. The interior of the cover 11 is provided with partitions such as 14 which, together with the side and top walls of the cover, define a liquid storage chamber or reservoir 15 having a filling opening normally closed by a removable, vented plug 16.

The soleplate 13 may be of conventional outline, as illustrated in Fig. 2, and is provided with a U-shaped heating element 17 secured thereto or imbedded therein as illustrated particularly in Figs. 1, 2 and 3. This heating element may be of well-known construction and comprises an outer metallic tube 18 (Fig. 3) having a coiled resistance element 19 supported in spaced concentric relation thereto by means of suitable heat-conducting, electrical insulating material.

Power for heating the soleplate is supplied to the element 17 by means of a cord 21 adapted to be connected to an electrical outlet (not shown). This cord comprises conductors 22 connected to the ends 20 of the resistance element 19 in series with a manually-adjustable thermostat 23 as shown in Fig. 4.

The thermostat 23 may be either a "creep" type or "snap-acting" type of conventional design. This thermostat is supported in a recess provided in the soleplate and is adjustable to regulate the temperature of the soleplate in the usual manner, by means of a rod 24 extending through a sleeve 25 brazed or soldered in fluid-tight relation in the upper and lower walls of the reservoir 15. A knob or handle 26 provided with a suitable scale adapted to cooperate with a fixed index on the cover 11, to indicate various temperature settings, is fixed to the upper end of the rod 24. The thermostat adjusting rod 24 carries an arm 27 which engages a curved finger 28 of a switch 29 to open the contacts thereof when the thermostat is turned to its "off" position. As shown in Figs. 1 and 4, this switch 29 may comprise a U-shaped spring member 30 which insulatedly supports contacts connected, respectively, to one of the conductors 22 and to the conductor leading to the heating elements 19 and 54.

The soleplate 13 is provided with a recess or hole 32 located within the loop or bight 33 of the heating element 17. This recess opens on the ironing surface 34 of the soleplate and is normally closed at its lower end by means of a metallic plug or member 35 which is threaded to removably engage mating threads formed on the side walls of the recess. It will be noted that the upper surface of this plug, together with the lateral wall 36 and the upper wall 37 of the recess, defines a chamber 32*a*.

The chamber 32*a* is divided into two communicating compartments by an annular rib or baffle 38, preferably formed integral with the plug. The circular space within this baffle provides a

steam-generating compartment 39 (Fig. 3) while the annular space between the baffle and the lateral wall 36 of the recess defines a steam-distributing compartment 41.

A plurality of steam ports 42 extending inwardly from the outer surface of the plug communicate with the steam-distributing compartment 41 and serve to discharge steam on the material being ironed. These ports also serve as tool-receiving openings whereby a suitable tool may be inserted therein for removing the plug from the iron.

The reservoir 15 is adapted to contain a liquid such as water or the like which is supplied to the steam generator through a valved outlet provided in the lower wall 14 of the reservoir. This outlet comprises a valve-stem guiding sleeve 43 which extends through and is preferably brazed or soldered in fluid-tight relation to the upper and lower walls of the reservoir 15. The lower end of this sleeve projects below the lower wall 14 and is externally threaded to be received in an internally threaded bushing member 44 preferably brazed, soldered or welded to the bottom wall of the reservoir. This bushing in turn extends through an aperture provided in the upper wall 37 of the soleplate 13 and is clamped thereto, in fluid-tight relation, by means of a nut 45 threaded thereon. The sleeve 43 is provided with holes 46 which afford communication between the interior of the reservoir and a water passage 47 provided in the bushing 44. The upper end of this water passage provides a valve seat 48.

The valve seat 48 is engageable by the lower tapered end of a valve stem 49, guided in the sleeve 43, for closing the passage 47. The upper end of the valve stem carries a knob 51 and is preferably threaded, as indicated at 52, to engage complementary threads formed in the upper end of the sleeve 43. By turning the knob 51 in one direction or the other, the valve stem is raised or lowered relative to the valve seat 48 to regulate the rate of water flow from the reservoir 15 into the steam generator. If desired, this knob may be provided with an index (not shown) to cooperate with a suitable scale which may be provided on the handle 12 to indicate the size of the valve opening for any given setting of the knob.

While the soleplate heating element 17 will usually provide sufficient heat to enable the steam generator to convert water, supplied thereto from the reservoir 15, into steam, under certain conditions the steam generator may be too cool to generate steam. For example, when the soleplate temperature is maintained at a very low value, such as 300° F., or even lower, as when ironing rayons, silks, and the like, it has been found that during the "off" cycle of the thermostat 23, the temperature of the steam generator may fall so low that the water entering therein is not evaporated into steam. In order to obviate this disadvantage, the present iron has been provided with an auxiliary heating element 54 which is controlled by means of a second thermostat 55.

The auxiliary heating element 54 is preferably of the armored type similar to the heating element 17 except that it may be of considerably less wattage. The heating element 54 may comprise a resistance element 56 arranged in zigzag or sinuous form within and insulated from a metallic sheath 57. The heating element substantially circumscribes the steam generating unit and is carried by or imbedded in the soleplate 13 as shown in Figs. 1, 2 and 3, between the steam generating unit and the main or soleplate heating element 17. The terminals of the auxiliary heating element 54 are connected to the conductors 22 of the cord 21 in series with the bimetal thermostat 55 and the line switch 29 as shown in Fig. 4.

The thermostat 55 may be either a "creep" type or "snap-acting" type and is supported within a recess provided in the soleplate closely adjacent the steam-generating unit so that it will operate in response to the temperature of that unit. This thermostat may be made adjustable in the usual manner as is well-known in the art, as by means of an adjusting screw 59, as shown in Figs. 1 and 4. This thermostat may be permanently adjusted by the manufacturer to operate at any desired temperature which will insure proper heating of the steam generator by the heating elements 17 and 54. A thermostat adjusted to operate between 275 and 300° F. is considered satisfactory.

It will be understood that when it is desired to use the iron for the purpose of steaming clothes or supplying moisture in the form of steam to an article being pressed, the operator fills the reservoir 15 with water and adjusts the thermostat 23 to maintain the ironing surface 34 of the iron at the proper temperature for the particular material being ironed. When the iron has reached the correct heat and it is desired to supply moisture to the material to be ironed, the water-valve controlling knob 51 is adjusted to allow water to flow at a predetermined rate from the reservoir through the openings 46 in the sleeve 43 and into the passage 47. The water falls on the surface of the plug 35 within the baffle 38 where it is instantly flashed into steam. The steam thus generated will pass over the baffle 38 and into the steam-distributing compartment 41 and then through the steam outlet ports 42 to the material being pressed. It will be understood that the plug 35, due to its metal-to-metal contact with the soleplate which carries the heating elements, will be heated sufficiently to convert the water into steam. Further, by locating the plug within the loops or bights of the heating elements 17 and 54, proper heating of the plug is insured.

If, during an ironing period, the temperature of the thermostat 55 falls below its critical or operating temperature, which indicates that the steam generator is not hot enough to convert the water into steam, a circuit for the auxiliary heater 54 will be completed from the conductors 22, as is apparent from an inspection of Fig. 4 to energize this heater and maintain the steam generator hot enough to convert the water supplied thereto into steam. However, as long as the temperature of the steam generator or the portion of the soleplate surrounding the same is above the operating temperature of the thermostat 55, the circuit for the auxiliary heater will be open.

It has been mentioned that on turning the thermostat adjusting knob 26 to its "off" position, the switch 29 will be automatically opened. This switch opens the circuits to heaters 17 and 54 and prevents the auxiliary heater 54 from heating the iron when the iron is not in use and the operator has neglected to disconnect the cord 21 from the electrical outlet.

In Figs. 5, 6 and 7 there has been illustrated a modified form of the invention. The modified iron generally indicated 10*a* is similar to the iron

10 described above and the same reference characters are used to identify elements of the iron 10a which are identical with corresponding elements of the iron 10. Elements of the iron 10a which are similar in function to elements of the iron 10 are identified by the same reference characters with the addition of the letter "a".

The soleplate and cover construction of the iron 10a is substantially identical with that of the iron 10 except that a single, snap-acting bimetal thermostat 61 is provided in a recess in the soleplate and the valve-stem-guiding sleeve 43 has been omitted from the water reservoir. The handle of the iron 10a has also been modified slightly in that it is hollow and receives the water valve operating mechanism to be hereinafter described. This modified handle 12a is preferably provided with an opening 62 along the top thereof which is closed by a removable cover plate 63.

As shown in Figs. 5 and 7, the single, snap-acting thermostat 61, which may be of any approved construction, is designed to complete a circuit from the conductors 22 to the main heater 17 when in one position, and when snapped over to its other position, it completes a circuit from the conductors to the auxiliary heater 54.

The operation and construction of snap-acting thermostats is well-known and therefore need not be described in detail. However, to aid in understanding the present invention, it may be well to point out that in the specific embodiment of the invention shown in the drawings, the thermostat 61, which has been shown somewhat schematically, comprises a bimetal element 64 of the snap-acting disc type supported at its center by an adjusting screw 65 threaded into the tube 25a brazed or soldered in the upper and lower walls of the water reservoir 15. A knob 26a fixed to the upper end of this rod serves as a convenient means for adjusting the thermostat. The bimetal element 64 of the thermostat is provided with a pair of contacts 66 which are electrically connected as by the metal of the bimetal element itself or by a copper or aluminum strip conductor carried thereby, and are adapted to engage fixed contacts 67 and 68 provided in the heater circuits as is apparent from an inspection of Fig. 7.

It will be understood that the operator adjusts the thermostat 61 by means of the knob 26a to maintain the soleplate at the proper temperature for the particular material being pressed. As long as the temperature of the soleplate is below this temperature, the bimetal element will be in the position shown in full lines in Figs. 5 and 7. With the contacts 66 in the position shown in full lines in these two figures, a circuit is completed from the conductors 22 to the heating element 17, but the auxiliary heater circuit will be open. When the temperature of the bimetal element 64 reaches its critical or operating temperature, the element will snap over to the position shown in dotted lines in Fig. 7 to open the circuit for the main heater and bridge the contacts 67 to complete the circuit for the auxiliary heating element 54. With this arrangement, a proper heating of the steam generator is insured even though the circuit for the main heater may be open for a substantial length of time as when the soleplate temperature is maintained at a very low temperature.

As in the case of the iron 10, the iron 10a is provided with a switch 29 which opens the circuits for the heating elements when the thermostat is turned to its "off" position.

In the event the iron is to be used as a "dry" iron, that is, without the use of steam, the auxiliary heater might raise the temperature of the soleplate too high during the "off" cycle of the thermostat. The "off" cycle of the thermostat may be considered as the time during which the circuit for the main heater is held open. To prevent overheating under this condition, an interlock arrangement has been provided for opening the auxiliary heater circuit whenever the water valve is closed, so that during a period when steam is not being generated, the soleplate will be heated solely by the main heater.

This interlock, as shown particularly in Figs. 6 and 7, may comprise a switch, including contacts 69, which is operated by the water valve operating mechanism to be described in detail hereinafter.

As distinguished from the iron illustrated in Figs. 1 to 4, inclusive, the iron 10a is provided with a sliding valve stem, although it will be understood that the irons 10 or 10a may be provided with either a rotatable or slidable valve stem. The slidable valve stem 49a is tapered at its lower end to engage the valve seat 48 for closing the passage 47 through the bushing 44. This valve stem is raised or lowered by means of a knob 71 movable along a slot 72 provided in the front support of the handle 12a. This knob is positioned to be conveniently engaged by the operator's thumb or fingers. A bracket 73 resiliently secured to the knob 71 by means of a screw 74 and a compression spring 75 transmits the motion of the knob to the valve stem to raise and lower the same. The free end of the bracket is provided with an open-ended slot 76 which receives the reduced portions 77 provided on the upper end of the valve stem. By particular reference to Fig. 6, it will be noted that this bracket carries one contact 69 of the interlock switch, while the other contact 69 thereof is mounted on the inner wall of the handle by means of a resilient bracket 78.

In order to hold the water valve in either its open or closed position, there has been provided an off-center spring toggle mechanism like that described and claimed in the copending application of Kenneth L. Woodman, Serial No. 382,305, filed March 8, 1941, and assigned to the assignee of the present application. This spring toggle mechanism comprises a pair of flat springs 79 which are compressed between a pair of posts 81 and the valve stem 45a. When the knob 71 is in its lower position as shown in Fig. 6, the springs 79 bias the valve stem downwardly into engagement with the valve seat 44 to stop the flow of water from the reservoir. On raising the knob to open the valve, the springs 79 snap over from the position shown in Fig. 5 to bias the valve stem upwardly and allow water flow into the steam generator.

When the valve stem is in position to close the water passage to the steam generator, the interlock switch 69 will be open as shown in Fig. 6, so that as long as the steam generator is not being used to generate steam, the auxiliary heater 54 will be disconnected from the electric supply source. However, when the valve stem is raised to open the valve, this switch will be closed and the auxiliary heater may be energized through a circuit (Fig. 7) controlled by the bimetal element 64 of the thermostat 61.

The contacts 67 may be permanently bridged by a conductor 67a as shown in Fig. 8, if desired, so that the auxiliary heater 54 is energized

whenever the switches 29 and 69 are closed. In this case, the operation of the auxiliary heater is controlled entirely by the switch 69 independent of the thermostat 61.

While the invention is not to be construed as limited to heating elements of a specific wattage, it is considered satisfactory to use an 850 watt main heating element and a 300 watt auxiliary heating element in the iron 10 illustrated in Figs. 1 to 4, inclusive. The main heating element of the iron 10a may have a 1,000 watt input and the auxiliary heating element an input of 300 watts.

While the invention has been shown in several forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof, and it is desired, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. A self-contained steam iron comprising a cover member having a liquid-storage chamber therein, a soleplate attached to said cover member, a U-shaped electrical resistance element carried by said soleplate for heating the same, a steam generator carried by said soleplate, said steam generator being located within the bight of said U-shaped resistance element and in spaced relation thereto, means for conveying liquid from said chamber to said steam generator, a second electrical resistance element located between the bight of said U-shaped resistance element and said steam generator, whereby said steam generator may receive heat from each of said resistance elements, and circuits connectible to a source of electrical energy for energizing said resistance elements.

2. A soleplate for a steam iron, said soleplate having a steam generator carried thereby, an electric heating element for heating the soleplate, a thermostat responsive to the temperature of said soleplate for controlling said heating element, and an auxiliary heating element carried by said soleplate and localized adjacent said steam generator for heating the same, said thermostat being adapted to control the operation of said auxiliary heating element.

3. A steam iron comprising a body having a steam generator carried thereby, means for supplying water to said steam generator, a soleplate carried by said body, means for heating said soleplate, auxiliary means for heating said steam generator, and temperature-responsive means for controlling said heating means, said temperature-responsive means being responsive to rising or falling of the iron temperature to a predetermined value to connect one or the other of said heating means to an energizing source.

4. A steam iron comprising a soleplate, a steam generator located, at least in part, within said soleplate, means for supplying a liquid to said steam generator, electric heating means embedded in said soleplate for heating said soleplate and said steam generator, second electric heating means carried by said soleplate and localized adjacent said steam generator, means for supplying electrical energy to said heating means, and thermostatic means for controlling the energization of both heating means.

5. A self-contained steam iron comprising a cover member having a liquid-storage chamber therein, a soleplate attached to said cover member, a U-shaped electrical resistance element carried by said soleplate for heating the same, a steam generator carried by said soleplate and located within the bight of said U-shaped resistance element and adapted to be heated thereby, means for conveying liquid from said chamber to said steam generator, a second electrical resistance element carried by said soleplate and localized adjacent said steam generator for heating the same, whereby said steam generator may receive heat from each of said resistance elements, circuits connectible to a source of electrical energy for energizing said resistance elements, and temperature responsive means for controlling said circuits.

6. A self-contained steam iron comprising a body portion having a liquid-storage chamber therein, a soleplate attached to said body portion, electrical heating means embedded in said soleplate for heating the same, a steam generator carried by said soleplate and located in good heat-receiving relation to said heating means, means for conveying liquid from said chamber to said steam generator, second electrical heating means located adjacent said first-mentioned heating means and said steam generator, whereby said steam generator may receive heat from each of said heating means, circuits connectible to a source of electrical energy for energizing both of said heating means, and temperature-responsive means for controlling said circuits.

7. A steam iron comprising a soleplate, a U-shaped electrical resistance element carried by said soleplate for heating the same, a steam generator carried by said soleplate within the bight of said U-shaped resistance element, means for supplying a liquid to said steam generator, a second electrical resistance element located adjacent said steam generator, whereby said steam generator may receive heat from each of said resistance elements, and means for connecting said elements to a source of electrical energy.

8. A steam iron comprising a soleplate having an ironing surface, a steam generator carried by said soleplate, means carried by said soleplate for supplying heat to said ironing surface and said steam generator, means responsive to the temperature of said ironing surface for controlling said heat supplying means, auxiliary heating means carried by said soleplate and surrounding a substantial portion of said steam generator for supplying heat thereto, and means responsive to the temperature of said steam generator for controlling said auxiliary heating means.

9. A soleplate for a steam iron, said soleplate having a steam generating space formed therein, a main electric resistance element carried by said soleplate for heating the soleplate and steam-generating space, thermostatic means responsive to the temperature of said soleplate for controlling the energization of said main resistance element, an auxiliary electric resistance element localized adjacent said steam generator space for supplying heat thereto, and thermostatic means for controlling the energization of said auxiliary resistance element.

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