April 10, 1956 H. MAYKEMPER 2,741,044

SPRINKLING AND STEAMING FLAT IRON

Filed Oct. 4, 1951 3 Sheets-Sheet 1

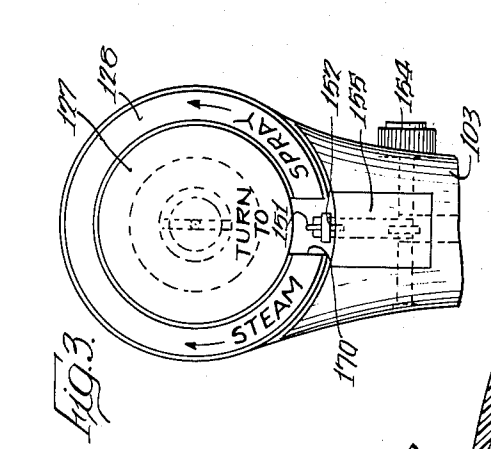


FIG. 3.

FIG. 1.

FIG. 2.

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SPRINKLING AND STEAMING FLAT IRON

Filed Oct. 4, 1951 3 Sheets-Sheet 2

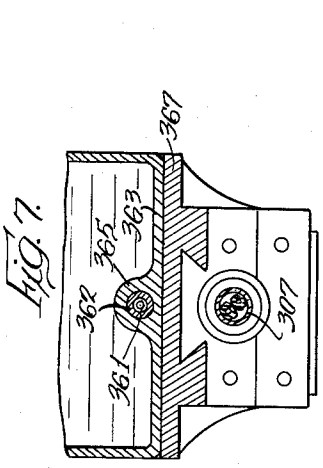


Fig. 7.

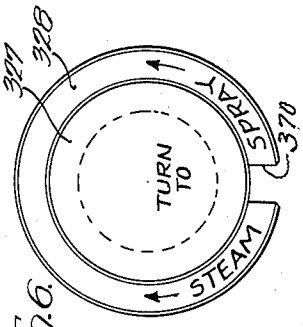


Fig. 6.

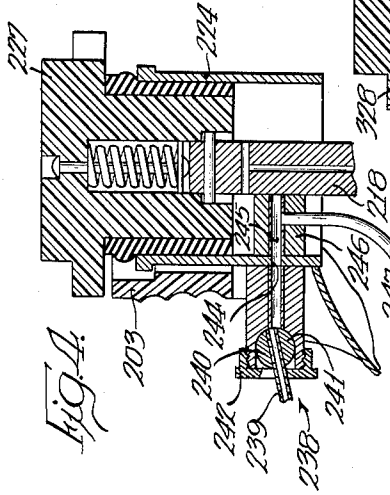


Fig. 4.

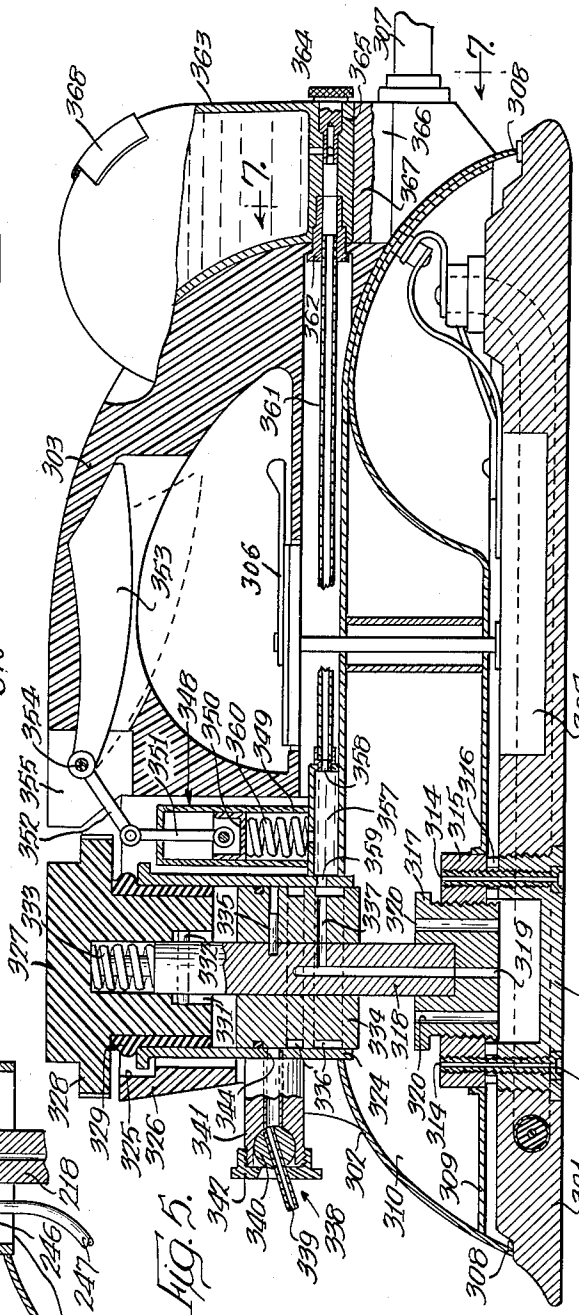


Fig. 5.

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SPRINKLING AND STEAMING FLAT IRON

Filed Oct. 4, 1951 3 Sheets-Sheet 3

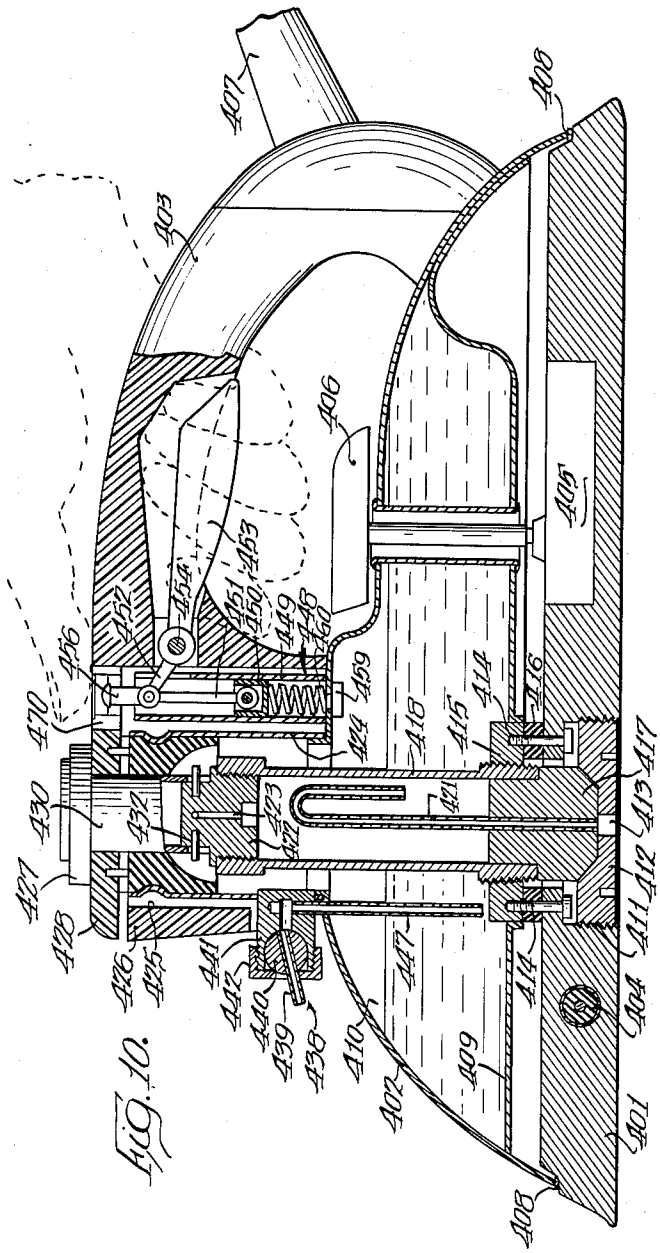


Fig. 10.

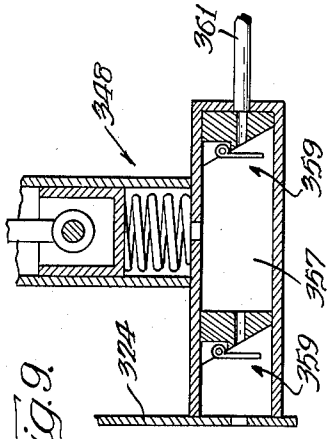


Fig. 9.

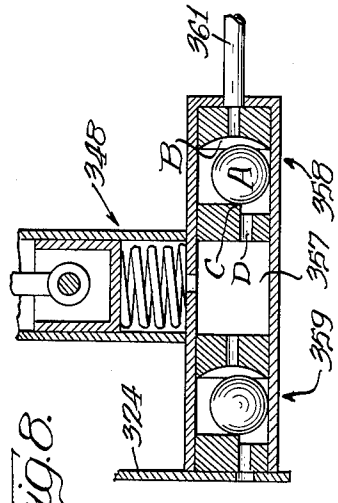


Fig. 8.

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2,741,044

SPRINKLING AND STEAMING FLAT IRON

Henry Maykemper, Eau Claire, Wis., assignor to National Presto Industries, Inc., a corporation of Wisconsin

Application October 4, 1951, Serial No. 249,681

23 Claims. (Cl. 38—77)

The present invention relates to improvements in flat irons and, particularly, to improved flat irons adapted to be utilized, selectively at the will of the operator, as a dry iron, a steam iron, or a sprinkling iron.

Heretofore, various proposals have been made in the art for electric flat irons for dry ironing, for electric steam irons and for electric irons incorporating means for sprinkling fluid on the article to be ironed. In my copending application Serial No. 785,897, filed November 14, 1947, now Patent No. 2,615,265, issued October 28, 1952, a continuation-in-part of my earlier application Serial No. 710,800, filed November 19, 1946, now abandoned, I have disclosed an electric steam iron, and in my copending application Serial No. 159,783, filed May 3, 1950, now Patent No. 2,674,054, issued April 6, 1954, I have disclosed an electric sprinkling iron. Both of my prior irons incorporate a tank or reservoir for liquid adapted to be heated from the sole plate of the iron and discharge passageway means for discharging steam and liquid, respectively, onto the work to be ironed. Both irons are adapted to be used for either wet (steam and sprinkling, respectively) or dry ironing as may be desired.

In ironing a normal family wash, the housewife is confronted with materials that must be dry ironed, other materials that are best ironed when dampened, and still other materials that are best ironed with the application of steam. However, most housewives are provided with only a single iron. If the iron is the conventional dry type, the housewife must predampen the wash that is to be damp ironed and must employ a dampened pressing cloth for the wash that is to be steam ironed. If the housewife is equipped with either of my prior irons, her work is substantially decreased. For example, if the housewife has my steam iron, she does not use a dampened pressing cloth for the steam ironing and this source of extra work, bother and irritation is eliminated. However, she is still required to predampen the wash for damp ironing. If she has my sprinkling iron, the necessity for predampening is eliminated thus saving a great deal of time and energy. However, the sprinkling iron is not adapted for direct steam ironing.

It is an object of the present invention to provide an improved iron adapted to perform all three types of ironing, whereby the user may proceed directly through a large ironing without the necessity for predampening, or the necessity for employment of a pressing cloth.

Another object of the invention is to provide an improved iron including a liquid reservoir, means for discharging liquid forwardly of the iron, steam generator means, a discharge port for steam, and controls for selectively rendering said means operative and inoperative.

A further object of the invention is the provision of an improved iron including a heated sole plate and steam generator means selectively movable toward and away from the sole plate, whereby the steam generator may be rendered operative and inoperative, respectively, at the will of the user.

A still further object of the invention is the provision of

an improved iron constructed in accordance with the foregoing and including control instrumentalities in the handle thereof, whereby the control of the iron for dry, sprinking, or steam ironing may be effected conveniently by the hand of the user employed in manipulating the iron.

It is also an object of the present invention to provide an improved iron of the character defined including control instrumentalities for selectively rendering the iron operative for dry ironing, sprinkling ironing, steam ironing, or a combination of sprinkling and steam ironing.

According to the present invention, I provide an improved iron including an electrically heated sole plate, a handle for manipulating the iron, a water reservoir spaced from the sole plate so as to receive only a limited amount of heat, if any, therefrom, a sprinkling discharge port for directing water forwardly of the iron, a pump having an operating member in the handle for forcing water from the reservoir to said port, a steam generator, a steam discharge port in the sole plate of the iron, the handle having a vertical bore therein adjacent the forward end thereof, the steam generator being vertically aligned with the bore in the handle, and a removable closure for the bore in the handle, the closure being operatively associated with the pump and with the steam generator and being movable to control the operability of the pump and the steam generator.

As will be appreciated, the iron of the present invention may be used in the absence of liquid in the reservoir for dry ironing. Also, the steam generator and pump control means, the closure, may be manipulated to render both devices inoperative so that the iron may be used for dry ironing even when the reservoir is filled with water. The control means or closure is further capable of manipulation to accommodate sprinkling only, steaming only, or both steaming and sprinkling at the same time, as desired. The control means or closure and the pump operating member are disposed immediately at the operator's finger tips for ready and convenient operation. Accordingly, it will be appreciated that the present invention provides for all types of ironing by means of a single iron.

In addition to the foregoing, the present invention provides the advantage that, in ironing, the changes to be made from one type of ironing to another may be very rapidly effected and there is no necessity for allowing the iron to cool, for emptying the liquid from the reservoir, or the like.

As will become apparent hereinafter, the present invention is capable of various embodiments and two embodiments thereof are disclosed herein. In one embodiment, which may be referred to a boiler type unit, the liquid reservoir is located within the iron housing and the steam generator is disposed within the reservoir and includes means movable into and out of heat conducting relation with the sole plate of the iron. When in heat conducting engagement with the sole plate, the steam generator acts in the same manner as has been disclosed in my Patent No. 2,615,265, wherein a limited amount of heat is transmitted to the liquid reservoir or boiler to effect a slow boiling of the liquid therein. The steam from the boiler is then conducted to the interior of the steam generator and is superheated prior to discharge through a port in the sole plate communicating with the steam generator. When the steam generator is moved out of heat conducting relation with the sole plate, the reservoir is so spaced and insulated with respect to the sole plate that the liquid therein may be heated to some extent, but will not be brought to a boil. Accordingly, there will be no discharge to the steam outlet port. The iron also includes a pump unit for pumping or forcing liquid from the reservoir through a suitable spray head or sprinkling nozzle at

the front end of the iron in the manner disclosed in my copending application Serial No. 159,783.

In the second embodiment of the present invention, I do not employ a boiler type reservoir, but instead provide a reservoir adapted to be disposed exteriorly of the iron housing. The iron includes a spray or sprinkling discharge nozzle, conduit means connecting the nozzle and reservoir and a pump in the conduit means for pumping liquid from the reservoir to the nozzle. The iron includes a steam generator unit adapted to be selectively connected with the conduit means to receive liquid from the reservoir, preferably by gravity flow, so that drops of liquid may be flashed into steam in the generator and discharged through the sole plate of the iron. Accordingly, the second embodiment of the invention may be referred to as a drip type unit. In this embodiment of the invention, the iron housing preferably serves as a steam chamber for accummulating the generated steam prior to discharge thereof through the sole plate of the iron.

As will be appreciated from the foregoing, both embodiments of my invention provide advantages heretofore unattained in the art, particularly the advantage that a single iron may now comprise a dry iron, a sprinkling iron, a steam iron, or a combination steam and sprinkling iron.

Other objects and advantages of the present invention will become apparent in the following detailed description of preferred embodiments of the invention.

Now, in order to acquaint those skilled in the art with a manner of making and using the electric flat iron of the present invention, I shall describe, in connection with the accompanying drawings, preferred embodiments of the invention and the manner of making and using the same.

In the drawings:

Figure 1 is a vertical, longitudinal, sectional view of one embodiment, a boiler type unit, of the iron of the present invention, the view showing the relationship of the components of the iron as disposed for steam ironing;

Figure 2 is a partial sectional view, similar to Figure 1, showing the relationship of the components of the iron of Figure 1 as disposed for sprinkling or dry ironing;

Figure 3 is a partial plan view of the forward end portion of the handle of the iron shown in Figure 1;

Figure 4 is a partial sectional view of a modification of the iron shown in Figure 1;

Figure 5 is a view similar to Figure 1 of a second embodiment, a drip type unit, of the iron of the present invention;

Figure 6 is a plan view of the closure or control member of the iron shown in Figure 5;

Figure 7 is a partial cross-sectional view of the reservoir and the mounting therefor of the iron shown in Figure 5, the view being taken substantially on line 7—7 of Figure 5;

Figures 8 and 9 are fragmentary sectional views of alternative forms of valved accumulating means that may be associated with the pump in the Figure 5 embodiment of the invention; and

Figure 10 is a view similar to Figure 1 of a further embodiment, a boiler type unit, of the iron of the present invention.

Due to the similarity of the various embodiments of the invention disclosed herein, the same will be described in conjunction with reference numerals having common digits and tens numerals for indication of like or similar parts, the embodiment of the invention shown in Figures 1 to 3 being described in conjunction with reference numerals in the 100 series, the modification of the iron shown in Figure 4 being described in conjunction with reference numerals in the 200 series, the embodiment of the invention shown in Figures 5 to 7 being described in conjunction with reference numerals in the 300 series and the embodiment of the invention shown in Figure 8 being described in conjunction with reference numerals in the 400 series.

Referring now to Figures 1 to 3, I have shown one embodiment of the iron of the present invention as including a sole plate **101**, a housing **102** overlying the sole plate, and a handle **103** disposed above and connected to the housing for manipulating the iron. A conventional electric heating element **104** is embedded in the sole plate **101** so as to heat the same. Heating of the sole plate is controlled by means of a thermostat **105** disposed within a recess in the sole plate and including an operating element or control **106** extending to the exterior of the housing adjacent the handle for convenient adjustment by the user of the iron. The thermostat **105** and the heating element **104** are suitably connected in circuit with electric conductors disposed within the conventional electric cord or conduit **107** which extends from the rearward side of the iron.

The housing **102** of the iron is rested at spaced insulated point contacts **108** on the sole plate **101** of the iron so as to receive a limited amount of heat from the sole plate. The construction of the housing is such that the same rests upon the sole plate only at the insulated point contacts and the remainder of the housing is spaced from the sole plate. The housing **102** is provided with a bottom wall **109** spaced upwardly from the sole plate **101** and defining a chamber or reservoir within the housing **102**. The reservoir **110** is adapted for the reception of water or other suitable liquid, as will become apparent as the description proceeds. Due to the insulated mounting of the housing with respect to the sole plate, and due to the spacing of the bottom wall **109** from the sole plate **101**, the liquid within the reservoir **110** will normally receive only a limited amount of heat from the sole plate, the spacing of the bottom wall of the housing and the sole plate providing a space for the passage of air to provide further insulation, or a cooling air stream, between the sole plate and the housing or reservoir.

The sole plate **101** and the bottom wall **109** of the housing **102** are provided with aligned apertures or bores and the sole plate **101** is provided with a counterbore **111** which is internally threaded for the reception of an externally threaded sole plate plug **112**. The plug **112** is provided with an axial bore **113** defining a steam discharge port. The flange provided on the sole plate by the counterbore **111** comprises a shoulder through which a plurality of connectors or fasteners **114** are adapted to extend to secure the housing **102** to the sole plate. A heat distributing ring **115** is disposed within the bore in the bottom wall **109** of the housing in spaced relation to the sole plate **101**. Between the heat transmitting ring **115** and the sole plate, there is disposed an insulating ring **116** limiting the transmission of heat from the sole plate to the ring **115**. The fasteners **114** are extended through the flange of the sole plate **101**, passed through the insulating ring **116** and threaded into the heat transmitting ring **115** to connect the housing **102** to the sole plate **101** in insulated relationship. Due to the described association, the housing and sole plate are connected together by single fastening means, namely fasteners **114**, which is located at substantially the center of gravity of the iron, as is shown in Figure 1, to minimize the stress to which the fastening means may be put during use of the iron and to maintain the housing and sole plate in fixed relation to one another.

The heat transmitting ring **115** is internally threaded for the reception of an externally threaded heat transmitting head **117** of a steam generator unit including a stem **118** secured to the head **117**. As will appear more fully hereinafter, the head **117** and the stem **118**, together with the sole plate plug **112**, comprise a steam generator, and the threaded connection of the head **117** with the ring **115** provides means whereby the head **117** may be moved into and out of heat conducting engagement with the sole plate plug **112**. The head **117**

and the stem 118 are provided with aligned bores defining a passage 119 for conducting steam from the interior of the chamber 110 to the steam discharge port 113 in the plug 112. When the heat transmitting head 117 of the steam generator unit is moved into engagement with the plug 112, heat from the sole plate will be transmitted to the head 117, to the stem 118, to the heat transmitting ring 115 and to the water or other liquid in the reservoir 110 to bring the water to a boil, as will be described in detail hereinafter.

At the top thereof, the housing 102 is provided with a tubular extension or filler tube 124 extending into a vertical bore 125 provided in the front leg 126 of the handle 103, the tubular extension 124 being disposed substantially coaxially of the stem 118. As shown, the stem 118 extends a substantial distance into the interior of the filler tube 124, but is closed at its top so that the tube 124 may be utilized as the filling opening for the liquid reservoir 110. At its upper end, the filler tube 124 is adapted to be sealed by means of a removable closure element 127 including a flange 128 extending over and covering the bore 125 in the front leg 126 of the handle 103. The body or plug portion of the closure 127 is provided with a tubular gasket or sealing element 129 encircling the plug portion of the closure and adapted to be fitted in sealing relation in the upper end of the filler tube 124. The gasket or sealing element is adapted to accommodate rotation of the closure 127 and at the same time to provide a seal between the closure and the filler tube. The closure 127 is provided with an axial bore adapted for the reception of the upper end of the stem 118. In addition, radial slots 131 are provided in the walls of the closure 127, which slots comprise diametrically opposed bayonet slots adapted for the reception of the opposite ends of a pin 132 secured to and extending from opposite sides of the stem 118 transversely of the axis of the stem. As will be apparent, the slots 131 and the pin 132 provide a connection between the stem 118 and the closure 127, so that the closure and stem, and the heat transmitting head 117, are adapted for conjoint rotation, the connection accommodating relative axial movement between the stem and the closure. Upon rotation of the closure, the stem 118 and the heat transmitting head 117 may be rotated into and out of heat conducting engagement with the plug 112 and the sole plate 101. The stem 118 and the closure 127 are normally biased away from one another by means of a spring 133 disposed within the bore in the closure and acting against the upper end of the stem. The spring 133 is suitably associated with a carrier 134 including a rod 135 slidably extending through the closure to the exterior of the closure. Preferably the rod 135 has a head engageable with an upwardly facing surface on the closure to prevent disassociation of the plug and the spring.

To condition the iron for steam ironing, it is merely necessary for the operator to rotate the closure 127 in the proper direction to effect threading of the heat transmitting head 117 into and through the heat transmitting ring 115 to bring the head 117 into engagement with the plug 112 and the sole plate 101. Preferably, the head 117 and the plug 112 are provided with complementary valve type slots and the same are ground or otherwise machined to provide for intimate engagement between the two. When the head 117 and plug 112 are in heat conducting relation, and the iron is energized, heat will be transmitted from the sole plate through the head 117, the stem 118 and the ring 115 to the liquid within the reservoir 110. The area of engagement between the head 117 and the plug 112 are such as to transmit sufficient heat to the reservoir to effect a slow boiling of the water or other liquid within the reservoir, but not to transmit such heat as would result in violent boiling of the liquid within the reservoir. As the liquid within the reservoir is boiled, the steam flows upwardly into the filler tube 124 and then flows through a diametrical bore 119a in the stem 118 into the passage 119 defined within the stem. As will be appreciated, the stem 118 and the head 117 are heated to a high degree from the sole plate of the iron and, accordingly, the steam passing through the stem and head is superheated to provide a relatively dry steam for discharge through the port 113 in the plug 112. To effect a cessation of steam ironing, it is merely necessary for the operator to rotate the closure 127 in such direction as to move the heat transmitting head 117 away from the sole plate plug 112, such as is shown in Figure 2, to provide an insulating clearance between the two members. When there is a disestablishment of the heat conducting relationship between the head 117 and the sole plate 101 of the iron, the heat transmitted from the sole plate to the reservoir is of such limited nature as will not result in boiling of the liquid within the reservoir. Thus, steam generation is discontinued.

To effect sprinkling of liquid on materials to be ironed thereby, the iron is provided with a nozzle, indicated generally at 138, disposed to the forward side of the iron and directed forwardly of the iron to effect sprinkling of liquid on the material to be ironed immediately prior to the passage of the iron over that portion of the material. The sprinkling nozzle 138 preferably includes an adjustable spray head 139 mounted in a ball 140 which is adjustably mounted within a socket 141 suitably secured to the filler tube 124, the ball 140 being adjustably retained within the socket member by means of a cap 142 adjustably secured to the socket in a suitable manner. To provide communication between the spray head 139 and the liquid in the reservoir, a vertical tube 147 is provided to establish communication between the interior of the socket member 141 and a point adjacent the bottom wall 109 of the reservoir 110.

To effect discharge of liquid from the reservoir 110 through the sprinkling nozzle 138, discharging means in the form, preferably of a manually operable pump, indicated generally at 148, is provided. While the pump 148 may take various forms, the same has been shown in the embodiment of the invention disclosed in Figure 1 as comprising an air pump including a tubular cylinder 149, a piston 150 reciprocable within the cylinder, a connecting rod 151 pivotally connected to the piston 150, an operating crank 152 pivotally connected to the rod 151 and an operating lever or handle 153 connected to the crank 152 and pivotally mounted with respect to the handle 103 by means of a pivot pin 154 journaled in a block 155 fitted within a recess provided in the upper portion of the handle 103 adjacent the front leg thereof. As will be apparent the handle 153 is mounted for oscillation with respect to the handle 103 and the handle 103 is provided with a recess for reception of portions of the pump operating handle. The air pump 148 is provided in a conventional manner with an inlet valve in the piston 150 thereof and with an outlet valve 159 disposed at the bottom of the cylinder 149 for controlling communication between the interior of the cylinder and the reservoir 110. As will be readily apparent, oscillation of the operating handle 153 with respect to the iron handle 103 will effect reciprocation of the piston 150 within the cylinder 149. To render operation of the pump as convenient as possible, the piston 150 is normally biased in an upward direction by a spring 160 confined between the piston and the top wall of the housing 102 normally to move the operating handle 153 in a downward direction so that the user of the iron need only move the operating handle 153 in an upward direction when effecting pumping. Operation of the pump 148, by means of the operating handle 153 and the spring 160, will effect pumping of air to the interior of the housing 102, that is to the chamber or reservoir 110. The chamber 110 is fluid tight, all connections between the components of the housing, the bottom wall and the filler tube being sealed, and the gasket 129 providing a seal between the closure 127 and the filler tube 124. As air

is pumped to the reservoir **110**, a pressure head is created on top of the liquid within the reservoir, so that the liquid is forced upwardly through the tube **147** to the sprinkling nozzle **138**. The spray head **139** is so constructed as to direct the liquid downwardly and forwardly in front of the iron to wet or dampen the material to be ironed. The spray head is preferably adjusted to dampen an area at least equal to the width of the sole plate of the iron and immediately forward of the iron in the normal path of movement thereof over the material to be ironed.

In irons for household use, it is preferred that the iron be operated at relatively low pressures so as to reduce to the greatest extent possible any danger or hazard. Accordingly, the iron is so constructed and arranged that steaming is carried out at relatively low pressures and that sprinkling also is carried out at relatively low pressures, but at pressures above steaming pressure. As pointed out hereinbefore, it is one object of the present invention to provide an iron that is adapted for either steam ironing or for sprinkling or damp ironing. To this end, it is preferable to provide means for preventing sprinkling during steaming, and for preventing steaming during sprinkling. As has been pointed out hereinbefore, the closure **127** provides means establishing control over steaming operations. Accordingly, it is preferable to incorporate all control functions in a single member, that is, the closure. To this end, the flange **128** of the closure is of such radial extent as to overlie the connecting rod **151** of the air pump to retain the piston **150** of the pump in its downward-most position against the urge of the spring **160**. Thus, as is shown in Figure 1, when the closure **127** is rotated to effect engagement between the steam generator head **117** and the sole plate plug **112**, the flange **128** of the closure **127** overlies the connecting rod **151** to render the pump **150** incapable of operation. When it is desired to effect sprinkling, it is necessary that the pump be operable, and it is normally preferred that steaming be discontinued. To effect the desired control, the flange **128** of the closure **127** is provided at one portion thereof with a cutout or slot **170** adapted to accommodate reciprocation of the pump connecting rod **151**. The slot **170** is so located in the flange **128** of the closure that the stem **118** and head **117** are disposed in spaced relation to the sole plate plug **112** when the slot **170** is aligned with and accommodates movement of the pump connecting rod **151**, as is shown in Figure 2, wherein the head **117** is spaced from the plug **112** so that very little heat is transmitted to the liquid in the reservoir **110**. While the liquid in the reservoir may be heated to a certain extent from the sole plate of the iron, the amount of heat transmitted to the liquid is not sufficient to bring the liquid to a boil. In this position, the iron may be utilized either for dry ironing or for sprinkling or damp ironing, depending upon whether or not the air pump **148** is actuated. If the user of the iron desires to sprinkle the material to be ironed, it is merely necessary to effect a squeezing action on the handle **103** of the iron and the operating handle **153** of the discharging means or pump to effect a down stroke of the piston **150**. As the piston **150** moves downwardly, the air confined between the piston and the outlet valve **159** is compressed and is discharged through the valve **159** into the interior of the reservoir. Upon release of the handle **153**, the piston **150** is moved upwardly by the spring **160** to accommodate entry of air to the space between the piston and the outlet valve. Then, upon the next squeezing action of the handles **103** and **153**, more air is introduced to the interior of the reservoir. As operation of the pump **148** is continued, sufficient air pressure is built on the liquid in the reservoir **110** to force the liquid outwardly through the tube **147** and to discharge the liquid through the spray nozzle **138**. As will be appreciated, continued operation of the handle **153** will effect continued operation of the sprinkling of liquid.

When it is desired to discontinue sprinkling and to engage in dry ironing, it is merely necessary for the operator to discontinue operation of the handle **153**. If it is desired then to effect steam ironing, it is merely necessary for the operator to elevate the handle **153**, rotate the closure **127** to thread the heat transmitting head **117** of the steam generator downwardly into engagement with the sole plate plug **112**. When the head **117** engages the plug **112**, the closure **127** will be retained against further rotation so that the operator will be aware that the iron is in condition for steam ironing. At that time, the handle **153** may be released. However, when the handle is released, the upper end of the connecting rod **151** will engage a portion of the flange **128** of the closure overlying the same so that the pump **148** is rendered inoperative. Thus, steam ironing may be indulged in without danger of accidental actuation of the pump operating handle **153** and steam ironing will be carried out at a low pressure. The steam pressure is insufficient to effect discharge of liquid in the reservoir through the tube **147** and the spray nozzle **138**. The upper end of the connecting rod preferably is adapted for cooperation with the flange of the closure to prevent accidental rotation of the closure from steaming position. Also, the iron is not normally capable of steam ironing when the operator is desirous of sprinkling, for the reason that the connecting rod **151** extends into the slot **170** in the flange **128** of the closure **127** to prevent accidental rotation of the closure. Thus, the pump structure and closure provide a control means interlock, it being necessary to move the pump handle **153** to full up position to accommodate rotation of the closure.

As is clearly shown in Figure 3, the closure **127** is adapted to be rotated in one direction, as is indicated by appropriate lettering and an arrow on the flange of the closure, to a steaming position. Rotation of the closure **127** in the opposite direction, as is indicated by suitable lettering and an arrow, will render the iron capable of sprinkling or damp ironing, or dry ironing as desired. Preferably, suitable mechanical stop means are provided between the closure **127** and the filler tube **124** to define a limit stop for rotation of the closure in the direction to render the iron capable of sprinkling. Similar stop means may suitably be employed for stopping rotation of the closure in the opposite direction, although such stop means is not actually required due to the physical engagement between the heat transmitting head **117** and the plug **112**.

As has been pointed out hereinbefore, there may be certain instances wherein it is desirable to have an iron that is capable of sprinkling and steaming at the same time. To provide an iron capable of such functions, it is merely necessary to redesign the closure **127** to a very slight extent. For example, an indicia could be provided on the handle **103** of the iron adjacent the closure **127** and a plurality of indicia could be provided on the top of the closure. Such indicia could conveniently comprise dots, with the dots on the closure being adapted to be brought into alignment with the dot on the handle to provide an indication of the type of ironing to be employed. For sprinkling, the flange **128** of the closure **127** would be provided with a slot and a dot immediately adjacent the slot adapted to be aligned with the dot on the handle to effect alignment of the slot and the connecting rod **151** of the pump, whereby sprinkling could be effected. For steaming and sprinkling, a second slot could be provided in the flange, say at a point diametrically opposite the slot **170**, and a second dot could be provided on the closure adjacent the second slot whereby an indication would be provided for effecting steaming and sprinkling simultaneously. In the position of both sprinkling and steaming, the heat transmitting head **117** would be brought into firm engagement with or would be disposed immediately adjacent but slightly spaced from the plug **112**, the spacing being insufficient for adequate insulation between the two members, so that the head **117**, the stem **118** and the heat transmitting ring

115 would be heated to a high degree. To effect steaming alone, a third dot could be provided on the closure 127 slightly to one side of the second slot. In this position, the head 117 would be slightly spaced from or in firm engagement with the plug 112, depending upon the relationship in the steaming and sprinkling position, and the flange 128 would overlie the connecting rod 151 to prevent actuation of the pump. To effect dry ironing, a fourth dot could suitably be provided disposed immediately to one side of the slot 170 in the flange 128, whereby the pump 148 would be locked in an inoperative position due to the overlying relationship of the flange 128 and still the head 117 would be separated from the plug 112 to prevent steaming.

With respect to the relation between the heat transmitting head 117 of the steam generator and the sole plate plug 112, it is to be pointed out that the threaded connection between the head 117 and the ring 115 may be a conventional screw thread, or may be a fast thread. For purposes of insulation between the head 117 and the plug 112, ⅛ inch spacing is entirely adequate to prevent boiling of the liquid within the reservoir. Thus, any screw thread adapted to effect ⅛ inch axial movement of the head 117 upon a given rotation of the closure 127 will be effective to move the steam generator into and out of operative position.

As will be appreciated from the foregoing, the present invention provides an iron adapted to be used for dry ironing, damp ironing, steam ironing, or combined steam and sprinkling or damp ironing. All controls for the iron are disposed within convenient reach of the operator's hand, that is, immediately at the operator's finger tips. The type of ironing which the iron is adapted to be conditioned for is directly under control of the closure 127 by slight rotary movement of the closure. At the same time, the closure provides means for sealingly closing the filler tube of the liquid reservoir of the iron.

In using the iron, the operator removes the closure 127, by axial movement as accommodated by the bayonet connection 131, 132, fills the reservoir 110 with the proper or desired amount of liquid, usually ordinary tap water, reapplies the closure, the bayonet slots automatically providing for alignment of the closure and the stem 118, plugs the cord 107 into an electrical outlet, sets the thermostat control 106 for the material or fabric to be ironed, elevates the pump handle 153 and turns the closure to the position for the type of ironing desired. To iron other fabrics, the thermostat control is adjusted in a conventional manner. For other types of ironing, the pump handle 153 is elevated and the closure 127 is rotated to the appropriate position. The response of the iron to changes in thermostat setting and type of ironing is very rapid so that, substantially no delay is involved and materials may be conveniently ironed without any necessity for a preliminary sorting and grouping.

In Figure 4, a modification of the iron of Figures 1 to 3 is shown, wherein the modification relates to the sprinkling feature and is directed, particularly, to the provision of means for preventing sprinkling when the iron control is set for steaming or dry ironing operation. As shown in Figure 4, the nozzle is indicated generally at 238 and the same includes an adjustable spray head 239 mounted on a ball 240 which is adjustably mounted within a socket member 241 and secured within the socket member by means of a cap 242. The socket member 241 extends through the handle 203 of the iron and communicates with a bore 244 provided in the filler tube 224. The bore 244 in the filler tube is adapted for communication with a port 245 provided in a valve member 246 secured to the stem 218 of the steam generator. A tube 247 extending to adjacent the bottom of the fluid reservoir communicates with the port 245 in the valve member 246. In use, the valve member 246 is rotatable with the stem 218 so that the port 245 is brought into and moved out of communication with the bore 244, and thus with the nozzle 238, upon rotation of the stem 218 to effect control of the type of ironing to be effected. When the control, that is the closure 227 is adjusted for sprinkling, the valve port 245 is moved into the position shown in Figure 4 so that sprinkling may be accomplished in the manner described hereinbefore. When the closure 227 is adjusted to set the iron for steam ironing, a blank portion of the valve member 246 is brought into alignment with the bore 244 in the filler tube 224 so as to close off the nozzle 238 from the fluid reservoir. When the closure 227 is adjusted for dry ironing, the valve member 246 may be so adjusted as to close off the nozzle 238 from communication with the reservoir as in the case of steam ironing, the bore 244 may be maintained in open communication with the upper portions of the fluid reservoir so as to prevent the creation of a pressure head on the liquid within the reservoir, or communication may be established between the tube 247 and the nozzle 238 in the manner shown in Figure 4 so that dry ironing is carried out in the same manner as has been described hereinbefore with respect to Figures 1 to 3.

The tube 247 employed in the embodiment of the invention shown in Figure 4 may be either a flexible tube or a rigid tube. If the tube is rigid, the same is preferably provided with a lateral offset, as is shown in Figure 4, so that the tube does not interfere with or engage the components of the steam generator. The purpose of the valve means 246 is to prevent the discharge of steam through the spray or sprinkling nozzle during steam ironing, particularly when the liquid level in the reservoir falls below the lower end of the tube 247. Otherwise, the operation of the modification shown in Figure 4 is the same as that described hereinbefore with respect to the embodiment of the invention shown in Figures 1 to 3.

Referring now to Figures 5 to 7, a further embodiment of the present invention is shown as including a sole plate 301, a housing 302 overlying the sole plate 301, and a handle 303 disposed centrally above the housing 302 for manipulating the iron. The sole plate 301 is adapted to be heated by a conventional heating element (not shown), which heating element is connected in circuit with a thermostat 305, disposed within a recess in the sole plate 301 and having a manual control element 306 extending to the exterior of the housing 302, and a suitable electrical conduit or cord 307. The housing 302 is rested upon the sole plate 301 at a number of spaced insulated point contacts 308, so that only a limited amount of heat is transmitted from the sole plate to the housing.

The housing is provided within the interior thereof with a bottom wall 309 disposed in spaced parallel relation to the upper surface of the sole plate, the housing and bottom wall being so mounted with respect to the sole plate as to define an insulating air space between the sole plate and the bottom wall of the housing. The bottom wall 309 of the housing 302 defines a chamber 310 within the housing adapted for accumulating steam.

The sole plate 301 and the bottom wall 309 of the housing are provided with aligned bores, the bore in the sole plate being adapted for the threaded reception of a sole plate plug 312 having steam discharge ports 313 therein. The housing 302 is adapted to be connected to the sole plate 301 by means solely of a plurality of hollow fasteners 314 located at substantially the center of gravity of the iron and extending through the plug 312 and establishing communication between the interior of the chamber 310 and the discharge ports 313 in the plug. The hollow fasteners 314 are suitably secured to a heat distributing ring 315 which is secured to the bottom wall 309 of the housing 302. Thus, the hollow fasteners 314 serve the dual purpose of securing the housing to the sole plate and providing discharge ports for the passage of steam from the chamber 310 to the steam discharge ports 313 in the sole plate plug 312. To maintain the insulated relationship between the housing 302 and the sole plate 301, an insulator ring 316 is disposed between the

heat distributing ring 315 and the sole plate plug 312, the fasteners 314 passing through the insulator ring 316.

The heat distributing ring 315 is provided with an internal screw thread adapted for the adjustable reception of a heat transmitting head 317 of a steam generator. The steam generator, in addition to the head 317, includes a stem 318 secured to the head 317. The head 317 and stem 318 of the steam generator are provided with aligned bores 319 defining a passageway, the purpose of which will be described immediately hereinafter. As shown, the discharge ports 313 and the hollow fasteners 314 are disposed radially outwardly from the heat transmitting head 317 of the steam generator and do not communicate directly with the passageway 319 in the steam generator element, but communicate directly with the steam accumulating chamber 310. To establish communication between the chamber 310 and the passageway 319 through the steam generator elements, the heat transmitting head 317 is provided with longitudinal bores 320 establishing communication between the opposite sides thereof. The heat transmitting head 317 and the sole plate plug 312 define a chamber therebetween comprising a flash evaporation chamber as will become more readily apparent as the description proceeds. As will be appreciated, the passageway 319 and the steam generator elements 317 and 318 define an inlet to the flash evaporation chamber and the bores 320 in the head 317 define an outlet from the flash evaporation chamber to the steam accumulating chamber 310 in the housing 302.

The housing 302 includes a tubular vertical extension 324 extending into a vertical bore 325 provided in the front leg 326 of the handle 303. The tubular extension 324 is adapted to be closed at the upper end thereof by means of a closure element 327 having a radial flange 328 overlying and covering the vertical bore in the front leg of the handle. To provide a suitable seal between the closure and the tubular extension 324, a gasket or sealing element 329 is suitably positioned on the body portion of the closure 327. As in the embodiment of the invention previously described, the closure 327 is adapted to comprise the control element for the iron and, to this end, is provided with an axial bore adapted for the reception of the upper end of the stem 318, the stem 318 and closure 327 being connected for conjoint rotational movement and for relative axial or longitudinal movement by the provision of bayonet slots 331 in the bore of the closure 327 and the provision of a diametrical pin 332 on the stem 318. A spring 333 is provided between the stem 318 and the closure 327 normally to bias the two away from one another. In Figure 5 embodiment of the present invention, the tubular extension 324 of the housing 302 is adapted to comprise one element of a fluid distributing valve structure including a cylindrical plug valve or distributing member 334 fixed to the stem 318 by means of a pin 335 and rotatably mounted within the tubular extension 324 for cooperation with the same to provide a valving action to be described hereinafter. The valve member 334 is provided with a pair of circumferential grooves 336 and a radial port 337 establishing communication between the lower one of the two grooves 336 and the passageway 319 provided in the stem 318 of the steam generator.

The sprinkling apparatus of the present embodiment of the invention includes a nozzle, indicated generally at 338, comprising an adjustable spray head 339 mounted on a ball 340 which is mounted in a socket member 341 and adjustably secured within the socket 341 by means of a cap 342. The socket member 341 is provided with a bore communicating with one side of the ball 340 and with a port or bore 344 provided in the tubular extension 324. The distributing means or plug valve 334 is vertically adjustable within the tubular extension 324 to establish communication between the upper of the two grooves 336 and the bore 344 and spray nozzle 338.

For effecting sprinkling of liquid, the iron is provided with discharging means preferably in the form of a manually operable pump, indicated generally at 348, including a cylinder 349, a piston 350 reciprocable within the cylinder 349, a connecting rod 351 pivotally connected to the piston 350, a crank 352 pivotally connected to the connecting rod 351 and an operating lever or handle 353 connected to the free end of the crank 352. The operating handle 353 and the crank 352 are pivotally mounted with respect to the handle 303 by means of a pivot pin 354 mounted in a block 355 which is positioned within a recess provided in the handle 303. The piston 350 of the pump 348 is solid and is adapted upon reciprocation to draw liquid into and discharge liquid from the space below the piston through a suitable port provided in the bottom wall of the cylinder member, which port establishes communication between the cylinder 349 and a fluid passage or tube 357. At the opposite ends thereof, the fluid passage tube 357 is provided with a back-pressure actuated inlet valve 358 and a back-pressure actuated outlet valve 359. The distributing means or valve member 334 is adapted to be adjusted within the tubular extension 324 to establish communication between the outlet valve 359 of the fluid passage 357 and the lower groove 336. The discharging means or pump 348 of the present embodiment of the invention is operable in the same manner as the pump of the embodiment of the invention previously described. That is, the operating handle 353 is adapted to be moved upwardly into a suitable recess provided in the handle 303 of the iron and a spring 360 is provided between the bottom wall of the cylinder 349 and the piston 350 to return the piston 350 and the handle 353 after the actuating stroke thereof.

The inlet valve 358 of the fluid passage 357 communicates with an inlet tube 361 extending along the upper wall of the housing 302 and terminating at the rearward end of the handle 303 in a valve connector head 362. The valve connector head 362 and the inlet tube 361 are adapted to communicate with the interior of a liquid reservoir 363 adapted to be mounted on the rearward portions of the iron and including a valve 364 adapted for operative association with the valve connector 362. The reservoir 363 is generally of U-shape in plan and is adapted to fit about the rearward portions of the handle 303. The reservoir 363 is provided with a base 365 adapted to be rested upon a support 366 formed on the rearward portions of the iron and the reservoir is adapted to be connected to the iron by means of a cooperating dove tail structure 367 provided between the base 365 and the support 366. In use, the reservoir 363 is adapted to be associated with and disassociated from the iron by sliding the same onto and off of the dove tail support 366 provided on the iron. To this end, the valve connector head 362 and the valve 364 are adapted for sliding cooperation in a known manner to establish and disestablish communication between the head 362 and tube 361 and the interior of the reservoir 363. As associated, inlet tube 361 and fluid passage 357 comprise conduit means accommodating flow of liquid from the reservoir to the distributing means 334. During such flow the passage 357 accumulates liquid therein and in conjunction with its valves 358 and 359 comprises a novel liquid accumulating means associated with the discharging means or pump 348. The reservoir 363 is provided in the top wall thereof with a suitable filler opening 368 by means of which liquid may be introduced into the interior of the reservoir.

Briefly stated, in operation of the iron shown in Figures 5 to 7, the valve 334 is movable to establish communication between the outlet 359 of the liquid passage 357 and the flash evaporation chamber defined between the sole plate plug 312 and the head 317 of the steam generator, or the spray nozzle 338. The pump 348 is operable under the control of the user of the iron to effect sprinkling and the back-pressure valves 358 and 359 of

the liquid passage tube 357 are adapted to effect pressure delivery of liquid when the pump 348 is operated, or to accommodate gravity flow of liquid from the reservoir when the pump is not operated.

To effect sprinkling operation only, the closure 327 is rotated in the appropriate direction to bring the upper groove 336 in the valve 334 into communication with the bore 344 provided in the wall of the tubular extension 324 to establish communication between the spray nozzle 338 and the upper groove 336. During such rotation, portions of the lower circumferential groove 336 are maintained in communication with the outlet 359, the two grooves 336 are interconnected and the port 337 is disposed out of communication with the outlet 359, so as to establish communication between the outlet valve 359, both grooves 336 the bore 344 and the spray nozzle 338. This is accomplished by means of plug valve 334 having lands within the grooves 336 to seal portions of the grooves from one another. Specifically, the lower groove 336 includes at least two circumferentially spaced lands to establish one groove portion communicating with the port 337, and another groove portion sealed from the port 337 and communicating by means of a longitudinal recess in the surface of the plug, for example, with the upper groove 336, all as is known in the art and, therefore, not specifically shown herein. Then, upon actuation of the operating handle 353 of the pump in the manner described, liquid will be drawn from the reservoir 363, through the valve members 362 and 364, through the inlet tube 361, through the inlet valve 358, and discharged through the outlet valve 359, the lower groove 336, the upper groove 336, the bore 344 in the tubular extension 324 and the spray nozzle 338. As the pump is operated on the intake stroke, the back-pressure, that is the tendency of the piston 352 to draw liquid from the outlet side of the valve 359 will effect seating of the outlet valve 359 so that water is drawn through the inlet valve 358 from the reservoir 363. On the down or discharge stroke of the piston 350, the tendency of the pump to discharge water through the inlet valve 358 effects seating of the back-pressure actuated valve to seal the inlet whereby water may be discharged through the outlet valve 359 to the spray nozzle 338 for sprinkling the material immediately in advance of the iron. As will be appreciated, continued actuation of the operating handle 353 of the pump 348 will effect continued discharge of liquid through the sprinkling nozzle 338. In such position of the valve member 334, the heat transmitting head 317 of the steam generator is moved upwardly away from the sole plate plugs 312 so that only a very limited amount of heat is transmitted to the valve 334. The amount of heat transmitted to the valve may be sufficient to effect a slight heating of the liquid passing through the valve but will not be sufficient to generate steam during passage of the liquid from the pump 348 to the sprinkling nozzle 338.

To effect steaming, the closure 327 is rotated in such direction as to move the heat transmitting head 317 of the steam generator downwardly into engagement with the upper portion of the cup-shaped sole plate plug 312 of the iron to engage the plug in heat conducting relation and yet to be spaced from the upper surface of the central portion of the plug to define a chamber between the head and the plug, as is shown in Figure 5. At this time, the pump 348 is rendered inoperative, in a manner to be described, and the valves 358 and 359 both automatically assume an open position so that liquid from the reservoir 363 may gravitate through the inlet 361, the liquid passage tube 357 and to the plug valve 334. To effect this gravitational flow, it is preferable that the inlet tube 361 be inclined slightly to the horizontal in a downwardly direction from the reservoir 363 to the valve 334. When the head 317 of the steam generator is adjusted in the manner stated, the port 337 in the valve 334 is brought into communication with the outlet 359 of the liquid passage tube 357, so that liquid gravitating from the reservoir 363 flows in drops through the passageway 319 in the steam generator elements and into the flash evaporation chamber defined between the head 317 of the steam generator and the upper surface of the sole plate plug 312. As drops of water engage the sole plate plug 312, the same are immediately vaporized and the vapor flows upwardly through the bores 320 into the steam accumulating chamber 310 defined by the housing 302. When sufficient steam is accumulated within the chamber 310, the steam flows outwardly through the hollow fasteners 314 and through the steam discharge ports 313 in the sole plate plug 312 to effect steaming of the material being ironed. During normal steaming operations, the upper circumferential groove 336 is moved out of communication with the bore 344 in the tubular extension 324 so as to prevent discharge of liquid or steam through the sprinkling nozzle 338. As will be appreciated from the foregoing, the iron when adjusted for steam ironing provides drip feed to the steam generator to provide for relatively slow generation of steam whereby needless heating and waste of liquid are avoided.

The valve member 334, the tube 324, the grooves 336 and the port 337 are constructed in a conventional manner to accomplish the control functions stated. Also, as pointed out hereinbefore, it may be desirable under certain circumstances to effect a simultaneous sprinkling and steaming of materials to be ironed. To this end, the valve member 334 may be further ported and grooved to establish communication between the port 337 and the outlet valve 359 and between the upper groove 336 and the spray nozzle 338 so as to accommodate simultaneous liquid feed to the steam generator and the nozzle.

As in the embodiment of the invention previously described, the closure 327 comprises the control for determining the type of ironing for which the iron will be adapted. For this purpose, the closure 327 is provided with suitable instructions or indicia to establish and indicate to the user the manner in which the iron is controlled and the positions at which various controls are effected. In the normal steaming operation, it is preferred that the sprinkling pump 348 be rendered inoperative, and to this end the flange 328 of the closure 327 is adapted to overlie the connecting rod 351 of the pump to prevent actuation of the same. To accomplish actuation of the pump 348 for sprinkling operations, the flange 328 of the closure 327 is provided with a radial slot 370 adapted to accommodate passage of the connecting rod 351 of the pump 348 when the closure 327 is adjusted to sprinkling or spraying position. In irons where it is desirable to provide for simultaneous spraying and steaming, the closure 327 is provided with a second slot, similar to the slot 370, as has been described hereinbefore with respect to the embodiment of the invention shown in Figures 1 to 3.

While reference has been made hereinbefore merely to back pressure actuated valves, it is to be noted that the back pressure actuated inlet and outlet valves 358 and 359 may be of any well known construction, such, for example, as chamber members defining a valve seat to the inlet side thereof and a ball or the like positioned loosely within the chamber and adapted to have sealing engagement with the seat to the inlet side of the chamber member when back pressure is exerted on the ball.

As will be appreciated from the foregoing, the present invention is capable of several embodiments, such as the boiler type and drip type irons described hereinbefore. As will be further appreciated, the two described embodiments of the invention are capable of further modification and change without departing from the scope of the present invention.

A further embodiment of the boiler type steam iron of the present invention is shown in Figure 8, which embodiment includes a sole plate 401, a housing 402 over-

lying the sole plate **401**, and a handle **403** disposed above the housing **402** and adapted for manipulation of the iron. A conventional electric heating element **404** is embedded in the sole plate **401** and a thermostat **405**, disposed within a recess in the sole plate **401**, is suitably connected in circuit with the heating element **404**. The thermostat **405** is under the control of a manual actuating member **406** disposed to the top of the housing **402** and the heating element **404** and thermostat **405** are suitably energized from a power source through a suitable electrical conduit or cord **407**. The housing **402** is rested upon the sole plate **401** on spaced insulated contact points **408** to insulate the housing from the sole plate. The housing **402** includes a bottom wall **409** disposed in spaced parallel relation to the top side of the sole plate so that the housing **402** defines a chamber or reservoir **410** spaced and insulated from the sole plate **401**.

The sole plate **401** and the bottom wall **409** of the chamber **402** are provided with aligned bores and the sole plate is provided with a counterbore **411** adapted for the reception of a sole plate plug **412** provided with a steam discharge outlet **413**. The flange defined between the bore and counterbore in the sole plate **401** comprises a shoulder adapted for the passage therethrough of a plurality of fasteners **414** adapted to be connected to a heat transmitting ring **415** suitably secured to the bottom wall **409** of the housing **402** so as to secure the housing **402** to the sole plate. These fasteners constitute the sole fastening means for connecting the sole plate and the housing and are located substantially at the center of gravity of the iron to assure firm connection of the sole plate and the housing. To insulate the heat distributing ring **415** from the sole plate of the iron, an insulator ring **416** is disposed between the sole plate and the heat transmitting ring, the fasteners **414** passing through the insulator ring.

To effect steam ironing, the iron is provided with a steam generator including a heat transmitting head **417** and a tubular stem **418** suitably secured to the head **417** and having threaded adjustable connection with the heat transmitting ring **415**. The heat transmitting head **417** is provided with a bore therethrough adapted for the reception of a tube **421** extending into the stem **418**, the tube defining a steam discharge passageway from the interior of the stem **418** to the steam discharge port **413** provided in the sole plate plug **412**. The upper end of the steam generator stem **418** is closed by means of a plug **422** provided with a tube **423** establishing, in conjunction with radial bores or the like (not visible in Figure 8), communication between the interior of the steam generator and the interior of the tube **424**, thus to establish communication between the reservoir and the steam generator for the passage of steam generated in the reservoir.

The housing **402** includes a vertical tubular extension **424** extending into a vertical bore **425** provided in the front leg **426** of the handle **403**. The filler tube **424** is necked down at the upper end thereof to provide a detent for releasably securing a closure **427** within the upper end of the filler tube to seal the tube and the reservoir **410**. The closure **427** is provided with a radially extending flange **428** overlying the bore **425** provided in the front leg **426** of the handle. The closure **427** also includes a vertically extending tube **430** which is slotted at the lower end thereof for the reception of a diametrical pin **432** provided on the closure member for the steam generator tube **418** whereby the closure **427** and tube **418** are connected for conjoint rotational movement and relative axial movement to effect vertical movement of the steam generator with respect to the sole plate of the iron.

The sprinkling apparatus of the iron disclosed in Figure 8 comprises a spray nozzle, indicated generally at **438**, including an adjustable spray head **439** mounted on a ball **440** which is adjustably mounted within a socket member **441**, the ball **440** being secured within the socket member **441** by means of a cap member **442**. A vertical tube **447** extending to adjacent the bottom of the reservoir **410** communicates with the spray head **439** to establish communication between the spray nozzle and the liquid reservoir.

The iron is provided with liquid discharging means comprising a pump **448** which in the present embodiment is an air pump, as has been referred to hereinbefore with respect to the embodiment of the invention shown in Figures 1 to 3. The air pump includes a tubular cylinder **449**, a piston **450** reciprocable within the cylinder **449**, a connecting rod **451** pivotally connected to the piston **450**, a crank **452** pivotally connected to the connecting rod **451**, and an operating lever or handle **453** connected to the crank **451**. The handle or lever **453** is pivotally mounted in the handle **403** of the iron by means of a suitable pivot pin **454**, the handle **453** being oscillatable into and out of a suitable recess provided in the handle **403** of the iron. The connecting rod **451** of the pump **448** is provided with an upwardly extending vertical projection **456** adapted to cooperate with the flange **428** of the closure in much the same manner as has been described hereinbefore with respect to the other embodiments of the invention.

The piston **450** of the pump **448** is provided with a conventional air inlet valve and a suitable air outlet valve **459** is provided in the top wall of the housing **402** to control the pumping of air to the interior of the reservoir **410**. As in the embodiments of the invention previously described, the pump **448** preferably includes a spring **460** to provide for automatic return of the piston **450** so that the operator need actuate the handle **453** in one direction only. To accommodate actuation of the pump **448**, the flange **428** of the closure **427** is preferably provided with a radial slot **470** for the purposes described hereinbefore.

As shown in Figure 8, the iron has been set to effect simultaneous steam and sprinkling ironing. That is, the slot **470** in the closure **427** is disposed in alignment with the extension **456** of the connecting rod **451** of the pump, so that the pump is capable of actuation at the will of the operator. Also, the closure **427** has been so adjusted as to bring the head **417** of the steam generator into engagement with the sole plate plug **412** so that heat will be transmitted from the sole plate to the liquid within the reservoir to effect a low boiling of the water or liquid in the reservoir. As the liquid within the reservoir boils, the steam passes upwardly into the filler tube **424** and through the tube **423** into the interior of the stem **418** of the steam generator. Within the interior of the stem **418**, the steam is superheated and any moisture therein collects on the top of the head **417** for conversion to dry steam. The tube **421** is provided with a reverse bend therein so that the free open end thereof is directed downwardly whereby only dry steam will flow into the tube **421** for discharge through the steam port **413** in the sole plate plug **412**. The manipulation of the closure **427** to effect the controls of dry ironing, sprinkling ironing alone or steam ironing alone will be apparent from the foregoing description of other embodiments of the invention.

From the foregoing, it will be apparent that the present invention provides an improved iron capable of use, at the will of the operator, for dry ironing, sprinkling ironing, steam ironing, or sprinkling and steam ironing simultaneously. The advantages of a single iron for accomplishing all types of ironing will be obvious to those skilled in the art. In addition, it is to be pointed out that the iron may be used for dry ironing even though the reservoir thereof is full of liquid, the iron may be used for sprinkling ironing without the creation of steam, which normally is disadvantageous to sprinkling ironing, and the iron is capable of use as a conventional steam iron with all the advantages and features provided in the

iron of my Patent No. 2,615,265. While specific embodiments of the steam generator, spray nozzle, pump, etc. have been shown and described herein, it will be appreciated that such components of the iron may be modified and changed in view of the teaching of my Patent No. 2,615,265 and my application Serial No. 159,783.

Hereinbefore, reference has been made to the spraying of a liquid from the reservoir of the iron. While the liquid to be used will, in most cases, comprise tap water, there are many advantages in directly applying a deodorizing, disinfecting, or mercerizing agent. Accordingly, it will be appreciated that the iron of the present invention is adapted for the sprinkling or steaming of various fabrics with various types of liquids. As has been brought out more fully in my Patent No. 2,615,265, the iron of the present invention does not require distilled water in the use thereof, ordinary tap water being entirely adequate for the iron due to the super-heater feature provided by the steam generator structure. Accordingly, there is no disadvantage in using other special liquid agents in the reservoir of the iron, as would be occasioned with conventional steam irons.

In the construction of the steam generator of the present invention, the thickness of section and size of the various elements is such as to absorb sufficient heat to super-heat and dry the saturated or wet steam originally evaporated. That is, wall thickness and heat storage characteristics are such as to be in proper relationship to the quantity of moisture removable from the saturated steam during the passage of the saturated steam through the ducts of the steam generator. To assist in proper drying and superheating of the saturated steam, the passages, bores or ducts in the steam generator may be drilled of different diameters to accommodate reduction in the speed of the passing saturated steam. The provision of bores of various diameters creates pockets for the breaking up of water particles more effectively than would be accomplished in a chamber wherein no obstacle to steam passage were provided.

The interlocking features provided by the control closure and pump provide for locking the pump against operation when the iron is in steaming position to provide a safety factor preventing the addition of air pressure to the low steam pressure by mistake. Furthermore, the structure is such as to prevent accidental rotation of the control closure. In operation, the pump operating handle must be elevated into its recess in the handle of the iron before the closure can be rotated. In addition, in the embodiments of the invention shown in Figures 1 to 3, 4 and 8, the closure comprises a removable closure for the filler opening of the fluid reservoir. In all embodiments of the invention, the control closure accommodates access to and repair of the valve and steam generator components.

Also, in the embodiment of the invention shown in Figures 5 to 7, an improved drip type iron construction is disclosed whereby even hard water containing foreign substances, such as lime and iron, may be used in the iron without the possibility of the iron becoming clogged by the residue resulting from boiling of the water. To this end, the particular embodiment of the invention provides a chamber for accumulating super-heated steam whereby the super-heated steam may attain the pressure necessary to penetrate materials to be ironed and whereby the super-heated steam may be slightly cooled and further dried before use.

In all embodiments of the invention, the steam generator unit is disposed in vertical alignment with the tubular vertical extension of the iron housing so that the steam generator (and valve) may be removed in a convenient manner from the iron for cleaning and repair, whereby the iron is particularly adapted for maintenance by the user. Furthermore, in all embodiments of the invention, all controls and actuating elements of the iron are disposed or mounted in the iron handle so that all controls and operations may be readily effected by the hand of the user employed for manipulating the iron. A further feature of the invention resides in the connection of the housing and sole plate of the iron at the center of gravity of the iron.

While I have described what I regard to be preferred embodiments of my invention, it will be appreciated that various changes, rearrangements and modifications may be made therein without departing from the scope of the invention, as defined by the appended claims.

I claim:

1. In a flat iron having an electrically heated sole plate, a housing insulated with respect to the sole plate, and a handle, the combination of a liquid reservoir in the housing, spraying means for discharging liquid from said reservoir forwardly of the housing, discharging means under the control of the iron user for forcing liquid from said reservoir to said spraying means, steam generating means movably mounted in said reservoir for movement into and out of heat transmitting engagement with the sole plate, said steam generating means being adapted to transmit a limited amount of heat from the sole plate to the liquid in said reservoir to generate steam, steam discharge means communicating with said steam generating means, means for moving said steam generating means, and means for locking said discharging means.

2. In a flat iron having an electrically heated sole plate, a housing insulated with respect to the sole plate, and a handle, the combination of a liquid reservoir in the housing, means for conducting a limited amount of heat from the sole plate to the liquid in said reservoir to evaporate the liquid, means for shifting the said heat conducting means into and out of heat conducting relation with respect to the sole plate, means for locking said heat conducting means in adjusted position, spraying means for discharging the liquid in said reservoir forwardly of the housing, and discharging means under control of the iron user for forcing liquid from said reservoir to said spraying means.

3. In a flat iron, the combination as set forth in claim 2, including a filler tube extending upwardly from said reservoir, a closure for said tube, and means establishing operative connection between said closure and said heat conducting means and between said closure and said discharging means, said closure being sealed with respect to said tube and rotatable in said tube to control operation of said discharging means and said heat conducting means shifting means.

4. In a flat iron, the combination as set forth in claim 2, including a tube associated with said housing and a closure for said tube, said closure being operatively associated with said heat conducting means and said discharging means and rendering said discharging means inoperative when said heat conducting means is disposed in heat conducting relation with respect to the sole plate.

5. In a flat iron, the combination as set forth in claim 2, including a tube associated with the housing and a closure for said tube, said closure being operatively associated with said heat conducting means and with said discharging means and rendering said heat conducting means inoperative when said discharging means is operative.

6. In a flat iron, the combination as set forth in claim 1, said steam generating means including means for superheating and drying the steam generated in said reservoir when said steam generating means is in heat transmitting engagement with the sole plate, a filler tube communicating with said reservoir, and a closure for said tube, said closure being detachably and operatively associated with said steam generating means for moving the same into and out of heat transmitting engagement with the sole plate, said closure having dial means thereon and being removable from said tube.

7. In a flat iron, the combination as set forth in claim 1, said steam generating means including a stem having

a bore therethrough and heat transmitting means on the lower end of said stem, said heat transmitting means being movable into and out of heat transmitting engagement with the sole plate, said heat transmitting means and said stem defining means for superheating and drying steam generated in said reservoir, a filler tube for said reservoir, and closure and dialing means for said tube operatively and detachably associated with the upper end of said stem.

8. In a flat iron, the combination as set forth in claim 2, wherein said heat conducting means includes a heat transmitter ring and a heat transmitting member mounted in said ring, said heat transmitter ring being secured to said reservoir, insulating means between said heat transmitter ring and the sole plate, fastening means for connecting said heat transmitter ring to the sole plate in insulated relationship, said heat transmitter ring being threaded, said heat transmitting member threaded in said ring for adjustment with respect to said ring and the sole plate, said heat conducting means including steam passageway defining means directly connected to said heat transmitting member.

9. In a flat iron, the combination as set forth in claim 2, said reservoir comprising a portion of the housing, the housing and said reservoir being insulated with respect to the sole plate, the sole plate being spaced from the housing and said reservoir to define an air space therebetween for the circulation of a cooling air stream, and means for securing the housing and said reservoir to the sole plate, said last-named means including fasteners disposed adjacent the center of gravity of the iron and operatively associated with said heat conducting means.

10. In a flat iron, the combination as set forth in claim 1, said discharging means comprising hand operated pump means including an operating lever movably mounted in a recess in the handle, said operating lever being adapted for actuation by the guiding hand of the iron user, said pump means including a cylinder mounted in the handle, a piston reciprocable in said cylinder, and connecting rod means establishing operative connection between said operating lever and said piston.

11. In a flat iron, the combination as set forth in claim 1, including a filler tube for said reservoir, a closure for said tube, said closure being operatively associated with said heat conducting means, said discharging means comprising said operated pump means including an operating lever movably mounted on the handle, a piston reciprocable in response to actuation of said lever, and connecting rod means establishing operative connection between said lever and said piston, said closure being adapted for cooperation with said connecting rod means, said closure being rotatable in said tube for adjusting said heat conducting means and for controlling operation of said pump means, said connecting rod means being adapted normally to retain said closure against rotation, said connecting rod means being movable upon actuation of said lever to accommodate rotation of said closure.

12. In a flat iron, the combination as set forth in claim 2, including a filler tube for said reservoir, a closure for said tube, said closure being operatively associated with said heat conducting means and with said discharging means and being rotatable in said tube to control said heat conducting means and said discharging means, said discharging means comprising hand operated pump means including a spring biased piston, a lever movably mounted on the handle, and connecting rod means operatively connecting said lever and said piston, said closure being adapted for cooperation with said connecting rod means, said connecting rod means normally being biased into cooperative association with said closure to retain said closure against rotation, said lever being operable to effect disassociation of said closure and said rod means to accommodate rotation of said closure.

13. In a flat iron, the combination as set forth in claim 2, said spraying means comprising an adjustable ball type spray nozzle adapted for variation in the amount and direction of spraying.

14. In a flat iron, the combination as set forth in claim 2, said spraying means including a spray nozzle having liquid passageway means leading to adjacent the bottom of said reservoir and having operative communication with said discharging means.

15. In a flat iron having an electrically heated sole plate, a liquid reservoir disposed in insulated relation with respect to the sole plate, a steam outlet in the sole plate, a steam generator movable into and out of heat conducting relation with the sole plate, said steam generator when moved into heat conducting relation with the sole plate being operative and establishing communication between said reservoir and said steam outlet in said sole plate, a spray nozzle spaced from said sole plate and adapted to communicate with said reservoir for discharging liquid from said reservoir forwardly of the sole plate, means for force feeding liquid from said reservoir to said spray nozzle, and means for selectively rendering said steam generator and said feeding means operative.

16. In a flat iron having an electrically heated sole plate and a handle for manipulating the iron, a liquid reservoir disposed in insulated relation with respect to the sole plate, a steam outlet in the sole plate, a steam generator movable into and out of heat conducting relation with the sole plate, said steam generator when moved into heat conducting relation with the sole plate being operative and establishing communication between said reservoir and said steam outlet in the sole plate, a spray nozzle spaced from said sole plate and adapted to communicate with said reservoir for discharging liquid from said reservoir forwardly of the sole plate, pump means associated with the handle for force feeding liquid from said reservoir to said spray nozzle, and control means associated with the handle for selectively rendering said steam generator and said pump means operative and inoperative, whereby the iron is adapted upon manipulation of the handle and the control and pump means associated therewith for dry, steam and spray ironing.

17. In a flat iron, the combination as set forth in claim 15, said spray nozzle including fluid passageway means, and a member operatively associated with said movable steam generator adapted for association with the passageway means of said nozzle, said member being disposed in communication with said passageway means when said steam generator is not in heat conducting relation with said sole plate.

18. In a flat iron, the combination as set forth in claim 15, including a housing, said liquid reservoir being disposed exteriorly of the housing, conduit means accommodating gravity feed of liquid from said reservoir, said conduit means including valved liquid accumulating means, said force feeding means being associated with said valved accumulating means and being under the control of the iron user for forcing liquid from said reservoir to said spray nozzle, said steam generator when moved into heat conducting relation with the sole plate communicating with said conduit means for the gravity feed of liquid thereto.

19. In a flat iron, the combination as set forth in claim 18, including distributing means movably mounted with respect to the outlet of said accumulating means for controlling thhe flow of liquid from said accumulating means to said steam generator and to said spray nozzle.

20. In a flat iron, the combination as set forth in claim 19, the housing defining a steam accumulating chamber, said steam generator having an inlet communicating with said distributing means and an outlet communicating with the chamber defined by the housing, the steam generated in said steam generator being accumulated in said chamber, said distributing means together with said steam generator defining a valve stem and a valve head for accommodating flow of drops of liquid to said steam generator.

21. In a flat iron, the combination as set forth in claim 19, said means for rendering said steam generator and said feeding means operative comprising a control instrumentality for actuating said distributing means to effect control of steam generating and spraying, said control instrumentality being adapted for cooperation with said feeding means to render said feeding means inoperative when said distributing means is adjusted for flow of liquid to said steam generator and to adjust said distributing means for flow of liquid to said spray nozzle when said feeding means is rendered operative.

22. In a flat iron, the combination as set forth in claim 15, including a steam accumulating chamber, passageway means accommodating flow of steam from said steam generator to said chamber, said steam outlet in the sole plate comprising restricted steam discharge openings in the sole plate communicating with said chamber, said restricted steam discharge openings accommodating a build-up of steam pressure in said chamber and a discharge of steam through the sole plate under pressure.

23. In a flat iron, the combination as set forth in claim 15, including passageway means between said reservoir and said steam generator accommodating flow of liquid from said reservoir to said steam generator, said force feeding means being disposed in said passageway means and including back-pressure actuated valves accommodating said gravity flow and operable upon operation of said feeding means to control force feed of liquid.

References Cited in the file of this patent

UNITED STATES PATENTS

2,292,386	Fitzgerald	Aug. 18, 1942
2,387,757	Hoecker	Oct. 30, 1945
2,437,571	Waage	Mar. 9, 1948
2,441,916	Busch et al.	May 18, 1948
2,512,054	Dafforn et. al.	June 20, 1950
2,520,360	Clark	Aug. 29, 1950
2,615,265	Maykemper	Oct. 28, 1952
2,666,998	Dafforn et al.	Jan. 26, 1954

FOREIGN PATENTS

509,596	Germany	Oct. 11, 1930
243,584	Switzerland	Jan. 3, 1947