Nov. 3, 1936. I. ABRAMS ET AL 2,059,620

STEAM GENERATING ELECTRIC IRON

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Fig. 1

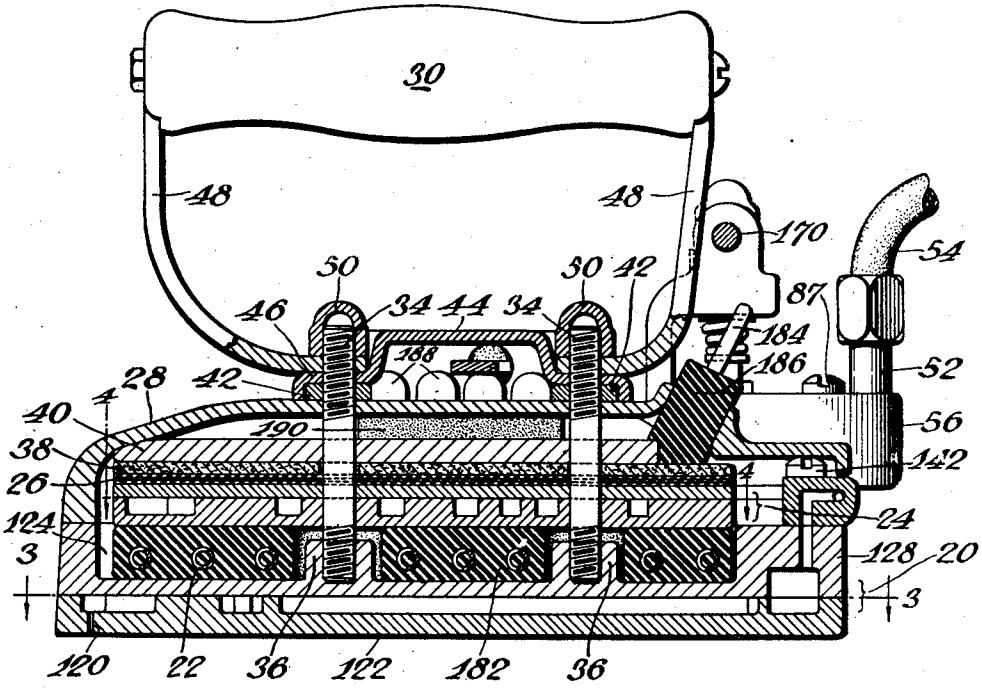
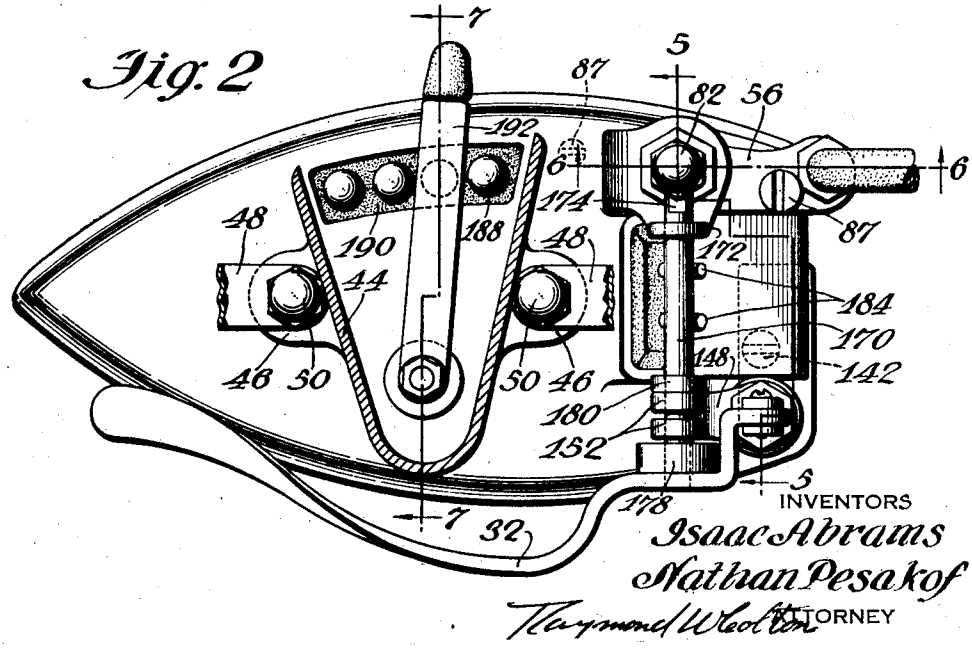


Fig. 2



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Fig. 3

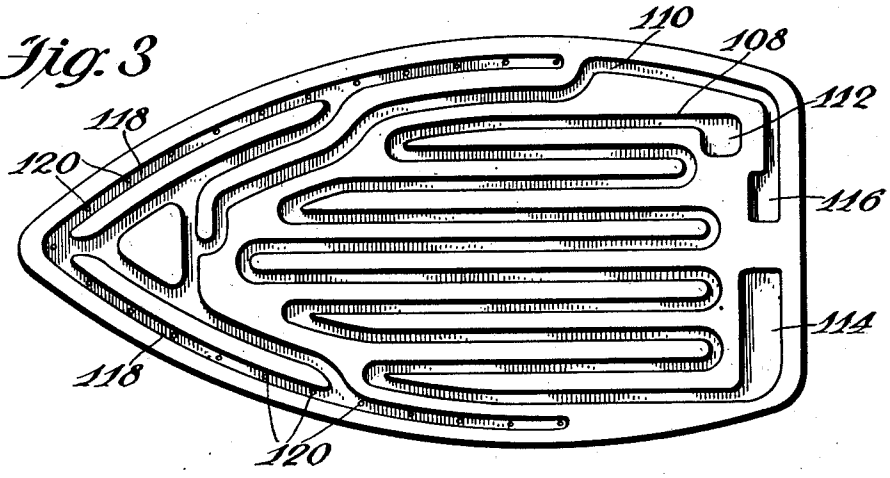


Fig. 4

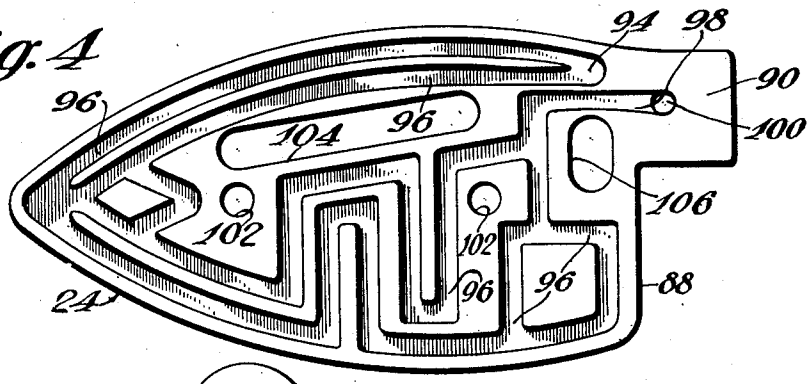


Fig. 5

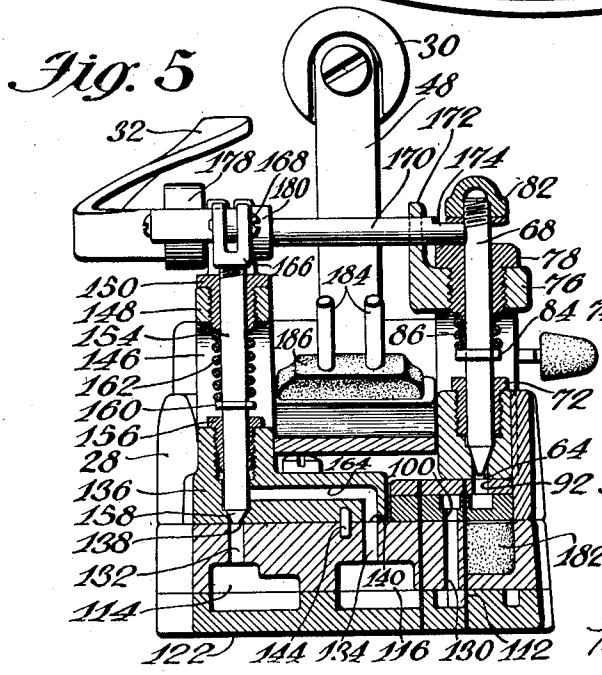
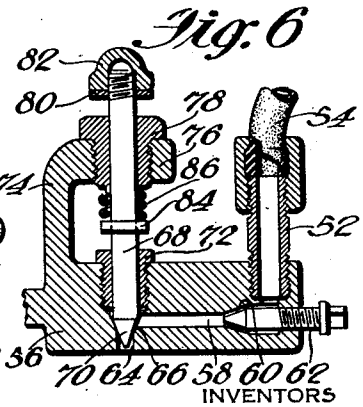


Fig. 6



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STEAM GENERATING ELECTRIC IRON

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Fig. 7

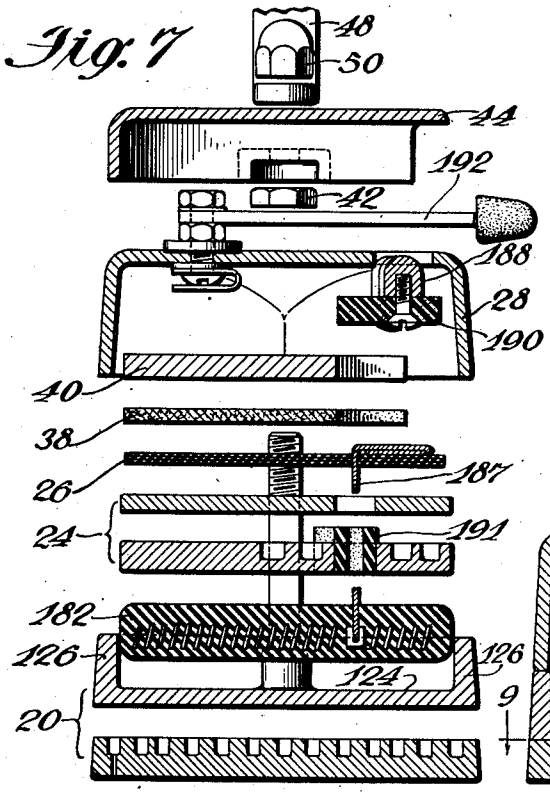


Fig. 8

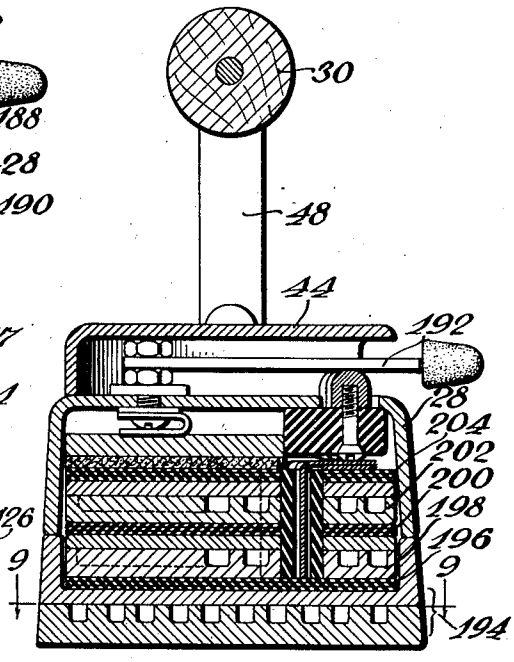


Fig. 9

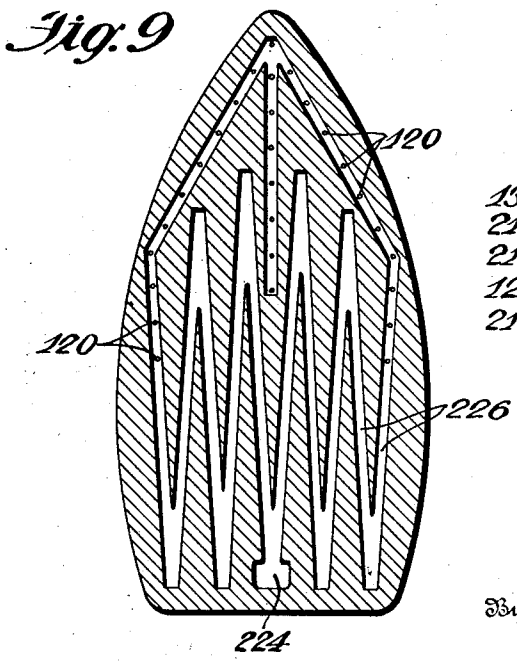
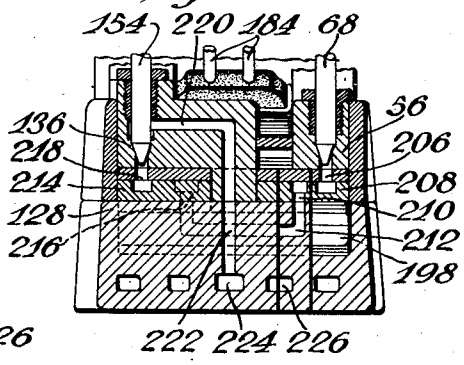


Fig. 10



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Patented Nov. 3, 1936 2,059,620

UNITED STATES PATENT OFFICE

2,059,620

STEAM GENERATING ELECTRIC IRON

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Application July 7, 1934, Serial No. 734,218

21 Claims. (Cl. 38—77)

The present invention relates to a fluid ejecting pressing iron which is intended to receive fluid in the form of water or steam and deliver the fluid as steam in a saturated or superheated condition to the material upon which the iron is operating. Fluids other than water and steam may find application to the structure of the invention however.

The pressing equipment in present day use by clothing manufacturers and tailors, ordinarily is bulky, expensive from the standpoint of purchase price as well as maintenance and necessitates a remote boiler which introduces the additional disadvantage of requiring an appreciable time for the generation of steam.

Devices similar in type to the present invention have been proposed and used to a limited extent, but as a whole they have been unsuccessful, principally because of leakage and difficulties in controlling pressures and temperatures, and failure to generate superheated steam in accordance with demands. Where provisions have been made for controlling the passage of fluid, the apparatus has been complicated, calling for expensive castings, necessitating a correspondingly high selling price.

By the present invention it is sought to overcome the faults and limitations of the known structures by providing an iron having a plurality of steamtight heat exchanging units, heated by electrical heat generating elements, one or more of which may have their effective resistances varied to establish the desired temperatures and conditions of steam as well as of the pressing surface itself. Valve mechanism is provided for controlling the fluid intake as well as the delivery, and the valve actuation is accomplished by a single actuating means conveniently positioned for use during the ironing operation. The valves may have their extent of opening independently adjustable so that the ratio of intake to delivery may be varied to suit operating conditions.

A complete understanding of the invention will be had upon reference to the drawings wherein:

Fig. 1 is a sectional elevation of one form of the invention;

Fig. 2 is a plan view, partially broken away;

Fig. 3 is a view along line 3—3 of Fig. 1;

Fig. 4 is a view along line 4—4 of Fig. 1;

Fig. 5 is a staggered section along line 5—5 of Fig. 2;

Fig. 6 is a section along line 6—6 of Fig. 2;

Fig. 7 is a section along line 7—7 of Fig. 2, with the parts in extended relation;

Fig. 8 is an elevation in section of a modification;

Fig. 9 is a view along line 9—9 of Fig. 8; and

Fig. 10 is a section of the modification showing the valve arrangement and is similar to the lower portion of Fig. 5.

With particular reference to Figures 1 to 7, the iron in general comprises a base member 20, an electrical heat generating element 22 received thereby, a primary heat exchanging or vaporizing unit 24 positioned between the heat generating element 22 and a second heat generating element 26, a cover plate 28 cooperating with the base member 20 for housing parts of the mechanism, a handle 30 for pushing the iron and a valve actuating lever 32 for operating the fluid valves, all to be described in greater detail.

A pair of bolts 34 are threadedly received in suitable tapped bosses 36 formed on the upper surface of the base member, for the reception of the heat generating elements, primary heat exchanging unit and cover plate aforesaid, in addition to insulating material 38 received between the heat generating element 26 and a pressure plate 40 which is surmounted by the cover plate. A pair of nuts 42 are received by the bolts for bearing upon the cover plate to establish close contact between the heat exchanging surfaces for high efficiency of heat transmission. A switch housing 44 having perforated flanges 46 is then applied to the bolts, above which the handle mounting arms 48 are received. A pair of cap nuts 50 are threaded on the ends of the bolts 34 for holding the handle and switch housing in assembly with the remainder of the structure.

The fluid supply enters the apparatus through an inlet 52 which may be connected to a remote source by a hose 54, or if desired, to a tank suitably carried by the iron itself. The inlet leads to a valve casing 56 provided with a passage 58 (Fig. 6) containing a valve seat 60 and a needle valve 62 for adjusting the amount of fluid which may be admitted. The passage 58 leads to a second passage 64, angularly disposed with respect thereto, and containing at the junction of the passages a valve seat 66. A valve stem 68 extends into the casing and has a tapered end 70 normally in contact with the seat 66. Surrounding the valve stem and threadedly received in the casing is a gland nut 72 which may be provided with suitable packing for the prevention of leakage. A bracket 74 projects vertically from the valve casing and carries a supporting arm 76 which is provided with a suitable journal nut 78 through which the upper end of the valve stem passes. The upper end of the valve stem is provided with a thrust washer 80 surmounted by a nut 82 threaded upon the stem. A collar 84 is rigidly secured to the valve stem at a point below the journal nut 78, and a helical spring 86 has its opposite ends seated on the collar and journal nut for urging the valve into the closed position depicted in Fig. 6. Naturally the valve and its seat need not be of the tapered form shown, but may assume other forms.

The valve casing 56 is suitably but removably

attached, by one or more screws 87, to the upper surface of the primary heat exchanging unit 24, the channelled construction of which appears in Fig. 4. This unit may be formed in two parts, one channelled as shown in Fig. 4 and the other with plane surfaces, which parts may be welded or sweated together to form a vaporizer having circuitous paths for the fluid so as to expose it to a large heating surface. If desired, the passage may be formed of metal tubing and the body material may be cast thereabout in a manner similar to the disclosure of the patent to Hoffman of October 16, 1928, numbered 1,687,562. Another contemplated mode of fabrication is by the use of cores to define the grooves, casting the metal and removing the cores such as is commonly done in casting practice. By slightly changing the path of the channels, drilling into a solid block may be resorted to, plugging the openings afterwards as disclosed in the patent to Tavender, 1,874,832, of August 30, 1932. The preferred general shape of the primary heat exchanging unit is similar to that of the base member, though somewhat smaller so that the cover plate 28 will enclose the unit and register with the base member. The unit 24 has a butt end 88 which terminates at a transverse flange on the base member, to be described, although an extension 90 of the unit overlies a portion of this transverse flange.

A port 92 formed in the upper surface of the unit 24 registers with the passage 64 in the valve casing and conducts fluid to the inlet end 94 of the channel 96, through which the fluid passes in divergent and then convergent paths whereby it is subjected to a large heating surface. The fluid finally passes to the outlet end 98 of the channel and downwardly through a port 100 formed in the lower surface of the extension 90. The body of unit 24 is formed with openings 102 for reception of the bolts 34 and perforations 104 and 106 through which electrical conductors are passed.

The base member 20 is provided with a pair of circuitous channels 108 and 110 constituting the superheating unit and the distributing unit respectively. This channelled member may be formed in any of the ways proposed for the formation of the unit 24, both units being preferably formed by fabricating two plates separately and joining them by welding or equivalent means. The channel 108 has a fluid inlet chamber 112 at one extremity and a fluid outlet chamber 114 at its other extremity. This channel traverses an appreciable area of the base member, exposing the conducted fluid to a large heating surface. The channel 110 has a fluid inlet chamber 116 at the butt end of the base member and diverges near the prow thereof into a plurality of channels 118 provided with small perforations 120 extending through to the pressing surface 122 of the base member.

The upper surface of the base member is provided with a pocket 124, defined by marginal longitudinally extending flanges 126 and a transverse flange 128 at the butt end. This transverse flange contains a fluid inlet port 130, in communication with the chamber 112, a fluid outlet port 132 in communication with the chamber 114, and another fluid inlet port 134 in communication with chamber 116.

A valve casing 136 having ports 138 and 140 in registry with the ports 132 and 134 respectively, is firmly clamped to the transverse flange 128 in fluid tight relation therewith, by one or more screws 142. A locating pin 144 penetrates the contacting surfaces of the flange and valve casing for assuring registry of the various ports. A bracket 146 rising from the valve casing provides a supporting arm 148 for the reception of a journal nut 150, and a second supporting arm 152, shown as bifurcated. A valve stem 154 passes through the journal nut 150, and has its lower end journalled in a gland nut 156 which is threadedly received in the valve casing, together with suitable packing material if required. The valve stem has a tapered end 158 normally in engagement with a seat therefor, formed as an enlargement of the port 138. Between the journal nut 150, and a collar 160 attached to the valve stem, a helical spring 162 is mounted for urging the valve into contact with its seat. A passage 164 formed in the valve casing affords communication between the ports 138 and 140 when the valve is opened against the force of the spring. Here again the valve and its seat may vary from the form illustrated.

Threadedly received by the upper end of the valve stem, there is a lifting element 166 of substantial U-shape. The base of this element is tapped for adjustable engagement with the threads on the valve stem and the arms are formed with concentric openings for the reception of a pivot pin 168 which may be threaded into either or both of the arms.

Having one end journalled in the bifurcated supporting arm 152, which is provided with suitably aligned openings therefor, is a valve actuating shaft 170, the opposite end of which is journalled in a perforated supporting arm 172 extending from the valve casing 56. A flattened or cammed end 174 of the shaft extends beyond the arm 172 into engagement with the lower surface of the nut 82 through the intermediate thrust washer 80 of suitable form. The nut 82 will be adjusted so that the valve will be closed when the flattened end 174 is in the position depicted in Fig. 5, and opened the desired amount when the shaft 170 is rocked in its journals.

The shaft also extends beyond the arm 152 where it is attached to the actuating lever 32 in a suitable manner, as by the collar 178 which is fastened to both the shaft and the lever. A removable collar 180 is also removably fastened to the shaft to prevent undesired lateral movements thereof. One end of the actuating lever 32 extends to the front or prow of the iron so as to be operable by the thumb of the worker without requiring removal of his hand from the handle 30 during a pressing operation. The rear end of the actuating lever is received between the arms of the U-shaped element 166 and pivoted thereto by the pin 168. Hence, by depressing the lever 32, the two valves referred to will be opened by a single movement by the operator.

It will thus follow that the fluid from port 100 will pass to the port 130 and to the inlet chamber 112, whence it flows through the channel 108 to the outlet chamber 114, port 132, port 138, by the valve when open, through passage 164, port 140, port 134, chamber 116, channel 110, channels 118 and out through the perforations 120 into contact with the material being operated upon. By adjusting the elements 82 and 166 on their respective valve stems, the quantity of fluid admitted to the heating units may be varied over a wide ratio with respect to the ejected fluid. Further adjustment may be had by operating the needle valve 62.

The heat generating element 22 is embedded

in electrical insulating material 182 which will conduct heat to the heat exchanging unit 24 and to the base member 20. This element is connected to a source of current through terminals 184 which are suitably insulated from the iron structure and from one another by the terminal block 186. A series of taps are taken from the heat generating element 22 and led by suitably insulated conductors 187 to a series of switch points 188 mounted on a switch block 190 of insulating material, these conductors passing through the perforation 104 formed in the unit 24, and being surrounded by an insulator 191. One of the terminals 184 communicates directly with the heat generating element by an insulated conductor passing through the perforation 186 in the unit 24. The other terminal is electrically connected with a switch arm 192, suitably pivoted on the cover plate 28, for selectively engaging the switch points 188 in accordance with the degree of heating desired. This heat generating element is received in the pocket 124 provided in the upper surface of the base member.

The heat generating element 126 may be connected directly across the terminals 184, may be in circuit with the element 22, or may be independently controlled.

The structure appearing in Figs. 8, 9 and 10 embodies the same general principles as that already described, differing principally in the provision of an additional heat exchanging unit and heat generating element and the presence of a single continuous channel in the base member. This modified structure utilizes a different arrangement of fluid ports, all of which differences will now be described.

The base member 194, formed with a pocket as in the previous embodiment, receives in said pocket a heat generating element 196 provided with suitably controlled taps for the variation of its effective resistance in the electrical circuit for resulting temperature variations. Superimposed upon this heat generating element, and also received within the pocket is a superheating unit 198 which may be channelled and constructed in much the same manner as the primary heat exchanging unit of the first example, or otherwise as desired. Upon the unit 198, a heat generating element 200 is placed and suitably connected with a source of current. The primary heat exchanging unit 202 in this case lies above the element 200 and has another heat generating element 204 in contact with its upper surface. The channelling in the units 198 and 202 may be identical or different as desired, and they will both be provided with perforations for the passage of electrical conductors for the heating elements. The heat generating elements may be connected in series or parallel, or in whatever relation found to be expedient. The insulation, pressure plate, cover plate, etc., will be assembled as in the first instance.

Fluid entering the valve casing 56 containing the valve stem 68, will pass the valve when opened and flow into the inlet port 206 formed in the extension 208 (similar to extension 90 of the first case) of the primary heat exchanging unit 202. After traversing the channel therein, the fluid leaves this unit through its outlet port 210 and passes into a passage 212 formed in the transverse flange of the base member. The superheating unit 198 is provided with an offset extension 214 which bears upon the transverse flange of the base member and has an inlet port 216 in registry with one end of the passage 212. Consequently, fluid from the passage 212 enters the superheating unit through its inlet port 216, traverses its circuitous channel and flows to the outlet port 218 provided in the upper surface of the extension 214.

The valve casing 136 in this embodiment bears partially upon the extension 214 and partially upon the transverse flange 128. It is provided with a valve controlled port registering with the port 218 in the extension. A passage 220 in the casing affords communication, when the valve is open, between the port 218 and a port 222 formed in the transverse flange and leading to the fluid inlet chamber 224, supplying the distributing channel 226 with fluid to be dispensed through the perforations 120.

Thus when the valve stem 154 is raised, fluid will pass from the port 218 into the passage 220, down into the port 222 and inlet chamber 224, through the channel 226, and to the material to be treated through the perforations 120.

Whereas it is contemplated that water be supplied to the inlet 52 and superheated steam be ejected through the perforations 120, it is conceivable that steam or some other fluid may be supplied at the inlet 52.

The primary heat exchanging unit may generate steam or it may merely raise the temperature of the water supplied thereto. It will be noted that heat is added to the fluid employed, in the distributing unit as well as in the heat exchanging units. Additional heat generating elements and exchanging units may be added to the structure for bringing the fluid to a different final temperature and dryness, or to the same final temperature and dryness in more gradual steps.

The heat exchanging units are preferably composed of metal having a high heat conductivity, and the channels formed therein are preferably of considerable length for providing large contact surfaces for the transfer of heat to the fluid.

The dryness or moisture content of the ejected steam will be controlled to suit the fabric of the article to be pressed, by varying the valve adjustments and the setting of the switch arm. This is important due to the differing requirements of woolens and silks, for example.

The primary heat exchanging unit may be provided additionally with an inlet valve operated by the liquid level therein for maintaining a constant head of water, especially in cases where the unit serves as a preheater for the supplied water. In such a case, it might be desired to prevent the generation of steam in the primary heat exchanging unit, which may be accomplished by using a temperature responsive element to break the cirucit of one or more of the heating elements before the water can flash into steam, and remake the circuit when the temperature falls below a predetermined minimum.

By the nuts 42, the several heat generating elements and exchanging units are maintained in good heat conducting contact so as to eliminate air pockets. The extension of any heat exchanging unit in contact with the transverse flange of the base member may be sufficiently offset to assure fluid tight registry of the cooperating ports as well as proper heat conducting contact of the body of such unit with its heat generating element or elements.

The number of variations and equivalents possible in the present case is exceedingly great, and it is accordingly contemplated that such modifications be included by the appended claims.

For example, a rotary valve mechanism may be employed for each or both of the reciprocating valves operated by the actuating lever 32.

We claim:

1. A fluid ejecting iron comprising a perforated base and a primary heat exchanging unit, a fluid inlet for said primary heat exchanging unit, conduit means connecting said primary heat exchanging unit with the perforations in said base, valve mechanisms controlling said inlet and said conduit means, means for simultaneously operating said valve mechanisms and heat generating elements associated with said base and said unit, controlled independently of said valves.

2. A fluid ejecting iron comprising a perforated base and a primary heat exchanging unit, a fluid inlet for said primary heat exchanging unit, conduit means connecting said primary heat exchanging unit with the perforations in said base, valve mechanisms controlling said inlet and said conduit means, means for adjusting the maximum opening of said valve mechanisms, means for simultaneously operating said valve mechanisms and means to heat said unit and said base.

3. A fluid ejecting iron comprising a perforated base, a superheating unit and a primary heat exchanging unit, said primary heat exchanging unit having a fluid inlet, means connecting said primary heat exchanging unit with said superheating unit for fluid passage, means connecting said superheating unit with the perforations in said base for fluid passage, valve means controlling both said inlet and said connecting means, means for simultaneously operating said valve means, said units constituting a closed system when said valve means are closed, and means for heating said units.

4. A fluid ejecting iron comprising a base member and a primary heat exchanging unit having a fluid inlet, said base member being formed with a superheating channel having inlet and outlet ports lying in the same horizontal plane, said base also having a distributing channel having a port coplanar with and communicating with said outlet port through valved conduit means, conduit means connecting said primary heat exchanging unit with said inlet port and said distributing channel with the lower surface of said base member.

5. A fluid ejecting iron comprising a base member provided with a plurality of distinct channels, the lower surface of said base member having a plurality of delivery orifices in communication with one of said channels, another of said channels being provided with a fluid inlet port, and valved means interconnecting an outlet port of the second of said channels with an inlet port of the first of said channels, and a preheating chamber having an outlet connected with the second of said channels, said preheating chamber being carried by said base member and serving to preheat the fluid which is ultimately ejected.

6. A fluid ejecting iron comprising a primary heat exchanging unit, a superheating unit and a distributing unit, heat generating elements interposed between said units, conduit means establishing fluid connection between said primary heat exchanging unit and said superheating unit and between said superheating unit and said distributing unit, a fluid inlet for said primary heat exchanging unit and valves operated by a common element controlling said conduit means and said fluid inlet, said distributing unit communicating with openings in the lower surface of the iron.

7. A fluid ejecting iron having an inlet for fluid at a relatively low temperature and an outlet for fluid at relatively high temperature, means for raising the temperature of the fluid, valve mechanism for controlling said inlet and outlet by a single movement and means for adjusting said valve mechanism to vary the ratio of intake and discharge therethrough.

8. A fluid ejecting iron comprising a heat exchanging unit and a distributing unit for receiving heated fluid therefrom, said heat exchanging unit having a fluid inlet, a valve controlling said fluid inlet and a valve controlling the passage of fluid to said distributing unit, a common mechanism for operating said valves, and means associated with said mechanism for varying the relative extent of opening said valves.

9. A fluid ejecting iron comprising a heat exchanging unit and a distributing unit for receiving heated fluid therefrom, said heat exchanging unit having a fluid inlet controlled by a valve and a valve controlling the passage of fluid to said distributing unit, means for adjusting said valves independently, means for operating said valves jointly, and means for heating said fluid, said distributing unit communicating with openings in the lower surface of the base of said iron.

10. A fluid ejecting iron comprising a base member having a lower surface and an upper surface, said base member containing a plurality of independent channels, said upper surface containing inlet and outlet ports communicating with the channels, valved connecting means overlying a plurality of said ports and interconnecting the outlet port of one of said channels with the inlet port of another of said channels, means for introducing fluid into one of said channels, conduit means communicating between one of said channels and the lower surface of said base member, and a preheating chamber having an outlet connected with one of said channels, said preheating chamber being carried by said base member and serving to preheat the fluid which is ultimately ejected.

11. A fluid ejecting iron comprising a channelled base member having a lower surface and an upper surface, said upper surface containing a plurality of ports communicating with the channelling for the passage of fluid, a second channelled member overlying said upper surface and having an extension having a port in communication with the channelling in the second member and with one of those in the upper surface, valved means interconnecting others of said ports, the channelling in said base member communicating with said lower surface, and the channelling in said second member having a fluid inlet.

12. A fluid ejecting iron comprising a channelled base member having a lower surface and an upper surface, said upper surface containing a plurality of ports communicating with the channelling for the passage of fluid, a second channelled member overlying said upper surface and having an extension having a port in communication with the channelling in the second member and with one of those in the upper surface, valved means interconnecting the remaining ports, and a heat generating unit between said channelled members, said base channelling communicating with the lower surface of the

iron and said second channelled member having a fluid inlet.

13. A fluid ejecting iron comprising a channelled base member having a lower surface and an upper surface, said upper surface containing a plurality of ports communicating with the channelling for the passage of fluid, a second channelled member overlying said upper surface and having an extension having a port in communication with the channelling in the second member and with one of those in the upper surface, valved means seated on said upper surface interconnecting the remaining ports, and a heat generating unit between said channelled members, and in thermal contact therewith, said base channelling communicating with the lower surface of the iron and said second channelled member having a fluid inlet.

14. A fluid ejecting iron comprising a base member containing a plurality of distinct channels, the upper surface of said base member containing a plurality of ports communicating with the channels for the passage of fluid, means interconnecting a pair of said channels through said ports, one of said channels having a fluid inlet, another of said channels having communication with the lower surface of said base member, means for interrupting the passage of fluid through said channels, and a preheating chamber communicating with one of said channels, said preheating chamber being carried by said base member and serving to preheat the fluid which is ultimately ejected.

15. A fluid ejecting iron comprising a base member containing a plurality of distinct channels, the upper surface of said base member containing a plurality of ports communicating with the channels for the passage of fluid, a valve casing seated on said upper surface for interconnecting and controlling a plurality of said channels through a plurality of said ports, one of said channels having a fluid inlet and another of said channels communicating with the lower surface of said base member, and a preheating unit communicating with said fluid inlet, said preheating chamber being carried by said base member and serving to preheat the fluid which is ultimately ejected.

16. A fluid ejecting iron comprising a base member containing a plurality of distinct channels and having a lower surface and an upper surface, said upper surface containing a plurality of ports communicating with the channels for the passage of fluid, a second channelled member overlying said upper surface and having an extension having a port in communication with the channelling in the second member and with one of those in the upper surface, said second channelled member having a port on its upper surface for the reception of fluid, a valve casing seated on said base member having ports in registry with a plurality of said channel ports for selectively interconnecting the corresponding channels, one of said channels having fluid communication with the lower surface of said base member.

17. A fluid ejecting iron comprising a channelled base member having a lower surface and an upper surface, said upper surface containing a plurality of ports communicating with the channelling for the passage of fluid, valved means interconnecting a pair of said ports, a second channelled member overlying said upper surface and having an extension having a port in communication with the channelling in the second member and with one of those in said upper surface, a heat generating element between said channelled members, and a heat generating element superimposed upon said second channelled member, said second channelled member having a fluid inlet and the channelling in said base member communicating with the lower surface of said base member.

18. A pressing iron comprising a base member having an electrical heating element superimposed thereupon, a channelled heat exchanging unit superimposed upon said element, said unit having a perforation therethrough for the passage of an electrical conductor to said element, said channelling existing on opposite sides of said perforation, there being an inlet for fluid to said channelling and an outlet therefrom in communication with a fluid passage in said base member, said base member having a perforation connecting said channel with the pressing surface of the iron.

19. A sadiron of the class described comprising a base having perforations therein opening out through the lower face thereof, and a passage connecting the perforations together, said base also having a sinuous passage therein, a heating element on the base, a steam generating plate located on the heating element and having a sinuous passage therein, a conduit connecting one end of the last-mentioned passage with the sinuous passage in the base, means for connecting the other end of the sinuous passage of the plate with a liquid supply, a conduit connecting the sinuous passage of the base with the passage in the base which connects the perforations together, and a valve in the conduit.

20. In an iron of the class described, a base having perforations therein opening out through the lower face of the base, and a passage in the base connecting the upper ends of the perforations together, said base also having a sinuous passage therein, a steam generating plate, a heating element located between the plate and the top of the base, a heating element on the top of the plate, said plate having a sinuous passage therein, means for connecting one end of the last-mentioned passage with a liquid supply, a conduit connecting the other end of said passage with one end of the sinuous passage in the base, a conduit connecting the other end of the sinuous passage in the base with the first-mentioned passage in the base, and a valve for controlling the flow of fluid through the conduit.

21. In an iron of the class described, a base formed of upper and lower sections connected together, the lower section having a passage therein in its upper face, perforations extending from the passage through the lower face of said section, the upper face of said lower section also having a sinuous passage therein, the upper section covering the passages, a heating element on the top of the base, a steam generating plate on the heating element, a second heating element on the plate, said plate being formed of upper and lower sections connected together, the lower section of the plate having a sinuous passage therein which is covered by the upper section, means for connecting one end of the sinuous passage in the plate to a liquid supply, a conduit connecting the other end of said passage with one end of the sinuous passage in the base, and a valve controlled conduit connecting the other end of the sinuous passage in the base to the first-mentioned passage in the base.

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