

May 13, 1952

R. L. HEDENKAMP
STEAM ELECTRIC IRON

2,596,684

Filed Dec. 3, 1945

2 SHEETS—SHEET 1

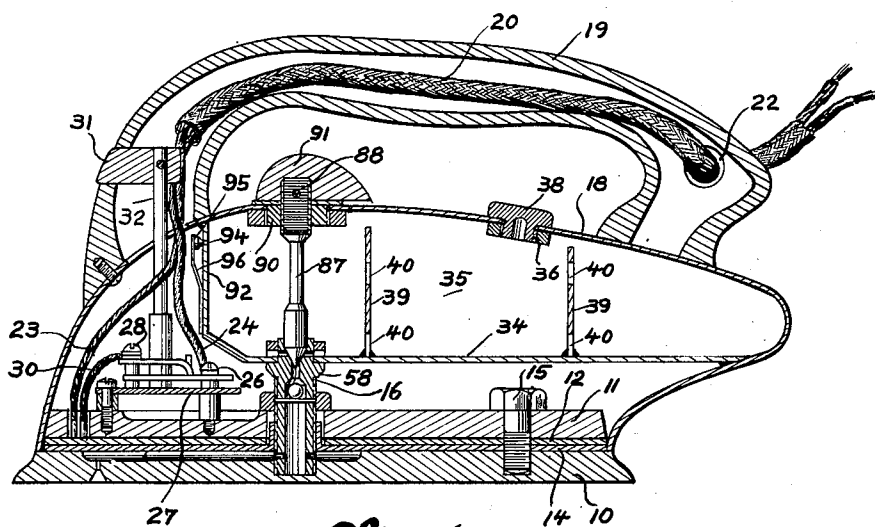


Fig. 1

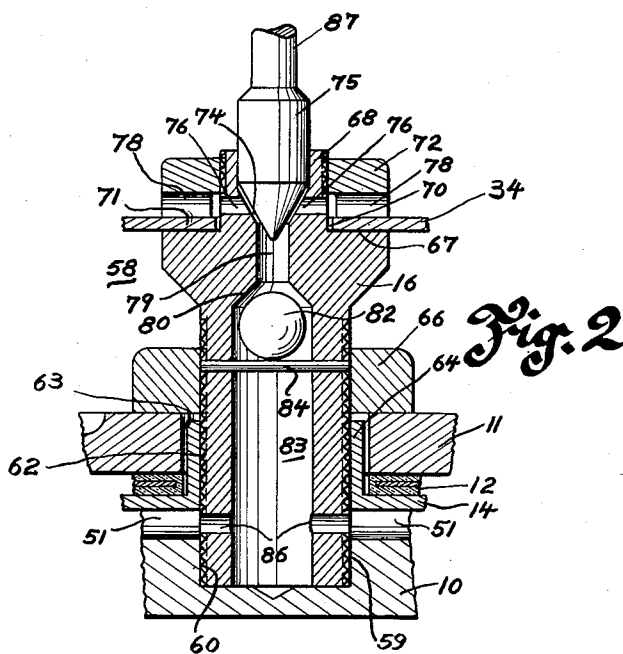


Fig. 2

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2 SHEETS—SHEET 2

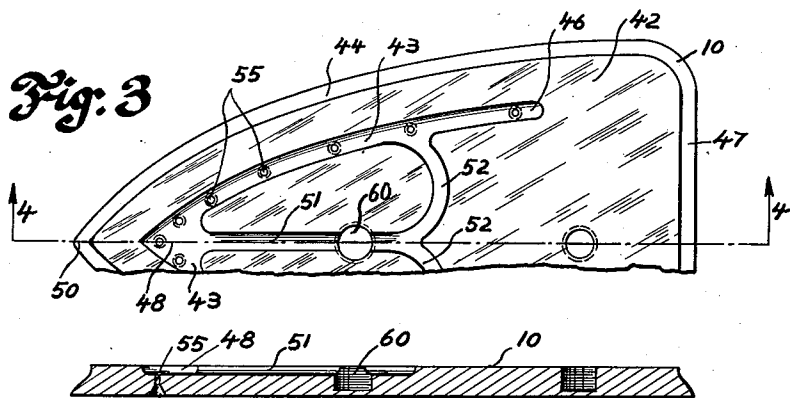


Fig. 4

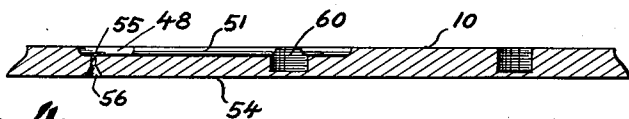
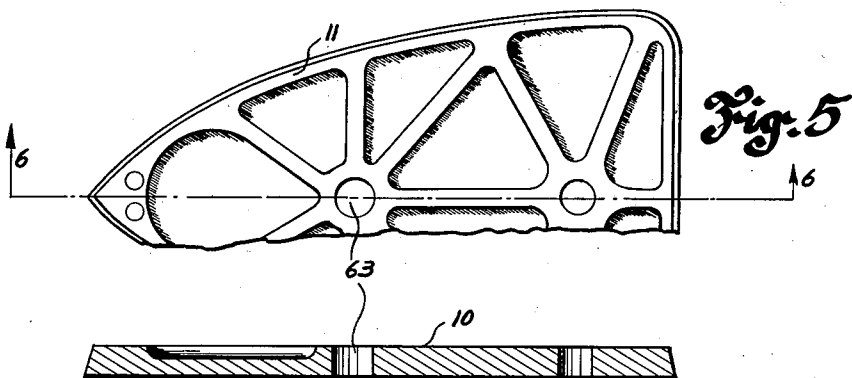


Fig. 6

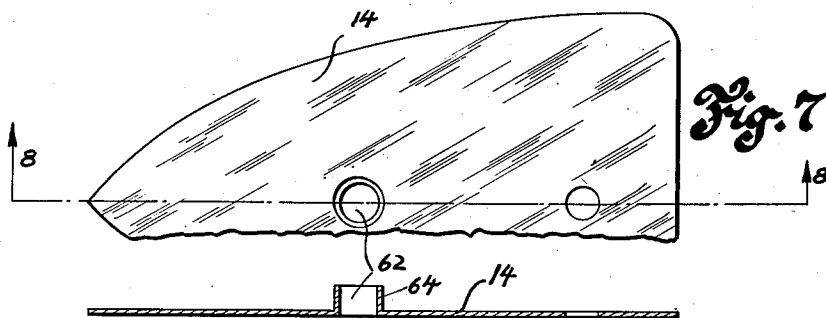
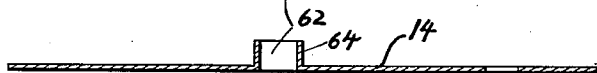


Fig. 8



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UNITED STATES PATENT OFFICE

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STEAM-ELECTRIC IRON

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11 Claims. (Cl. 38-77)

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This invention relates in general to sadirons of the electrical resistance-heated type, and has particular reference to improvements in sadirons of this character, including improved facilities adapting the same for so-called steam pressing.

An object of the invention is to provide a greatly simplified and fully effective steam-electric iron for domestic use or use in commercial pressing establishments and the like, which is fully capable of employment either as an independent steam-electric iron, as a hot iron without the steaming provision, or as a steam-electric iron in connection with a constant supply of water to permit continuous use of the iron for any extended period as may be desired.

Another object is to provide an improved steam-electric iron of a novel and relatively simplified construction, in which are embodied effective steam generating and steam delivery provision and automatic means in control of said provisions, the latter including means affording facultative regulation of steam delivery in pressing.

A further object is to provide in an improved iron of the character indicated, a steam generating provision which is effective for steam generation only when the iron is in a pressing position, and excessive pressure relieving provisions including a thermostatically controlled pressure relief valve in operative association with the steam generator.

Other objects and advantages of the present improvements will appear readily from the following description of a presently preferred embodiment of the invention as exemplified by the accompanying drawings, wherein:

Figure 1 is a sectional elevation of the improved iron, as taken longitudinally there-through;

Figure 2 is an enlarged sectional view of the steam valve assembly of the steam generating means;

Figure 3 is a fragmentary plan view of the sole plate of the iron;

Figure 4 is a longitudinal section through the sole plate, as viewed from line 4-4 in Figure 3;

Figure 5 is a fragmentary plan view of the sole backing plate;

Figure 6 is a longitudinal section through the backing plate, as viewed from line 6-6 in Figure 5;

Figure 7 is a fragmentary plan view of a gasket plate utilized with the sole and backing plates, and

Figure 8 is a longitudinal section through the

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gasket plate, as viewed from line 8-8 in Figure 7.

Referring to the drawing and first to Figure 1, the presently improved iron includes a pressing or sole plate 10, a backing plate 11 of ribbed construction (Fig. 5), superimposed on the sole plate, an electrical heating resistance unit 12 of plate-like form, interposed between the sole and backing plates, and a gasket plate 14 between the unit 12 and the inner surface of the sole plate. These parts are secured in assembly by any suitable means, such as the stud bolt 15, and by present preference, additionally by the valve casing 16 of the main steam control valve presently to be described. Overlying the plate assembly above described, is a casing or hood member 18 which may be suitably removably secured to the plate structure in any well known manner, or by means preferred and presently to be described, and externally on the hood in a hollow handle 19. An electric cable 20 for supplying the resistance unit 12 with heating current, is extended through a handle opening 22 preferably at the rear end of the handle, and thence through the handle to a connection of one lead 23 to the heating unit 12, and the opposite lead 24 to one terminal 26 of a suitable thermostatic heat regulator device 27, the construction and operation of which is well known. The device 27 located in the forward end of the hood 18 and suitably mounted upon the backing plate 11, has its opposite terminal 28 connected to the heating unit 12 by a lead 30. Regulation of the thermostatic control device to determine the degree of iron heating, is presently effected by a rotary finger-tip wheel element 31 secured upon the thermostat control shaft 32 and exposed through the forward side of the handle 19. By present preference, the wheel 31 has an "off" position in which the conductor circuit to the heater unit 12 is open-circuited through the device 27.

The hood 18 which is formed from a suitable rust-resistant metallic sheet material, supports interiorly thereof a wall member 34 of like rust-resistant material, the wall preferably being suitably secured along its margins to the hood and forming with the latter, a chamber or water reservoir 35. An internally threaded port 36 normally closed by a threaded plug 38, is provided in the top of the hood, for the admission or discharge of water relative to the reservoir 35. Longitudinally spaced baffle plates 39 having ports 40 therethrough, extend transversely of the chamber and serve to dampen reciprocatory mo-

tion of the body of water in the reservoir during ironing operations.

Referring now to Figs. 1, 3 and 4 in particular, the sole plate 10 which is of suitable non-corrosive metal and/or a metal satisfactorily plated, of sufficient weight to facilitate efficient pressing, is formed to provide in its inner or top surface 42, opposite longitudinal steam channels 43 each substantially paralleling the adjacent curved side 44 of the plate, and each terminating at 46 at a suitable distance from the transverse rear edge 47 of the plate. The channels 43 terminate in a communicating juncture 48 inwardly of the forward tip end 50 of the sole plate, and extending centrally longitudinally of the plate from the juncture 48, is a supply channel 51. The channel 51 from its end somewhat centrally of the sole plate surface 42, is continued through opposite preferably curved branch supply channels 52, into communication with the side channels 43 as illustrated in Figure 3. Steam delivery to the pressing face or surface 54 of the sole plate is afforded from each of the side channels 43 through a series of passages 55 through the plate, each passage terminating in an outwardly flaring or conical port 56 opening to the plate surface 54. From the passage 55 at the juncture 48, the passages in each channel 43 are increasingly relatively spaced along the channel as shown in Fig. 3, in order to provide efficient distribution of steam to the fabric under press beneath the sole plate. Moreover, the arrangement of the supply and delivery channels and passages in the sole plate is such as will least affect uniform heat distribution throughout the sole plate.

Steam generation in the channels 43, 51 and 52 is facilitated by the close adjacency thereof to the resistance heat unit 12 overlying the same. However, in order to prevent direct contact of steam and water vapor with the unit 12, a relatively thin plate gasket 14 (Figs. 7 and 8) heretofore referred to, formed of a non-corrosive metallic material, is interposed between the heating unit 12 and the sole plate and forms the top closure for the several channels. The gasket plate further is characterized by high heat conductivity, and hence serves to conduct heat to the channels for steam generation therein.

Water supply to the steam generator channels is effected from the reservoir 35 through the valve casing 16 (heretofore mentioned) of a control valve device 58 (Figs. 1 and 2). Valve casing 16 is externally threaded at 59 over its lower section, for threaded reception in a threaded opening 60 formed in the sole plate 10 through the supply channel 51, the sole plate opening as shown in Fig. 3 having its axis intersecting the longitudinal axis of the sole plate. The valve casing extends upwardly therefrom through a flanged opening 62 provided in the gasket plate 14, and through an opening 63 formed in the backing plate 11, the latter opening being of sufficient size to receive both the valve casing and the flange 64 of the gasket opening 62. An assembly nut 66 on the threaded valve casing, serves to lock the valve casing to the sole plate by clamping engagement with the backing plate 11, and additionally aids the stud bolt 15 in holding the sole plate, backing plate, gasket and heater unit in clamped assembly. The upper portion of valve casing 16 is formed to provide an annular flange seat 67 and a central upstanding neck 68, the latter projecting inwardly of the reservoir 35 (Fig. 1) through an opening 70 in the reservoir wall 34. The wall marginal portion 71 defining the opening 70, is seated on the casing seat 67 and is

firmly clamped thereon by a nut 72 threaded onto the neck 68. It is to be noted here that the nut 72 in clamping the wall margin 71 to the casing seat 67, affords a ready means for removably mounting the hood 18 and the reservoir to the pressing plate assembly.

The casing neck 68 is axially bored to provide a frusto-conical valve seat 74 therein, for co-operation with a control valve 75. Extending radially through the neck 68 and opening in the valve seat 74, are water delivery passages 76, these communicating through radial passages 78 in the nut 72, with the reservoir chamber 35. Opening to the valve seat 74 axially thereof, is a neck passage 79 which is outwardly enlarged or flared at its lower end to provide a valve seat 80 for a ball check valve 82 of a predetermined weight, arranged in the longitudinal chamber 83 of the valve casing. A pin or stop element 84 projected transversely of the chamber 83 below the ball 82, retains the ball valve in operative relation to its seat 80 and limits opening displacement of the ball valve. Near the lower end of casing chamber 83 are diametrically opposite passages 86 through the casing 16, these passages being provided to communicate chamber 83 with the central channel 51 in the sole plate 10.

Control valve 75 is carried by or formed on the lower end of a valve stem 87 which extends upwardly through reservoir 35 and terminates in a threaded head 88 threadedly received through a nut 90 secured to the hood 18 as shown in Fig. 1. The upper exposed end of the head 88 has suitably attached thereto, a control handle or finger-tip control knob 91 through which the valve stem 87 may be rotated for adjustably relating the valve 75 to its seat 74. Since the nut 90 is fixed, rotation of the threaded head 88 therein serves to displace the valve stem and valve upwardly or downwardly according to the direction of head rotation, so as to determine correspondingly, a lesser or greater restriction by the valve 75 to flow communication between the valve seat passages 76 and 79.

Near the upper end of the forward wall portion 92 of the chamber 35 and above the normal level of water in the reservoir when the latter is filled, is a vent port 94 which is controlled by a valve element 95 externally of the chamber on the end of a thermostatic member 96 fixed at its lower end to the wall portion 92 (Fig. 1). The purpose and function of this valve controlled vent 94 will appear presently.

In normal operation with a suitable volume of water in the reservoir 35 and the iron electrically heated to the desired temperature as controlled by the device 27 regulated through the wheel 31, adjustment of the valve 75 to an open position as effected through the fingertip control 91, permits a correspondingly regulated flow of water from the reservoir 35 through valve passages 78, 76 and 79, past the ball check valve 82 and into the valve casing chamber 83. The interior of chamber 83 is heated from the heater unit 12 by heat conduction through the gasket plate flange 64 in close surface contact with the valve casing 16, and thence through the valve casing 16, so that the water admitted to the chamber 83 becomes heated and tends quickly to vaporize therein. The water vapor thus formed then passes through chamber passages 86 into and along the sole plate channels 51 and 52 to the side channels 43. In these channels the water vapor is transformed by high heat conduction from the heater unit 12 through the

gasket plate 14, into steam, and as the steam is so generated, it issues through the sole plate ports 56 to the pressing surface of the iron for steaming and moistening the fabric under press.

Normally the ball check valve 82 will remain open, but in the event of an undesirable or inordinate rise in steam or vapor pressure in the casing chamber 83, the ball valve will respond by upward displacement to close the passage 79 for preventing steam or vapor flow into the reservoir 35. When such pressure is relieved through the sole plate ports 56, the ball check will return to its open position for continued steaming operation of the iron.

While the water supply valve 75 normally regulates the rate of water delivery from the reservoir 35 to the steam generator, it also serves as a safety release device in the event the valve should be fully closed while the iron is in use and there is a volume of water in the reservoir. If under these conditions, the iron is employed for any appreciable period, the indirect heating of the reservoir water, as through heat conduction thereto through the valve casing 16 and wall 34, will produce eventually a considerable vapor pressure in the reservoir, tending if prolonged, to reach a dangerously high value if not relieved. Accordingly, the present improvements affording the support of the valve 75 directly on the hood 18 (Fig. 1), thus enables relief of excessive vapor pressure in the reservoir, since the vapor pressure will cause an upward expansion or pressure displacement of the hood 18 which will produce a corresponding lift of the valve 75 from its seat 74, whereby to open the reservoir to the steam generator passages.

A further safety feature for the reservoir 35 is embodied in the vent 94 and thermostatic valve device 95-96 in control of the vent. The thermostatic element 96 is calibrated such that it will hold the valve 95 in a position to open the vent 94 during normal operation of the iron when the reservoir water is relatively cool, since at this time the weight of water in the reservoir will afford sufficient pressure for delivery of water through the control valve to the steam generator passages. However, in the event of inordinate heating of the water flow valve in the region of the valve seat 74, such as to produce vaporization of the water in such zone, which if permitted to continue would prevent water delivery to the steam generator passages, the resulting temperature of the water in the reservoir and consequent heating of the wall portion 92 to which the thermostat 96 is secured, will cause the thermostat to move valve 95 into a position of vent closure at the vent port 94. Consequently, the vapor pressure will rise in the reservoir 35 to a point which will assure positive pressure flow of water and vapor past the flow control valve to the steam generator passages. Moreover, should the pressure build-up in the reservoir proceed more rapidly than it can be relieved through the open flow control valve, the vent valve 95 will respond to pressure approaching dangerous limits, by opening the vent 94 to allow escape of vapor beneath the hood 18 and eventually to atmosphere, thus relieving the pressure in the reservoir.

By locating the flow control valve 74-75 near the forward end of the reservoir 35, and by forming the reservoir such that its length is many times the maximum depth thereof, as by a ratio of the order of 3 or 4 to 1 for example, it will be appreciated that by reason thereof, water

delivery to the steam generator may occur only when the iron is in a substantially horizontal or pressing position. Tilting the iron rearwardly so that it rests upon the rear ends of the hood 18 and sole plate 10, or upon the rear ends of the hood 18 and handle 19, will bring the water level (even with a normal maximum volume of water in the reservoir) below the seat 74 of the control valve. Thus by tilting the iron between pressing operations, the period of pressing service with each filling of the reservoir, may be materially increased.

When it is desired to operate the iron merely as a hot iron, without the steaming provision, the reservoir may be emptied of water through the filling opening 36. Moreover, the present assembly is such as to facilitate complete drainage of the reservoir, valve passages and steaming passages in the sole plate 10, when the iron is to be stored for any extended period, this being accomplished by removing the hood 18 through removal of the assembly nut 72. Then the reservoir water may be discharged through either or both the opening 70 and the filling opening 36, while the valve passages and steam passages may be equally readily emptied of all moisture. The nut 72 can be removed by first rotating the valve stem 87 out of engagement with nut 90, then rotating nut 90 out of engagement with hood 18, and finally inserting a tool through the opening normally occupied by nut 90 and turning nut 72.

A further feature of the present improvements concerns the ready adaptation of the iron for continuous steaming operation in instances where pressing is to be conducted for long periods at a time, as occurs in commercial pressing establishments for example. The threaded filling opening 36 is selected such that it is suitable to receive one end of a flexible pipe or hose (not shown) leading from a constant source of water, as the house water system, so as to provide a constant supply of water in the reservoir 35. The same result may be obtained in domestic use where it is desired, through a like hose connection as to a water tap or the like.

From the foregoing, it will now appear that there is afforded by the present improvements, an electric-steam iron having all of the advantages hereinbefore enumerated and others now apparent, and which is of greatly simplified and economical construction and fully automatic in its operation. While but a single preferred embodiment of the iron is herein shown and described, nevertheless, it is to be understood that alterations and modifications of the parts and their arrangement, may be made without departing from the spirit and full intended scope of the invention, as defined by the appended claims.

What I claim is:

1. In a sadiron, a pressing plate, said pressing plate having openings therein for outlet of fluid, a heating element in heat-transferring relation with said pressing plate, a fluid reservoir spaced from said pressing plate, a valve seat at the bottom of said fluid reservoir, a passage from said valve seat to the openings in said pressing plate, and a valve stem that is adjustably supported by the top of said fluid reservoir and is in register with said valve seat, said valve stem being supported by a portion of said reservoir and being movable relative to said portion of said reservoir to move toward and away from said valve seat, said fluid reservoir being deformable by excessive pressure to move said portion thereof and said valve stem away from said valve seat to vent said

excessive pressure through the openings in said pressing plate.

2. In a sadiron, a pressing plate, said pressing plate having openings therein for outlet of fluid, a heating element in heat-transferring relation to said pressing plate, a fluid reservoir spaced above said pressing plate, a valve that controls flow of fluid from said fluid reservoir to said openings in said pressing plate, a vent in a wall of said fluid reservoir and a thermally responsive element that is normally spaced from said vent but is actuatable by heat to close said vent, said vent normally being open to permit gravity-induced flow of fluid from said fluid reservoir to said openings in said pressing plate, said vent being closable by said thermally responsive element to permit the generation of a pressure in said fluid reservoir that will induce flow of fluid from said fluid reservoir to said openings in said pressing plate, said thermally responsive element being of resilient material, said thermally responsive element being deformable in response to excessive pressure in said fluid reservoir to open said vent even when said element is heated.

3. A sadiron that comprises a pressing plate, said pressing plate having openings therein for outlet of steam, a fluid reservoir, an outlet for said fluid reservoir, a passage between said outlet for said fluid reservoir and said openings in said pressing plate to conduct fluid from said fluid reservoir to said openings, a manually-operated valve that regulates the flow of fluid through said passage from said fluid reservoir to said openings in said pressing plate, a pressure-responsive valve element that is positioned between the outlet of said fluid reservoir and said openings in said pressing plate, and a valve seat that is intermediate said outlet of said fluid reservoir and said openings in said pressing plate, said valve element being movable by the pressure of steam adjacent said openings toward said valve seat to prevent flow of steam from said pressing plate into said fluid reservoir.

4. A sadiron that comprises a pressing plate, said pressing plate having openings therein for outlet of steam, a fluid reservoir, an outlet for said fluid reservoir, a passage between said outlet for said fluid reservoir and said openings in said pressing plate to conduct fluid from said fluid reservoir to said openings, a manually-operated valve that regulates the flow of fluid from said fluid reservoir to said openings in said pressing plate, a pressure-responsive valve element that is positioned between the outlet of said fluid reservoir and said openings in said pressing plate, and a valve seat that is intermediate said outlet of said fluid reservoir and said openings in said pressing plate, said valve element being movable by the pressure of steam adjacent said openings toward said valve seat to prevent flow of steam from said pressing plate into said fluid reservoir, said pressure-responsive valve being positioned between said manually operated valve and said openings in said pressing plate and being normally open.

5. A sadiron comprising a pressing plate, said pressing plate having openings therein for outlet of steam, a fluid reservoir, an outlet for said fluid reservoir, a passage between said outlet for said fluid reservoir and said openings in said pressing plate to conduct fluid from said fluid reservoir to said openings, a manually-operated valve that regulates flow of fluid through said passage from said fluid reservoir to the openings in said pressing plate, and a pressure responsive valve element

and seat between said manually-operated valve and said openings in said pressing plate, said pressure-responsive valve normally in open position to permit flow of fluid from said fluid reservoir to said openings in the pressing plate but being closable against said seat in response to the pressure of the steam in said openings in said pressing plate to prevent flow of fluid from said fluid reservoir to said openings on said pressing plate and to prevent flow of steam from said openings in said pressing plate into said fluid reservoir.

6. A sadiron that comprises a pressing plate, said pressing plate having openings therein for outlet of steam, a heating element in heat-transferring relation with said pressing plate, a fluid reservoir, an outlet from said fluid reservoir, a passage between said outlet for said fluid reservoir and said openings in said pressing plate to conduct fluid from said fluid reservoir to said openings, and a pressure-responsive valve that is positioned between the outlet of said fluid reservoir and the openings in said pressing plate and is openable to permit passage of fluid to the pressing plate and is closable to isolate said fluid from the fluid reservoir so it can generate considerable pressure, said valve being normally open but being closable by the pressure of steam in said openings in said pressing plate.

7. A sadiron that comprises a pressing plate, said pressing plate having openings therein for outlet of fluid, a heating element in heat-transferring relation to said pressing plate, a fluid reservoir, a vent in a wall of said reservoir, a resilient closure for said vent, a valve seat at the bottom of said fluid reservoir, and a valve stem that is adjustably supported by another wall of said fluid reservoir and is in register with said valve seat, and said valve stem being adjustable relative to said other wall of said reservoir to move toward or away from said valve seat and thereby stop or pass liquid to said openings in said pressing plate, said resilient closure being deformable to permit opening of said vent when the pressure in said fluid reservoir becomes excessive, said reservoir being deformable to move said other wall of said reservoir and the valve stem supported thereby away from said valve seat when the pressure in said fluid reservoir becomes excessive.

8. A sadiron that comprises a pressing plate, said pressing plate having openings therein for outlet of fluid, a heating element in heat-transferring relation to said pressing plate, a fluid reservoir, a vent in a wall of said reservoir, a resilient closure for said vent, a valve seat at the bottom of said fluid reservoir, and a valve stem that is adjustably supported by another wall of said fluid reservoir and is in register with said valve seat, said valve stem being adjustable relative to said other wall of said reservoir to move toward or away from said valve seat and thereby stop or pass liquid to said openings in said pressing plate, said resilient closure being deformable to permit opening of said vent when the pressure in said fluid reservoir becomes excessive, said reservoir being deformable to move said other wall of said reservoir and the valve stem supported thereby away from said valve seat when the pressure in said fluid reservoir becomes excessive, said resilient closure being thermally responsive to the temperature of said fluid reservoir to open said vent when the fluid in said fluid reservoir is cool.

9. In a sadiron of the character described, a

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pressing plate assembly including an electric heater element, said assembly providing steaming passages therein opening to the pressing surface of the assembly, a hood arranged over said assembly and formed to provide a deformable fluid reservoir therein, a member arranged between said assembly and reservoir and formed to provide passage means communicating the reservoir with said steaming passages, a valve seat past which fluid flowing through said passage means must flow, and a valve element, said valve element being movable against said valve seat to prevent flow of fluid through said passage means and being movable away from said valve seat to permit flow of fluid through said passage means, said valve element being supported by a wall of said fluid reservoir and being adjustable relative to said wall to move against and away from said valve seat, said wall of said fluid reservoir being movable upon deformation of said fluid reservoir to carry said valve element away from said valve seat, said fluid reservoir deforming upon the generation of excessive pressures therein, thereby moving said valve element away from said valve seat and permitting fluid to flow through said passage means and vent said pressure.

10. In a sadiron of the character described, a pressing plate assembly including an electric heater element, said assembly providing steaming passages therein opening to the pressing surface of the assembly, a hood arranged over said assembly and formed to provide a deformable fluid reservoir therein, a member arranged between said assembly and reservoir and formed to provide passage means communicating the reservoir with said steaming passages, said member being secured to one wall of said reservoir, a valve seat on said member that communicates with said passage means, and a valve element that is movable toward and away from said valve seat to prevent or permit flow of fluid through said passage means, said valve element being supported by that wall of said fluid reservoir which is opposite to said one wall and being movable relative to said second wall to move toward and away from said valve seat, said second wall being adapted to move said valve element away from said valve seat whenever pressures within said fluid reservoir deform said fluid reservoir, said

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fluid reservoir being stiff and normally being capable of maintaining any predetermined setting of said valve element relative to said valve seat.

11. In a sadiron of the character described, a pressing plate assembly including a heater element, said assembly providing steam passages therein opening to the pressing surface of the assembly, a fluid reservoir arranged over said assembly, a valve seat and a valve element that are separable to permit flow of fluid from said fluid reservoir to said steam passages and are engageable to prevent flow of fluid from said fluid reservoir to said steam passages, a vent in one wall of said fluid reservoir to vent pressures created within said fluid reservoir, and a thermally-responsive element positioned adjacent said vent, said thermally-responsive element normally being spaced from said vent to permit ready venting of pressures within said fluid reservoir but responding to heat to move toward and close said vent, said thermally-responsive element being of resilient material, said thermally responsive element responding to excessive pressures within said fluid reservoir to move away from and open said vent but being again movable toward said vent whenever said pressures have been vented.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,548,957	Slobotkin	Aug. 11, 1925
1,681,911	Spencer	Aug. 21, 1928
2,178,512	Schreyer	Oct. 31, 1939
2,188,011	Miller	Jan. 23, 1940
2,309,427	Wolcott	Jan. 26, 1943
2,313,382	Kistner	Mar. 9, 1943
2,316,907	Wallace	Apr. 20, 1943
2,322,593	Riddington et al.	June 22, 1943
2,337,078	Morton	Dec. 21, 1943

FOREIGN PATENTS

Number	Country	Date
330,870	Great Britain	June 19, 1930