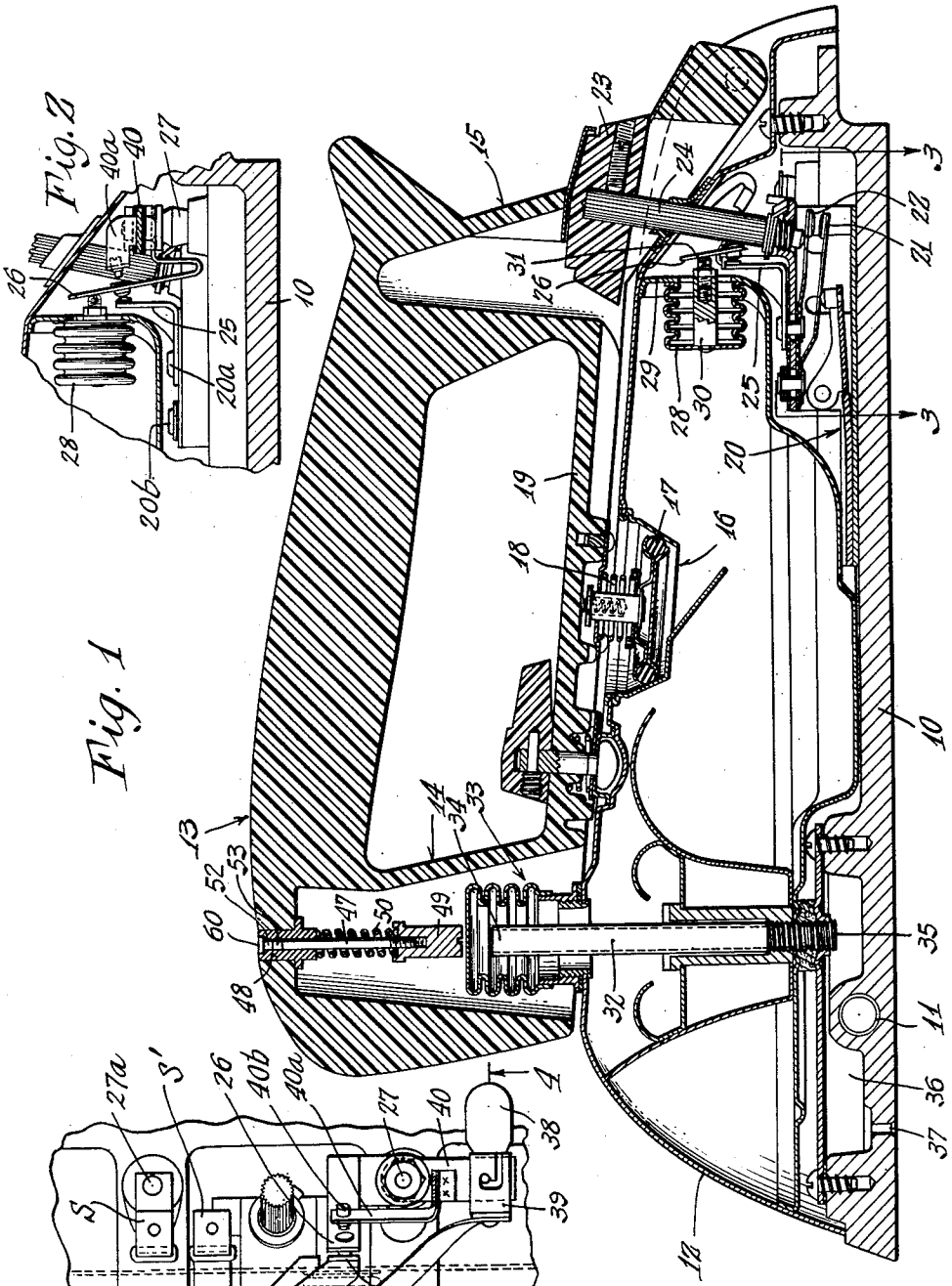
Feb. 16, 1954 A. A. JOHNSON 2,669,643

SAFETY DEVICE FOR STEAM IRONS

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Fig. 4

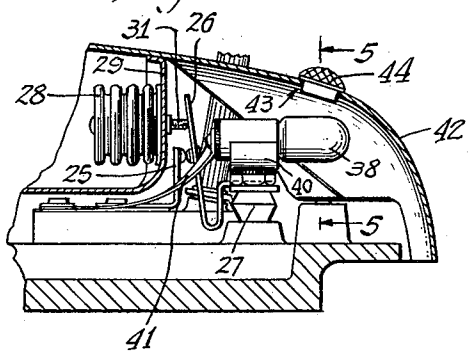
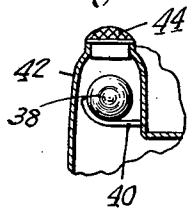


Fig. 5



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SAFETY DEVICE FOR STEAM IRONS

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10 Claims. (Cl. 219—25)

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This invention relates to steam-electric flat irons of the type having an electrically heated sole plate and a boiler above the sole plate, and having steam vents or ports in the sole plate, connected with the boiler to receive steam therefrom.

An object of the invention is to provide an improved steam-electric iron of the above type, wherein the heating of the boiler will be automatically discontinued in response to any abnormal steam pressure within the boiler such as might be occasioned by clogging of the steam vents or ports, or by any accidental airtight covering of said ports, thereby preventing high steam pressures which might constitute a hazard to the user.

Another object of the invention is to provide an improved steam-electric iron in accordance with the foregoing, wherein the user will be immediately apprised visually and/or by the sense of touch, of any rising pressure of the steam within the boiler.

A further object of the invention is to provide an improved steam iron in accordance with the foregoing, having simple and reliable means for signaling the discontinuance of heating of the boiler when such is occasioned by an abnormal pressure.

Still another object of the invention is to provide an improved steam-electric iron as above characterized, which is simple and economical in construction and reliable in use throughout an extended period of time.

In accomplishing the above objects I provide a novel flat-iron structure comprising an electrically-heated sole plate and a boiler above the sole plate. On the boiler I provide a sensitive pressure-responsive device preferably in the form of a bellows, arranged to actuate a circuit control connected with the heating element of the sole plate. Whenever any abnormal pressure within the boiler is produced, as might be occasioned by stoppage of the steam discharge pipe of the boiler, or the steam vents or ports in the sole plate, the bellows will respond to such pressure and actuate the circuit control and open the heating element circuit, thereby to deenergize said element. Deenergization of the element may be made to occur as soon as the pressure within the boiler exceeds a predetermined value slightly above the normal operating pressure and substantially below the safety factor of the boiler, thereby providing for any unavoidable increase in pressure as a result of residual heat in the sole plate when the circuit is opened. Since the effect of the residual heat will vary depending on

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ambient temperature and continued use of the iron, so that pressures approaching the safety factor may be attained even with the circuit off, it is preferable that the boiler be also provided with a pressure responsive blow-off valve as a double insurance against explosion of the boiler.

In addition, I provide an electric signal, as for example an electric pilot light and contacts that are closed by the bellows, and the operator of the flat iron will be apprised of the fact that the pressure in the boiler is excessive and that the heating element has been deenergized. The deenergization of the heating element will be continued so long as the boiler continues to have an abnormally high pressure; also the signal will continue to be given, assuming that the iron remains plugged in. Therefore the user will know that the steam vents or the steam discharge pipe are clogged, and can take the necessary steps to remedy the condition.

I also provide a second pressure-responsive indicator, which however is independent of the electric system of the flat iron, so that the user will have not only a second indication of increased pressure in the boiler, but in addition an indication which is operative regardless of whether or not the iron is plugged in. This second indicator likewise comprises a bellows connected with the boiler. I prefer to arrange such bellows so as to constitute the steam dome of the boiler whereby the bellows surrounds the open top portion of the steam discharge pipe which normally extends into the steam dome. I provide a movable indicator member, preferably carried by the handle of the flat iron, for actuation by the second bellows, and the said member may be advantageously in the form of a plunger adapted to protrude from the foremost part of the handle of the iron in response to increased pressure, to engage the fingers of a user when the iron is being manipulated. Thus indication of the increased boiler pressure is had by the sense of touch as well as by the sense of sight.

Other features and advantages will hereinafter appear.

In the accompanying drawings:

Figure 1 is a longitudinal vertical sectional view through the improved steam-electric iron of this invention.

Fig. 2 is a fragmentary detail in section illustrating the pressure-responsive switch for the heater of the iron.

Fig. 3 is a fragmentary plan view taken on line 3—3 of Fig. 1.

Fig. 4 is a fragmentary view partly in section

and partly in elevation, taken on line 4—4 of Fig. 3, and

Fig. 5 is a partial view taken on line 5—5 of Fig. 4.

Referring to Fig. 1 the improved steam-electiic iron of this invention comprises a sole plate 10 having an electric heating element 11 embedded in it, and having a boiler 12 mounted above the sole plate, carrying a handle structure 13 including front and rear posts 14 and 15 respectively.

The boiler 12 has a filler opening 16 which is normally closed by a stopper 17 yieldably mounted by means including a spring 18 on the underside of a deck portion 19 of the handle structure 13 whereby the stopper 17 may function as a safety valve and yield to permit the escape of steam after the pressure within the boiler 12 arises to an appreciable, abnormally high value.

The heating element 11 is controlled by the usual thermostatic switch 20 having contacts 21 and 22 adjusted by a manually operable knob 23 and shaft 24.

In accordance with this invention I provide, in the heating element circuit, a second circuit control or switch comprising a stationary contact 25 and a movable contact 26, the latter being preferably connected to one terminal 27 of the heating element and the stationary contact 25 being connected to one terminal 20*a* of the thermostatic switch 20. I provide pressure-responsive means for actuating the movable contact 26, said pressure-responsive means being preferably a bellows 28 mounted on the rear wall 29 of the boiler 12 and extending within the said boiler. The innermost end of the bellows 28 has secured to it a stud 30 provided with an adjustment screw 31 adapted to engage the movable contact 26 of the circuit control.

By this organization, increases of pressure in the boiler 12 will cause the bellows 28 to contract, protruding the stud 30 and screw 31 from the rear wall of the boiler 12 and separating the contacts 25 and 26 so as to open the circuit through the heating coil 11. Such increases of pressure might be occasioned by various circumstances, as for example clogging up of the steam discharge pipe of the boiler, or the steam discharge vents. Any usual type of steam discharge means may be provided for the boiler 12; for example, the boiler may have a discharge pipe 32 in its forward portion extending upwardly into a steam dome 33, the topmost end portion 34 of the pipe being open and the lowermost end portion 35 communicating with a superheater chamber 36 connected with steam vents or ports 37 provided in the sole plate 10.

I prefer to make the bellows 28 of extremely sensitive construction, and to adjust the action of the bellows by means of the screw 31 so that any small abnormal increase in steam pressure in the boiler 12, such as may initially occur due to stoppage of the vents 37 or discharge pipe 32, will cause the contacts 25 and 26 to separate and open the heating element circuit. Thus the heating element will be very quickly deenergized if for any reason the steam outlet means of the flat iron should become clogged up.

Preferably the deenergization of the heating element is effected in response to very slight increases in the steam pressure, much less than that required to actuate the closure or safety valve 17, and therefore the operation of said valve may be considerably delayed or may be completely forestalled, depending on the relative operating characteristics of the valve and the bellows 28.

According to the present invention I also provide an improved and simplified signal means adapted to operate when the heating element circuit is opened by the contacts 25 and 26. This signal means comprises a bulb 38 carried in a socket 39 which is mounted on conductor strips 40 and 41, the latter strip being connected to the remaining terminal 20*b* of the thermostatic switch 20 and the strip 40 being insulatedly mounted on the terminal post 27 of the heating element. The strip 40 carries an arm 40*a* and an adjustable contact screw 40*b*, the latter being engaged by the contact 26 when this has been separated from the contact 25 by the bellows 28. The signal bulb 38 is thus connected in such a manner that it will be energized whenever the contact 26 is moved into engagement with the contact 40*b* and the flat iron is plugged in.

The signal thus provided may be made to indicate with considerable accuracy the separation of the contacts 25 and 26 and the deenergization of the heater 11. For, if the adjustable contact screw 40*b* is positioned to be separated only a minute distance from the contact 26 when the latter is engaging the contact 25, then the slightest separation of contacts 26 and 25 will result in engagement between contacts 26 and 40*b*, and energization of the signal.

The circuit through the bulb 38, when the contacts 26 and 40*b* are engaged, is as follows: End terminals S and S′ are provided on the iron, the terminal S being connected directly to a terminal 27*a* of the heater 11, and the terminal S′ being connected to the terminal 20*b* of the thermostat 20. Current thus will flow through terminals S and 27*a*, through the heater 11, terminal 27, movable contact 26, contact 40*b*, arm 40*a* and strip 40, through the bulb 38, strip 41 and thence to the end terminal S′.

Referring to Fig. 4, the rear portion of the flat iron may have a casing 42 provided with a window 43 and a jewel 44, through which light from the bulb 38 may pass, to apprise a user of the fact that increased boiler pressure has resulted in the heating element of the flat iron being automatically deenergized. It will be understood that when the contacts 25 and 26 separate to open the heating element circuit, and the contacts 26 and 40*b* become engaged in response to increased pressure in the boiler 12, the respective pairs of contacts will remain separated and engaged so long as the boiler pressure is not relieved in some manner. The energizing of the signal bulb 38, apprising a user of a defect in the steam discharge means of the iron, will enable the user to immediately take measures to clear the obstruction from the discharge passages, whereupon the drop in the boiler pressure will automatically result in the contacts 25 and 26 reclosing, rendering the iron again in condition for use.

In accordance with this invention I provide a second pressure-responsive indicator means, which is of a mechanical nature in contradistinction to the electrical indicator means above described, and which is adapted to apprise a user of increased boiler pressure by the sense of touch as well as visually. In accomplishing this, referring to Fig. 1, I make the steam dome 33 in the form of a bellows, and above the bellows I provide a rod or plunger 47 slidably carried in a bushing insert 48 of the handle 13. The lower end of the plunger 47 has an adjustment nut 49

threaded to it, and a spiral compression spring 50 is carried by the plunger, engaging the nut 49 and the bushing 48. The upper end of the plunger 47 has a head 60 engageable with the top of the bushing 48 to function as a stop.

Normally the plunger 47 does not protrude from the bushing 48 and handle 13. However, when there is an abnormal or increased pressure in the boiler 12 the bellows 33 will be expanded, raising the plunger 47 and causing it to project from the handle whereby it may be felt by the fingers of a user when the iron is being manipulated. Thus a user will be apprised of the fact that there is an increased pressure in the boiler 12. The upper portion of the plunger 50 may have different colored zones 52 and 53 whereby the extent of protrusion of the plunger may be readily determined.

By the above organization I have provided a novel safety means adapted to respond to increased boiler pressures in a steam-electric iron whereby the heating element of the iron will be automatically disconnected and deenergized, and whereby a signal of such deenergization will be given both electrically and mechanically, and visually and by the sense of touch.

In accordance with my invention this safety means may be so correlated with respect to the usual safety valve of the boiler that the opening of the latter may be either greatly delayed, or else entirely averted in the event that the steam discharge means of the boiler should become clogged up. Therefore there may be avoided the somewhat startling and even dangerous circumstance of steam under pressure suddenly issuing forth from the flat iron, through the safety valve.

In the form of the invention herein illustrated there are several different safety devices cooperating to the end that abnormal steam pressures within the boiler may be avoided either entirely automatically or manually as by disconnecting the iron from the circuit in case the automatic means should fail or by permitting the escape of excess steam through the safety valve acting only under abnormally high pressures above which the automatic means operates. However, it should be understood that for economy in constructing the iron, some of these safety features may be omitted, those remaining performing their functions but with somewhat reduced security against damage. For instance, the closure 17 for the filling opening may have no function as a safety valve, in which case reliance would be placed on the automatic opening of the circuit by the pressure responsive device 28. Again, whether the safety valve feature is retained or not, the visual and touch responsive signal, including the plunger 47 and the bellows 33, may be dispensed with, in which case reliance would be placed on the automatic operation of the pressure responsive device 28 to open the circuit, and the user would be apprised of the fact that the circuit was opened by the operation of the light bulb 38. Even the latter signal could be omitted in addition to the visual and touch responsive signal, but in such cases the automatic device might continue to function repeatedly to open and close the circuit without the user being aware of it. Of course, if the escape of steam through the pipe 32 and openings 37 were prevented, causing the pressure to rise and the bellows 28 to operate the user would immediately be aware of the fact that the iron was not functioning as intended by the fact that no steam would be seen to escape through the openings 37. Thus it will be seen

that variations and modifications may be made within the scope of this invention and portions of the improvements may be used without others.

I claim:

1. An electric steam iron having a sole plate provided with steam vents; an electrically energized steam generator in communication with said vents; a thermostatic switch for controlling the heating of the steam generator to produce steam for discharge through said vents, the normal operating pressure of said steam in the generator depending upon the discharge rate through the vents; and means independent of the operation of said thermostatic switch and responsive to excessive pressure of the steam in said generator, for de-energizing the steam generator when the steam pressure therein abnormally rises above said normal operating pressure.

2. The invention as defined in claim 1 in which the means responsive to excessive steam pressure comprises a bellows mounted on a wall of the steam generator.

3. An electric steam iron having a sole plate provided with steam vents; an electrically energized steam generator in communication with said vents; a thermostatic switch for controlling the heating of the steam generator to produce steam for discharge through said vents, the normal operating pressure of said steam in the generator depending upon the discharge rate through the vents; and means independent of the operation of said thermostatic switch and responsive to excessive pressure of the steam in said generator, for de-energizing the steam generator when the steam pressure therein abnormally rises above said normal operating pressure, said means automatically becoming inoperative to de-energize the generator when the steam pressure falls below said normal operating pressure.

4. An electric steam iron having a sole plate provided with steam vents; an electrically energized steam generator in communication with said vents; a safety valve on said generator, set to operate in response to a predetermined supernormal pressure in the generator; a thermostatic switch for controlling the heating of the steam generator to produce steam for discharge through said vents, the normal operating pressure of said steam in the generator depending upon the discharge rate through the vents; and means independent of the operation of said thermostatic switch and responsive to excessive pressure of the steam in said generator substantially below said supernormal pressure for de-energizing the steam generator when the steam pressure therein abnormally rises above said normal operating pressure and reaches said excessive pressure.

5. The invention as defined in claim 1 in which the pressure-responsive means includes a bellows secured to a side wall of the boiler and disposed wholly within the boiler, and includes a stud secured to the inner end of the bellows and projecting from the boiler, and in which the switch includes a pair of cooperable contacts and a driving connection between one of said contacts and said stud.

6. The invention as defined in claim 1 in which the switch includes a pair of cooperable contacts, one of which is movable and is separated from the other to open the heating coil circuit, and in which there is an electric signal and a third contact connected thereto, said third contact being engaged by said movable contact during its separating movement, thereby to render said signal operative.

7. In a steam iron having a handle and a boiler, the improvement which comprises an indicator member mounted on the handle of the iron for movement between different positions, said member being engageable by the fingers of a person operating the iron to enable its position to be approximately determined by the sense of touch; and means responsive to pressure in said boiler for actuating said indicator member whereby the positions of the member will apprise a user of the pressure in the boiler.

8. The invention as defined in claim 7 in which the forward part of the handle is hollow, in which the indicator member comprises a plunger disposed in said forward part of the handle and projectable above the latter, and in which the means for actuating the member comprises a bellows mounted on the boiler and extending upward therefrom into the hollow of the handle.

9. In a steam-electric iron having a boiler and a steam discharge pipe projecting into said boiler, said pipe having an open top portion extending through an opening in the top wall of the boiler, the improvement which comprises a bellows attached to said top boiler wall over the opening thereof and extending upward therefrom, said bellows surrounding the open top portion of said steam pipe and being responsive to pressure in said boiler; and indicator means mounted on the iron and actuated by said bellows, the latter responding to the steam pressure adjacent the open top portion of the steam discharge pipe.

10. In a steam-electric iron having a handle provided with a hollow portion, having a boiler connected with said handle and a steam discharge pipe connected to said boiler, and having a sole plate provided with steam ports connected to said discharge pipe, the improvement which comprises a steam dome consisting of a pressure-responsive bellows surrounding the intake end of said discharge pipe and located within the hollow portion of the handle; and means including a movable indicator member carried by the handle and actuated by said bellows, for indicating pressures within said boiler whereby a user will be apprised of stoppage of said steam pipe or steam ports by a rise in the boiler pressure.

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