May 8, 1956 P. J. MORE 2,744,342

STEAM IRON

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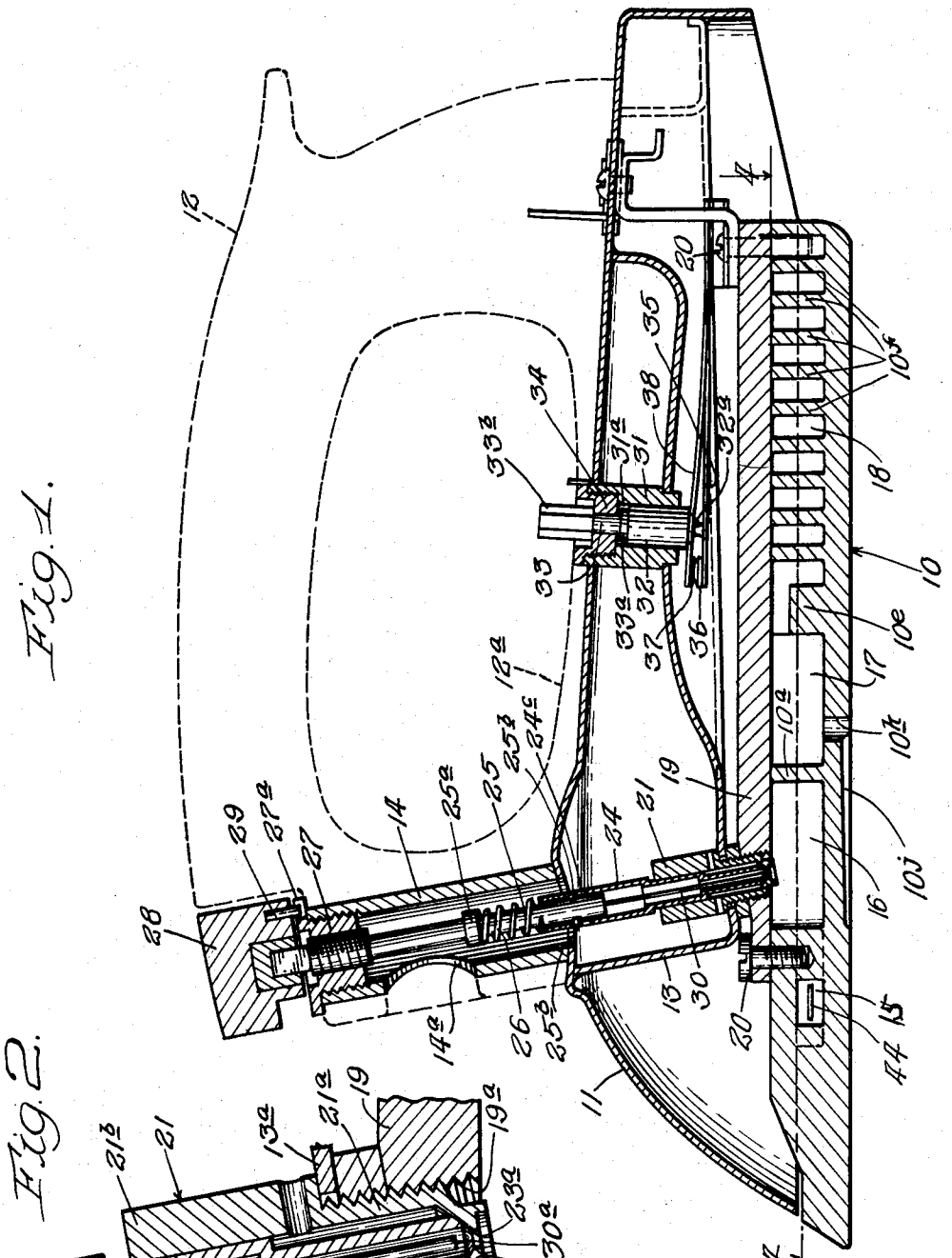


Fig. 1.

Fig. 2.

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Fig. 3.

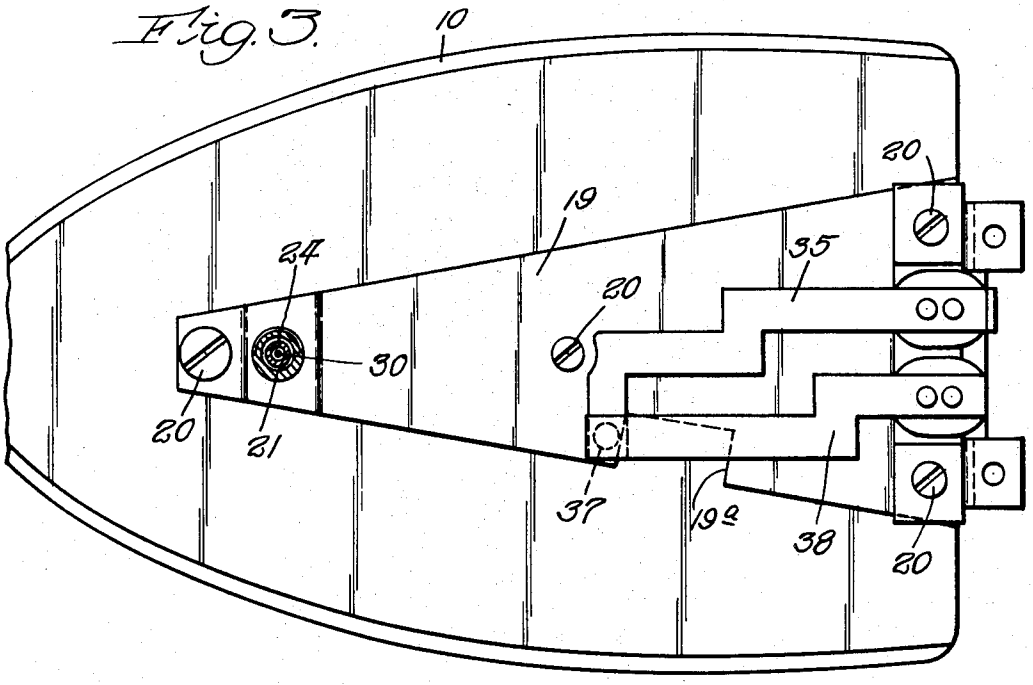
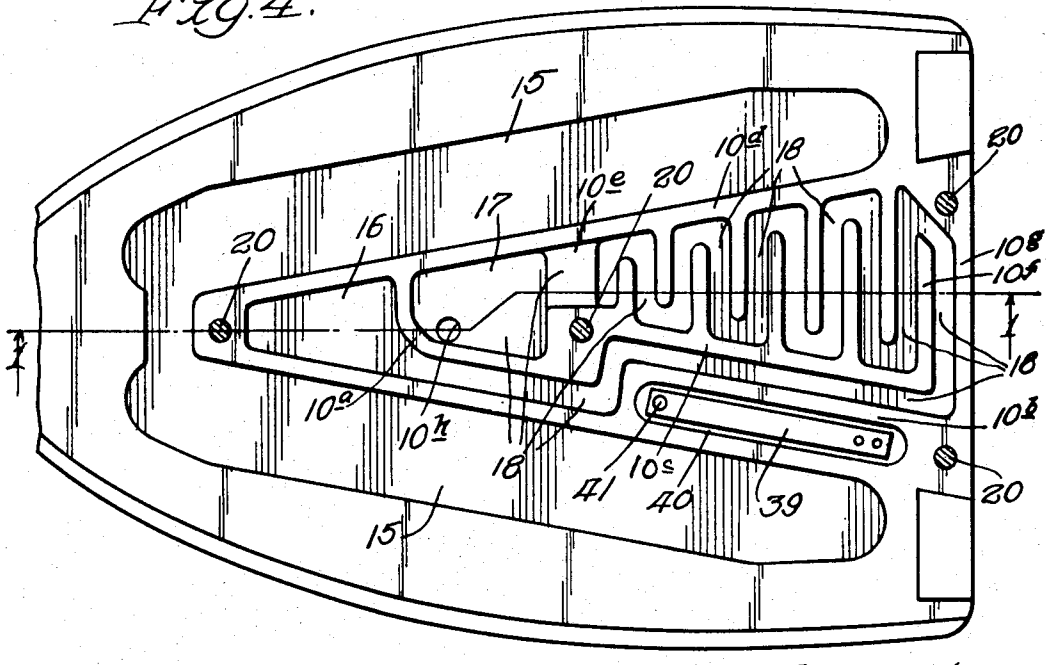


Fig. 4.



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STEAM IRON

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Application April 19, 1952, Serial No. 283,219
4 Claims. (Cl. 38—77)

This invention relates to a steam iron and particularly to an apparatus for supplying water to a steam generating chamber within the iron.

Most of the better type steam irons employ a steam generating chamber in the sole plate and a valve for feeding a controlled quantity of water to this steam chamber so that the amount of steam produced and the rate of production can be carefully controlled with this rate and amount being in general dependent upon the type of fabric being ironed. Such a valve requires very close control and there have been great difficulties in preventing sediment or other foreign solid materials in the water supply from partially obstructing the valve and thus reducing the water flow and in some instances, stopping it entirely. In the new iron described and claimed herein, the valve is so constructed that operation thereof to open and close the valve not only removes any obstructions that may be deposited on the valve seat and thus permits complete closing of the valve, but also simultaneously removes obstructions that might be deposited in the water passage of the valve.

In the iron of this invention, the valve body is constructed to serve a dual purpose in that it is used not only to control the flow of water into the steam generating chamber, but is also used to attach a portion of the water reservoir to the sole plate structure of the iron in the area adjacent the steam generating chamber and thus provides a sturdy construction requiring a minimum of parts.

The valve used in the steam iron of this invention is also arranged to permit sharp control of the water flow. Thus when the valve is closed, the flow of water immediately stops as there is no long passage below the valve seat. Similarly, when the valve is opened, water flow starts almost instantaneously as the valve seat is preferably located at the bottom of the valve and water surrounds the valve closure member so that it can begin to flow immediately.

In the preferred iron constructed according to this invention, a reservoir is provided with an upwardly extending hollow member at the front of the iron and having a side opening for filling the reservoir. This hollow member is provided with a closure at the top thereof and a valve operating member extends through the hollow member and is rotatably supported in this closure. Thus, the valve is easily operated from the top of the iron yet the operating parts, except the control knob, are hidden within the hollow member which also serves as a filling spout or passage for the water reservoir.

The invention will be described as related to the embodiments shown in the accompanying drawings. Of the drawings:

Figure 1 is a vertical section taken through a steam iron constructed according to this invention with this section being substantially along the line 1—1 of Figure 4;

Figure 2 is an enlarged fragmentary detail view of a portion of Figure 1 showing the valve structure and associated parts;

Figure 3 is a plan view of the portion of the iron beneath the water reservoir and the enclosing shell; and

Figure 4 is a horizontal sectional view of the iron taken substantially along the line 4—4 of Figure 1.

The steam iron shown in the accompanying drawings is provided with a sole plate 10 and enclosing shell 11

thereover and a handle 12. Within the shell 11 there is provided a water reservoir 13 attached to the shell and to the sole plate structure. At the front of this reservoir there is provided an upwardly extending hollow member 14 located within the front portion of the handle and provided with a front opening 14*a* through which water may be poured to fill the reservoir 13. Because of the spaced relationship of this opening 14*a* to the reservoir 13, no plug is required for this opening unless such is desired.

The sole plate 10 is provided with diverging heating elements 15 arranged substantially in a "V" shape. This sole plate is preferably generally of the type described and claimed in the Charles H. Sparklin and Philip J. More copending application Serial No. 68,588 filed December 31, 1948. Within the sole plate and between the heating elements 15 there are provided a steam generating chamber 16, a steam outlet chamber 17, and a connecting labyrinth 18 therebetween.

An important feature of the sole plate is its extremely low height which is only a fraction of the maximum width of the plate. This low height permits increased water storage capacity without excessively increasing the over-all height of the body portion of the iron in that it permits the use of a larger water reservoir than that ordinarily possible. In the preferred iron, the height of the chambers 16 and 17 and the passage 18 is preferably not greater than about 15% of the maximum width of the sole plate. In the embodiment shown, this height is somewhat less than 10% of the maximum width of the sole plate.

As is shown in Figures 1 and 4, the steam chambers 16 and 17 and the steam passage 18 therebetween are defined by walls including the walls 10*a*, 10*b*, 10*c*, 10*d*, 10*e*, 10*f* and 10*g* which are open at the top when the sole plate structure 10 is disassembled but are normally closed by an over-all closure plate 19 which is attached to the sole plate proper by means of screws 20 or the like.

As can be seen in Figure 4, wall 10*a* separates the steam generating chamber from the steam outlet chamber 17 although these chambers are closely adjacent to each other and near the front of the iron. The steam passage 18 leads from the steam generating chamber 16 toward the rear of the iron and then progresses back and forth in the space between the heating elements 15 toward the front of the iron and terminates in the steam outlet chamber 17. From this outlet chamber 17, the steam flows through the exit orifice 10*h* to the bottom of the sole plate and is provided with radiating grooves 10*j* to aid in distributing the steam.

The steam passage 18 is made extremely long for the amount of space available and is preferably at least as long as the over-all length of the sole plate. In the embodiment shown, it is considerably longer than the over-all length of this sole plate. By providing such a long steam passage between the generating chamber 16 and the steam outlet chamber 17, any water carried by the flowing steam from the chamber 16 has ample time to be converted into steam before it reaches the orifice 10*h*. The conversion of all water into steam is further aided by making numerous sharp turns, most of which are about 180°, in the steam passage. This conversion of all water into steam is further ensured by making the long dimension of the cross section of the passage vertical as shown in Figure 1. These relatively long walls 10*f*, therefore, are easily heated as they form an integral part of the sole plate and any droplet of water carried by the steam is projected around a curve at such a speed that it strikes one of these heated walls and flattens out thereagainst so that maximum heat transfer is achieved. Conversion of substantially all of the water into steam is further ensured by providing wide wall 10*e* at the exit of the steam passage 18 into the outlet chamber 17. This wall is preferably

wider than its height and has its top portion below the bottom surface of the closure plate **19** but considerably above the bottom of the steam passage **18**. Thus, any droplet of water that might exist at the exit of the steam passage must be propelled over the wall **10***e* before it can get into the outlet chamber **17**. In order to do this, the droplet must, of course, pass across the relatively wide top surface of this wall **10***e* where it again will receive heat to convert any such droplet into steam. In actual practice, with the iron operating at normal temperatures, no water has ever been observed at the exit of the outlet passage **10***h*.

In order to control the flow of water from the reservoir **13** to the steam generating chamber **16**, there is provided a valve **21** communicating between the interior of the reservoir and the chamber **16**. As is shown in Figures 1 and 2, this valve preferably has a threaded lower end **21***a* of smaller diameter than the upper portion of the valve and that is screwed into an opening **19***a* in the closure plate **19**. At the top of this closure plate there is provided a nut **22** with an annular portion **13***a* of the wall of the reservoir positioned between the larger upper part **21***b* of the valve and the nut **22**. With this construction, the valve **21** not only provides a controllable water flow from the reservoir **13** to the steam generating chamber **16** but also serves to attach the front part of the reservoir to the sole plate structure.

The interior of the valve **21** is provided with an extended cylindrical passageway **21***c* communicating by means of a plurality, preferably four, side passages **21***d* with the interior of the reservoir **13**. The bottom of the passageway **21***c* is defined by an inwardly and downwardly sloped flange **23** having a relatively small opening **23***a* therein.

The valve closure member, arranged to operate against the inclined bottom flange **23**, comprises a hollow body or tube **24**. As can be seen most clearly in Figure 2, the bottom part of this tube is spaced from the inner surface of the passageway **21***c* while the part **24***b* immediately above this part **24***a* and above the side passages **21***d* substantially fills this passageway **21***c* so that it acts as a piston therein. The portion **24***c* of the tube **24** above the part **24***b* is enlarged still further as it is always beyond the valve **21**.

Extending into the top part **24***c* of the hollow body or tube **24** is an elongated member or rod **25** that is provided with an annular collar **25***a* spaced from the top of the tube **24** so that a helical spring **26** positioned around the rod **25** will bear upwardly against the collar **25***a* and downwardly against the top of the tube **24**.

The top end of the rod **25** is threaded into a closure plug **27** closing the top of the hollow member **14**. The extended end of the rod **25** is provided with a knob **28** having a downwardly projecting pin **29** adapted to be guided in an arcuate groove **27***a* upon rotation of the knob **28**.

The lower part of the rod **25** is provided with a pair of outwardly projecting studs **25***b* positioned in elongated slots **24***c* in the wall of the tube **24**. Projecting from the bottom end of the rod **25** is a pin-like member **30** located substantially centrally within the hollow body **24** and longitudinally thereof with the bottom end **30***a* of this member being blunt. When the member **30** is in its lowest position with the studs **25***b* at the bottoms of slots **24***c*, the end **30***a* extends to slightly below opening **23***a* and the member **30** substantially fills this opening.

With the structure as described, the spring **26** always urges the tube **24** downwardly so that when the knob **28** is rotated, the bottom tapered end **24***d* of the tube will seat against the tapered flange **23** and close the water passage at the earliest possible moment. This water passage is defined by the side passages **21***d*, the central passage **21***c*, and the lower relatively small opening **23***a*.

When the parts are in the position shown in Figures 1 and 2, the bottom end **24***d* is in its initial contact with the flange **23** to stop the flow of water. Further rotation of the knob **28** in closing the valve rotates the tube **24** by means of the cooperation between the side slots **24***c* and the studs **25***b*. This further rotation with the spring **26** holding this bottom part **24***d* against the flange serves to dislodge any sediment, scale or other obstructions that might be on the valve seat and that might interfere with proper closing of the valve. This continued rotation also causes the rod member **26** and the attached pin-like member **30** to continue their downward travel so that the lower end **30***a* will project through the passage **23***a*. This will dislodge any obstructions such as sediment and scale that might be present by a shearing and scraping action. As can be seen from this description, both the final closing movement and the initial opening movement of the valve closure dislodges obstructions that may be present in the water passage. Continued opening movement of the valve caused by the rotation of the knob **28** serves to withdraw both the lower end **24***d* of the tube **24** and the lower end **30***a* of the pin-like member **30** away from the flange **23** defining the valve seat and its opening **23***a* so that water may flow into the steam chamber **16**.

With the valve structure as explained above, the flow of water from the reservoir **13** into the steam generating chamber **16** can be very carefully controlled so that only the desired amounts of water are supplied. The larger portion of this water is almost instantaneously flashed into steam as soon as it hits the bottom of the steam generating chamber **16**. The steam then flows at a rapid rate through the steam passage **18** around the many corners and finally over the baffle **10***e* into the steam outlet chamber **17**. From this outlet chamber, the steam flows through the orifice **10***h* and the radiating passages **10***j* onto the cloth being ironed.

The temperature at which the iron operates may be regulated by a thermostat that is adjustable to any desired temperature setting within the operating range of the iron. Any suitable adjusting mechanism desired may be used. In the embodiment shown, the adjusting mechanism comprises a tubular shell **31** extending through the reservoir **13** and having a substantially square or rectangular inner bore **31***a*. Within this bore **31***a* there is positioned a substantially vertically slidable operating member **32**. This member **32** is provided with a substantially circular threaded recess threadingly receiving the threaded lower end **33***a* of a rotatable member **33**. This member **33** is rotatably held in a closure **34** adjacent to the top end of the tubular shell **31** and normally closing this end. The rotatable member **33** is provided with an upper end portion **33***b* extending above the shell portion **12***a* of the handle **12** and adapted to receive a button or the like for rotating the member **33**.

The lower end **32***a* of the slidable member **32** bears against a spring arm **35** which carries a contact button **36** at its outer end. This contact button bears against another contact button **37** on a second spring arm **38**. The springiness of the arms **35** and **38** hold the buttons **36** and **37** in contact and permits them to move up or down as a unit with the buttons in contact until they are forcibly separated. Thus, the position of the slidable member **32** determines the position of the spring arms **35** and **38**. This relative position determines the operating temperature of the iron.

In order to operate the arms **35** and **38** and thus the contact buttons **36** and **37** when the temperature exceeds the predetermined setting controlled by the position of these arms, there is provided a bimetal strip **39** housed in a well **40** within the sole plate **10** and between a heating element **15** and a steam passage **18**. Flexing of this bimetal upwardly under the influence of increasing temperature causes a post **41** on the free end thereof to force the spring arm **38** upwardly and separate the contact buttons **36** and **37** when the temperature exceeds the predetermined value that is dependent upon the relative positions of the spring arms **35** and **38**. With the above construction, the temperature is easily regulated

by rotating the upper end 33*b* of the member 33. When this upper end is rotated, the engagement of the lower end 33*a* with the slidable member 32 causes this member to slide upwardly or downwardly within the bore 31*a* of the shell 31 to position the spring arms 35 and 38 to a position corresponding to the desired temperature. This temperature will then be maintained by flexing of the bimetal 39 which will cause the buttons 36 and 37 to separate when the temperature exceeds this predetermined value and will cause the buttons to again contact when the temperature falls below this value. The spring arms 35 and 38 are in the electricial circuit that includes resistance strip 44 so that the flow of electricity to this strip is immediately stopped when the buttons 36 and 37 are separated. By locating the bimetal 39 within the well 40 in the sole plate, good heat transfer is obtained. Similarly, by locating this strip 39 adjacent to the steam passage 18 at a point that is near the entrance of this steam passage any water flowing through the steam passage will tend to cool that portion of the sole plate containing the bimetal strip and ensure that a sufficiently high temperature is maintained to convert this water into steam.

As is shown in Figure 3, the closure and temperature storage plate 19 that forms the top wall of the various steam chambers and the steam passage and which is held in place by the screws 20 is cut away at 19*a* so that the bi-metal post 41 will be free to operate.

The combination including the sole plate 10, steam generating chamber 16, steam outlet chamber 17, steam passage 18 and associated structure is described and claimed in the copending application of Charles H. Sparklin, Serial No. 283,161, filed April 19, 1952.

Having described my invention as related to the embodiments shown in the drawings, it is my intention that the invention be not limited by any of the details of description, unless otherwise specified, but rather be construed broadly within its spirit and scope as set out in the accompanying claims.

I claim:

1. In a steam iron, a steam chamber, a valve passage communicating therewith and having a bottom provided with an annular flange, a movable valve closure for closing the passage, said closure including a hollow body having its lower end adapted to contact the flange around the opening therein to close the passage, a separate elongated member extending through the hollow body, said member substantially filling the flange opening when fully extended, complementary threaded portions on the iron and on the elongated member engaging to direct the member into and out of the opening, engaging means extending from the elongated member, the hollow body being provided with longitudinal slots below the upper end thereof for engagement by said means, said slots extending from a point at least as far from the lower end of the hollow body as the engaging means are from the lower end of the elongated member to a point spaced from the end of the hollow body a distance less than the distance from the engaging means to the end of the elongated member, a projection on the elongated member, spring means seated on said projection and contacting the hollow body thereby urging said hollow body downwardly biasing the upper ends of the slots against the engaging means when the lower end of the hollow body is out of contact with the flange, the combination of the engaging means, slots, and spring means causing longitudinal movement of the elongated member and the hollow body when the lower end of the hollow body is not contacting the flange and the said combination causing rotational movement of the hollow body on the flange when said lower end of the hollow body contacts the flange.

2. In a steam iron, a steam chamber, a valve passage communicating therewith and having a bottom provided with an annular flange, a movable valve closure for closing the passage, said closure including a hollow body having its lower end adapted to contact the flange around the opening therein to close the passage, a separate elongated member extending through the hollow body, said member substantially filling the flange opening when fully extended, complementary threaded portions on the elongated member and on the iron engaging to direct the member into and out of the opening, connecting means between said elongated member and hollow body for causing simultaneous rotational movement of said elongated member and hollow body and for causing longitudinal movement of the elongated member relative to the closure when the hollow body is in contact with said flange in order simultaneously to rotate the hollow body on the flange and extend the elongated member into and out of the opening.

3. In a steam iron, a steam chamber, a valve passage communicating therewith and having a bottom provided with an annular flange, a movable valve closure for closing the passage, said closure including a hollow body having its lower end adapted to contact the flange around the opening therein to close the passage, a separate elongated member extending through the hollow body, said member substantially filling the flange opening when fully extended, complementary threaded portions on the elongated member and on the iron engaging to direct the member into and out of the opening, connecting means including a pin on said elongated member engaging a longitudinal slot in said hollow body below the upper end thereof for causing simultaneous rotational movement of said elongated member and hollow body and for causing longitudinal movement of the elongated member relative to the closure when the hollow body is in contact with said flange in order simultaneously to rotate the hollow body on the flange and extend the elongated member into and out of the opening.

4. In a steam iron, a steam chamber, a valve passage communicating therewith and having a bottom provided with an annular flange, a movable valve closure for closing the passage, said closure including a hollow body having its lower end adapted to contact the flange around the opening therein to close the passage, a separate elongated member extending through the hollow body, said member substantially filling the flange opening when fully extended, complementary threaded portions on the iron and on the elongated member engaging to direct the member into and out of the opening, engaging means extending from the elongated member, the hollow body being provided with a longitudinal slot below the upper end thereof for engagement by said means, said slot extending from a point at least as far from the lower end of the hollow body as the distance of the engaging means from the lower end of the elongated member to a point spaced from the end of the hollow body a distance less than the distance from the engaging means to the end of the elongated member, spring means bearing against the elongated member and pressing the hollow body toward said flange thereby urging said hollow body downwardly biasing the upper end of the slot against the engaging means when the lower end of the hollow body is out of contact with the flange, the combination of the engaging means, slot, and spring means causing longitudinal movement of the elongated member and the hollow body when the lower end of the hollow body is not contacting the flange and the said combination causing rotational movement of the hollow body on the flange when said lower end of the hollow body contacts the flange.

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