Dec. 13, 1955 C. H. SPARKLIN 2,726,466

STEAM IRON

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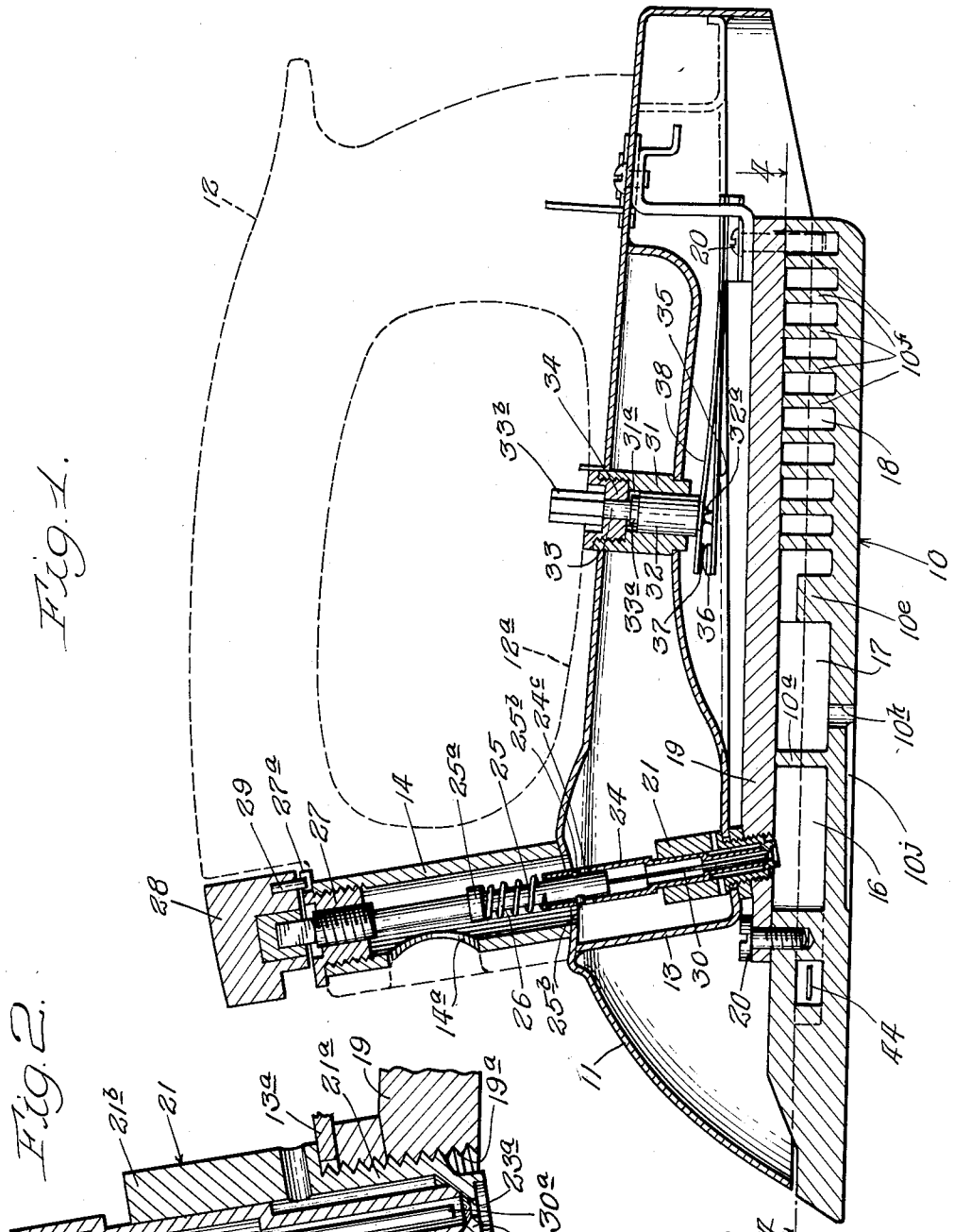


Fig. 1.

Fig. 2.

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Fig. 3.

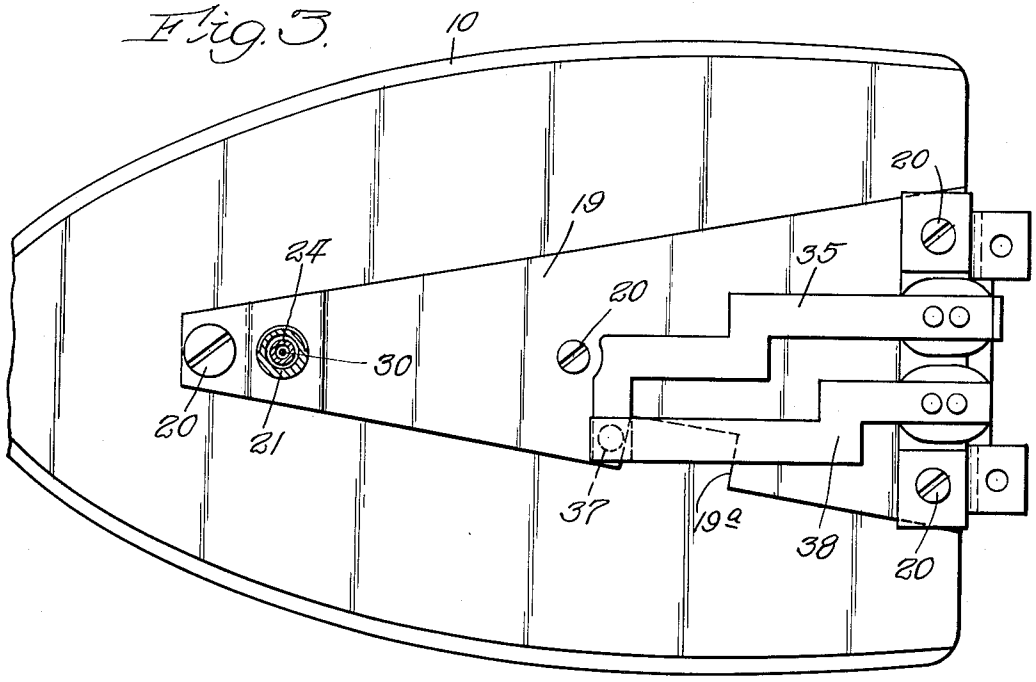
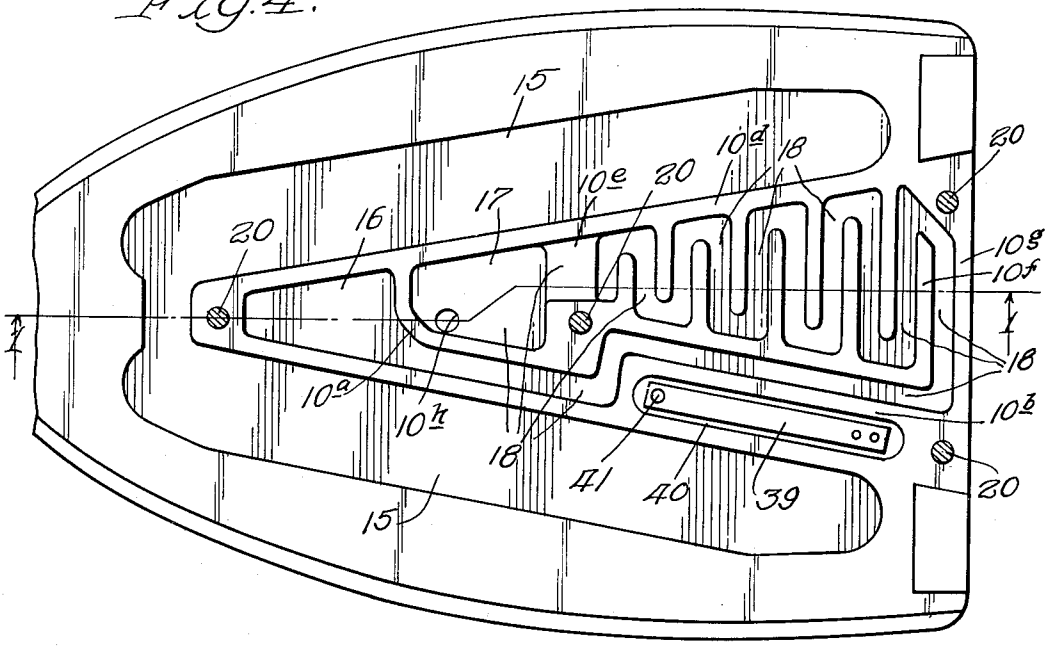


Fig. 4.



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STEAM IRON

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1 Claim. (Cl. 38—77)

This invention relates to a steam iron and particularly to the sole plate thereof including the steam generating chamber, steam outlet chamber and communicating passage.

In electric steam irons, a steam generating chamber is provided to receive heat from the heating elements so as to convert water in this chamber into steam. This steam is then conducted to a steam outlet chamber or a portion of the generating chamber is used as an outlet chamber in order that this steam may be vented through the sole plate to the bottom thereof for contact with the fabric being ironed.

In most prior steam irons, considerable difficulty has been encountered in providing effective heat transfer to prevent the passage of water from the steam generating chamber onto the fabric. This problem has been particularly acute when the steam demand is high such as when relatively heavy fabrics are ironed and the valve control mechanism is opened wide. Under these conditions the steam generating portion of the iron often becomes overloaded so that not all of the water is converted into steam before it leaves the iron.

In the steam iron of this invention a steam generating chamber, a steam outlet chamber, and a connecting passage are so constructed that all the water fed into the steam generating chamber, even under the most severe operating conditions, is converted into steam before the steam leaves the exit passage from the iron. Furthermore, the heating and steam generating portion of the iron are so designed that a minimum of space is used. Thus the water storage capacity of the iron is large in relation to the over-all size of the iron.

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 converging heating elements **44** underlying cover plates **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 **44** 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 **44** toward the front of the iron and terminates in the steam outlet chamber **17**. From this outlet chamber **17**, the steam flows through one or more exit orifices **10***h* to the bottom of the sole plate which 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 tube **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 lowermost position with the studs **25***b* at the bottoms of the slots **24***c*, this end **30***a* will extend slightly below the water opening **23***a* and the member **30** will substantially fill 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 chmaber, 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** of the same shape. 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 shield 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 separate 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 **44** and the 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 depended 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 tempera-

ture 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 electrical 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 bimetal post **41** will be free to operate.

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 claim.

I claim:

In an electric steam iron, a sole plate including a heating element arranged in a forwardly converging substantially V-shape with the apex of the element located adjacent to the toe of the sole plate, a steam generating chamber adjacent to said apex, a steam outlet chamber

adjacent to said apex and separate from said generating chamber, the sole plate having an opening leading from said outlet chamber through the bottom of the sole plate, and a plurality of transverse walls forming a steam passageway extending rearwardly from said generating chamber to an area adjacent to the heel of the sole plate and then forwardly of the heel to said steam outlet chamber, a portion of said passageway between the rear diverging ends of said heating element being labyrinthian, the heating element, steam generating chamber, steam outlet chamber and passageway-forming transverse walls being substantially aligned in a plane substantially parallel to the bottom surface of the sole plate, said chambers and passageway-forming transverse walls being located substantially entirely within the area defined by said heating element.

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