

June 19, 1956

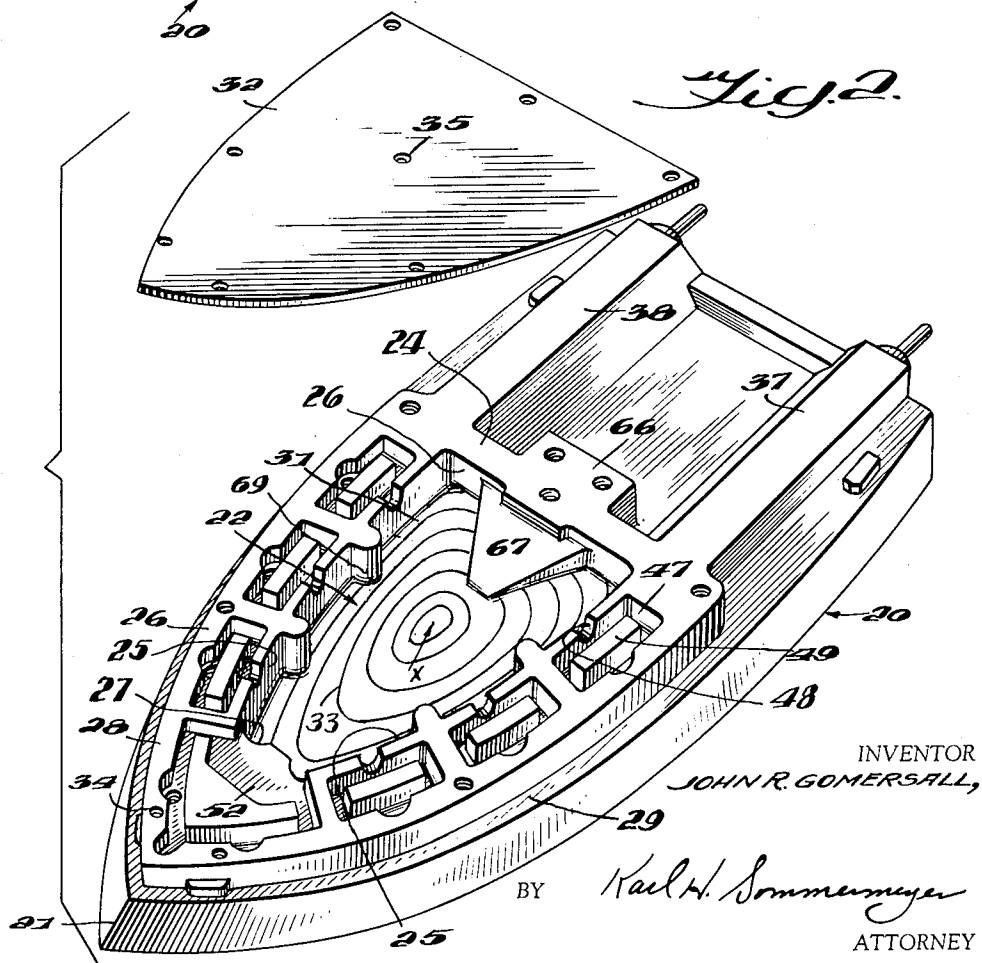
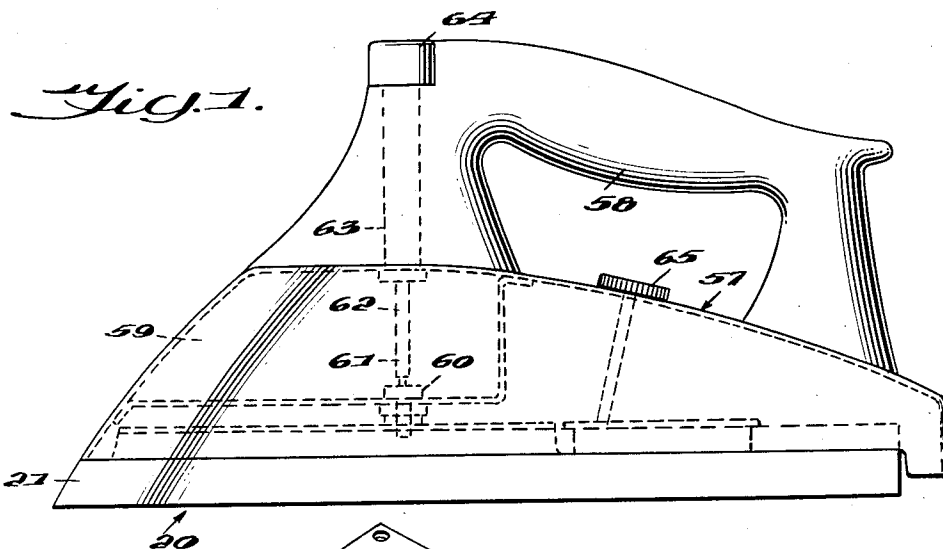
J. R. GOMERSALL

2,750,690

STEAM IRON

Filed Jan. 21, 1953

3 Sheets-Sheet 1



INVENTOR
JOHN R. GOMERSALL,

BY

Karl H. Sommer

ATTORNEY

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J. R. GOMERSALL

2,750,690

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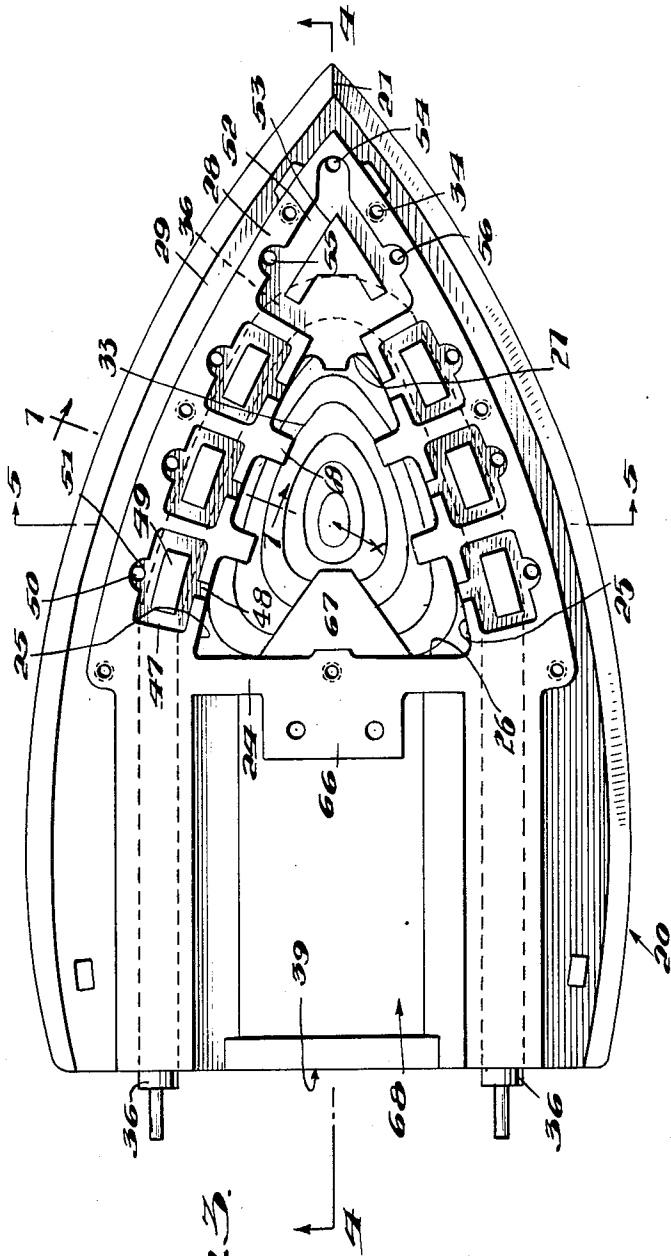


Fig. 3.

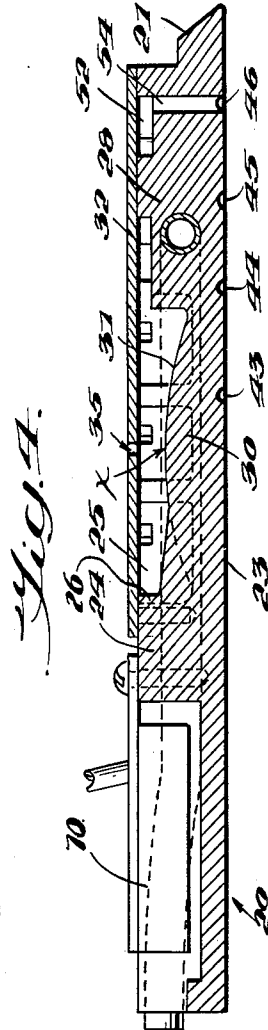


Fig. 4.

INVENTOR

JOHN R. GOMERSALL,

BY *Karl H. Sommermeyer*

ATTORNEY

June 19, 1956

J. R. GOMERSALL

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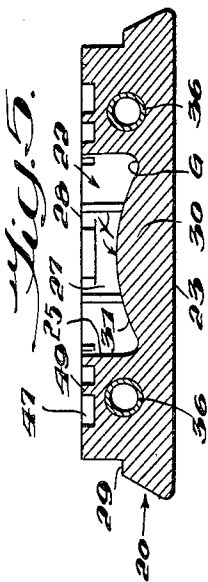
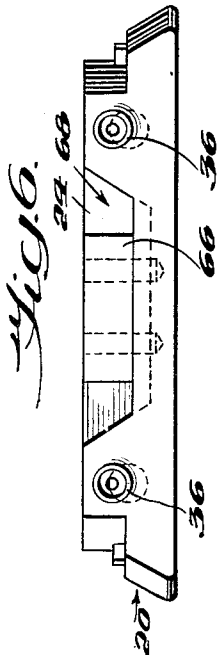


Fig. 8.

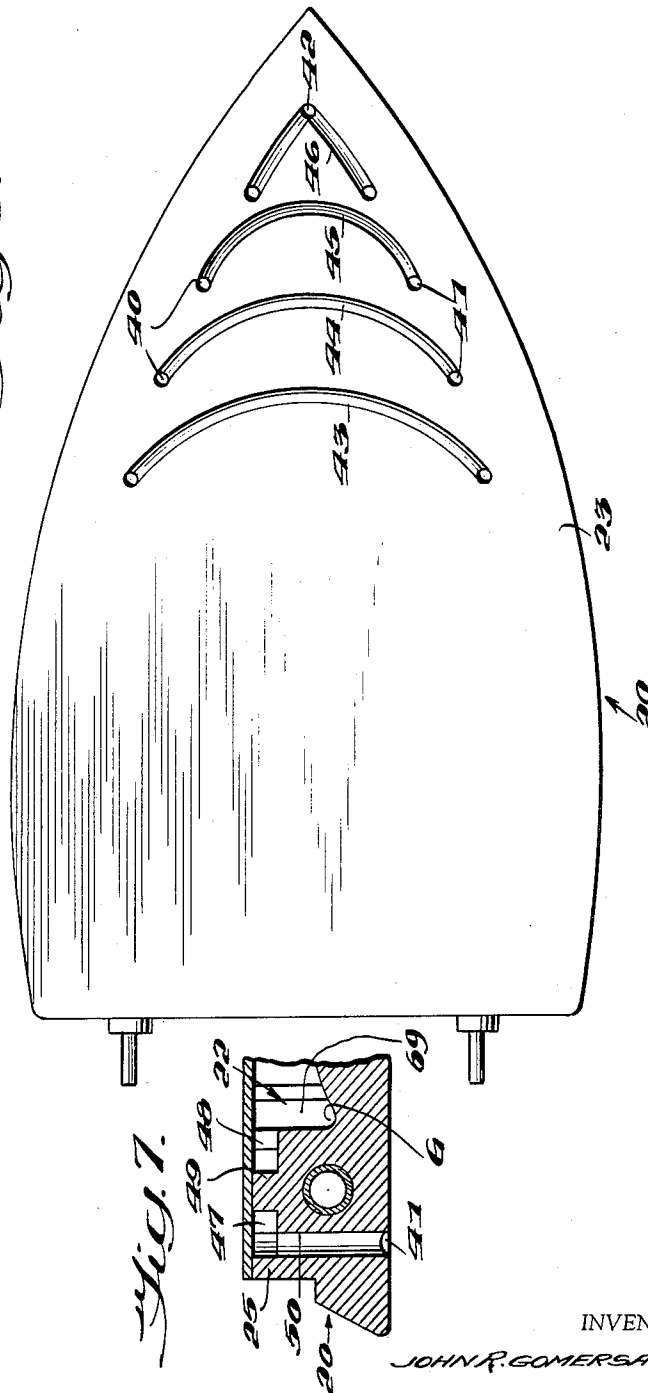
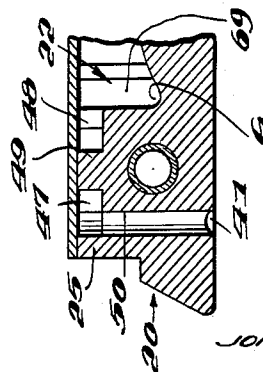


Fig. 7.



INVENTOR

JOHN R. GOMERSALL,

BY

Karl H. Sommermeyer

ATTORNEY

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2,750,690

STEAM IRON

John R. Gomersall, Elgin, Ill., assignor to McGraw Electric Company, Elgin, Ill., a corporation of Delaware

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8 Claims. (Cl. 38—77)

This invention relates to steaming sadirons and more particularly to electric steam irons of the flash-boiler type.

Objects of the invention include the provision of a more efficient generation of steam in irons of the type referred to, the provision of a novel and improved steam generating means for such purpose in iron sole plates, and the provision of novel combined means for generating steam and distributing steam in steam iron sole plates.

A further object is to provide a sole plate of simple construction that accomplishes efficient, rapid and thorough evaporation of the water into steam, that operates in spite of large deposits of lime, that confines lime-formation to non-critical areas, and that steams properly and delivers water-free steam even when partly flooded.

Still further objects are to improve the discharge of steam from steam iron sole plates to the fabric being ironed, and to prevent ironing of wrinkles in fabric by a steam iron.

These and other objects and advantages of the invention will appear from the following description of one specific embodiment which illustrates the manner in which the invention may be practiced, taken in connection with the accompanying drawings wherein:

Figure 1 is a side elevation of an illustrative electric steam iron according to the present invention;

Fig. 2 is an exploded perspective view of the sole plate and top plate of the iron shown in Fig. 1;

Fig. 3 is a top plan view of the sole plate;

Fig. 4 is a longitudinal section taken on line 4—4 of Fig. 3;

Fig. 5 is a transverse section taken on line 5—5 of Fig. 3;

Fig. 6 is a rear end view of the sole plate as seen from the left of Fig. 3;

Fig. 7 is an enlarged fragmentary section taken on line 7—7 of Fig. 3; and

Fig. 8 is a bottom plan view of the sole plate corresponding to the top view of Fig. 3.

Referring to the drawings, a metal sole plate for an iron is generally designated 20. As shown, the sole plate may have the usual truncated lenticular outline wherein curved sides meet at the front in a pointed nose 21. Formed in the sole plate is a novel steam generating chamber including a cavity 22 of a substantial clear area and varying depth. Since it is desirable that the discharge of steam be from the front area of the ironing surface, the steam chamber is located in the front portion of the soleplate. Further, the cavity 22 is of generally triangular shape to conform to the outline of the sole plate and to make full use of the available space. The cavity 22 is enclosed partly by the erect walls consisting of converging side walls 25, a rear wall 26 and a front wall 27.

The floor 31 of the steam cavity 22 is formed by a solid metal portion 30, the underside of which forms part of the ironing surface 23. This floor 31 is convex and has a high central area X from which the floor curves down

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in all directions to the margins of the cavity 22. At such margins the floor 31 meets the surrounding upstanding walls 25, 26 and 27 of the cavity to form a gutter-like sump G. Projections 69 extend into the cavity 22 from the upstanding side walls, and among other things, divide the sump G into a plurality of sumps, which constitute the lowest or deepest areas of the steam chamber. The shape of the sloped floor 31 is shown partly in the sectional views of Figs. 4 and 5 and partly by the approximate contour lines 33 in Figs. 2 and 3.

The roof of the steam chamber is formed by a separate top plate 32 secured by screws (not shown) in sealing engagement with the top surfaces of the sole plate. An inlet port 35 for water is located in top plate 32 directly over, and spaced above, the high central area X of the floor 31. (See particularly Fig. 4). A generally U-shaped electric heating element 36 is embedded in the sole plate partly encircling the cavity 22 and lying close to the walls 25 and 27 thereof. The ends of the element 36 extend back, and emerge for electric connections at the heel of the sole plate. The heating element uses a well known construction of a coil of resistance wire embedded in a mineral insulation such as compacted magnesium oxide, all enclosed in a steel tube. It may have a heating capacity of about 1000 watts.

Formed in the upper surface of the sole plate surrounding the cavity 22 and overlying heating element 36 are six similar baffled and heated trap chambers 47 which provide steam passages to vertical ducts 50 that extend down through the sole plate to the ironing face, just outside the heating element 36. Steam is admitted to each chamber 47 from the upper zone of steam generating cavity 22 through a transverse inlet port 48. Each trap chamber 47 is formed with a central baffle 49 around which steam must pass. The location of the vertical steam delivery passages 50 in an alcove 51 at the outer side of the trap chamber provides further baffling of the steam. Another baffled and heated trap chamber 52 with central baffle 53 and vertical discharge passages 54, 55 and 56 is formed in apex portion 28 above the heating coil and communicates with the front end of cavity 22. Top plate 32 of the sole plate assembly forms the roof of all trap chambers 47 and 52.

Vertical steam ducts 50, 54, 55 and 56 open onto the bottom, or ironing face, in two converging longitudinal series of transversely spaced pairs of steam discharge ports 40 and 41, and another discharge port 42 below apex portion 28, as is shown best in Fig. 8. To obtain good distribution of steam to the fabric being ironed the pairs of corresponding ports such as 40 and 41, are connected by steam distributing grooves 43, 44, 45 and 46. Groove 46 connecting the fore pair of ports 40 and 41 further connects at its center with port 42. As shown, such grooves all preferably arch in a forward direction and increase in steepness and in sharpness of curvature in a forward direction. Also, the center of each groove is preferably substantially in transverse alignment with the pair of steam discharge ports connected by the next forward groove. Such arrangement of the grooves is designed to cause the groove edges to spread out any wrinkles in the fabric being ironed, and to avoid creasing such wrinkles.

The sole plate assembly which has been described may be associated with any suitable or usual iron construction such as shown and indicated in Fig. 1. As shown, a casing 57 covers the upper portion of the sole plate assembly and sets at its lower edge on the marginal ledge 29 of the sole plate. Mounted on the casing is a handle 58. Located in the front portion of the casing 57 and spaced above chamber 22 is a water reservoir 59. A suitable valve fitting 60 connects the reservoir to

water inlet port 35 of chamber 22 and provides for the controlled delivery of water thereto. A suitable needle-valve stem 61 coacts with valve fitting 60. A rotatable shaft 62 having a threaded mounting (not shown) carries valve stem 61 and extends up through a vertical bore 63 in the front of handle 57 for operation by an adjusting knob 64. Bore 63 serves also as a water supply duct for filling reservoir 59 and as a vent for maintaining atmospheric pressure in the water reservoir 59. As is well known, knob 64 may be hollow or may fit loose in bore 63 for keeping the passage open.

A regulating wheel 65 is shown mounted on casing 57 for a thermostatic switch indicated generally at 70 for controlling heating element 36. Conveniently, the thermostatic switch 70 occupies a cavity 68 in the rear portion of the sole plate and is mounted to the sole plate on extension 66 of the partition 24 between cavities 22 and 68. A tapering and forward sloping extension 67 of the partition 24 merges with the humped floor 31 of cavity 22 to provide good thermal conduction between the metal of the humped central part X of floor and the thermostat so that the thermostatic switch will respond promptly to changes in the temperature of the floor 31 and thereby respond promptly to changes in heat demand, as when the water is turned on or off.

When heating element 36 has heated the sole plate to steam generating temperature, knob 64 is turned to open needle valve 61 to admit water through port 35 into the steam generating chamber. The water will flow slowly, e. g., at a rate of 8 or 10 cc. per minute, and probably will issue from the valve port in a small solid stream but may under certain conditions fall from the valve port in discrete drops. The water falls on the high central portion, or hump X, of the heated floor 30 and begins to spread toward the sides. Normally the heat of the floor 30 quickly heats the water and evaporates it, and preferably it completes evaporation before the water reaches the gutter or sumps G so that all evaporation takes place from the thin film of water that spreads down the sloped floor 31. This action minimizes the entrainment of water drops in the steam. However, for high steam rates the sumps provide additional heated surfaces from which to heat the water for evaporation.

Steam rising to the top of cavity 22 passes into the various trap chambers 47 and 52. Such chambers, highly heated, and baffled, serve to catch any water particles in the flowing steam, and evaporate them. Hence the present construction prevents any water droplets or particles which are likely to produce unwanted spots on the work, from being discharged with the steam through the various discharge ports 40, 41 and 42 and steam distributing grooves 43, 44, 45 and 46 to the fabric being ironed.

Since the steam chamber of the present sole plate is intended to operate as a "flash boiler," it is undesirable to let more water accumulate in cavity 22 than can be accommodated as a thin layer on the water-evaporating surfaces thereof. Excessive water in the cavity 22 tends to reduce the temperature of the ironing surface and increase the danger of water drops being carried out with the steam. Such excessive water may accumulate, for example if water is being fed rapidly (for a high steam delivery rate), and at the same time the sole plate is cooled by application to excessively wet work. Generally, the user will be unaware of this flooded condition unless and until water spots appear on the work, and so will be unable to take any timely action for alleviating the flooding. Accordingly it is desirable that the iron purge itself promptly of excessive water without impairing its operation as an iron and without expelling water droplets. The construction and location of the sumps in the steam cavity 22 contribute to meeting this requirement. First, the sumps collect the water close to the heating element 36 so that it is heated rapidly and efficiently. Second, the projections 69 improve the transmission of heat to the water in the sumps. Third, those same projections, by

forming several sumps, reduce the tendency of the boiling water to slop about as the iron is manipulated and thereby reduce the entrainment of water drops in the escaping steam. Fourth, the location of the sumps at the extreme margins of cavity 22 and next the upright walls improve the tendency of the water drops to fall out of the steam from those sumps before leaving the cavity 22. And fifth, the location of the sump close to the path along which heat travels to the central hump X of the floor 31 of cavity 22 insures that the humped part of floor 31 (to which the thermostat 70 responds quickly) will not get much hotter than the sumps. This insures that should the water valve 60 be shut off while the sumps are flooded, the resulting removal of the heat load from the central hump X will not cause the thermostat to deenergize the heating element 36, but insures rather that the water in the sumps will keep the temperature low enough to keep the heating element energized. The fact that the projections 69 contribute to the heat path from heating element to the central hump of floor 31, contributes to this effect.

The construction and arrangement of the evaporating cavity 22 minimizes troubles due to the formation of lime deposits, which must be accommodated because users of irons are disinclined to provide mineral-free water. Because the water spreads rapidly away from the high center part of the floor of the cavity 22, the lime deposits are spread thin over a large area and generally tend to not form close to the top. The distribution of lime will be made random by the varying temperatures and rates of water delivery. Initially a thin mineral deposit facilitates the film-like spread of the water to increase the area over which further deposits are made. If by chance the deposits begin to accumulate more rapidly near the top (near the center of cavity 22) the thermal insulation of such deposits will cause the water to flow farther down the slope. Because of these effects mineral deposits will be scattered and so will need to fill a large proportion of the cavity 22 before they can stop operation of the iron.

It will be apparent that the arrangement just described provides an efficient steam generator for uniformly and quickly delivering steam to various areas of the ironing surface of the sole plate for proper steam ironing operation, and provides an iron that operates well in spite of flooding, that purges itself well, and that tolerates a considerable volume of lime deposits. It will also be apparent that the arrangement avoids circuitous and long passages, the steam reaching all desired areas of the ironing surface from the steam generating chamber by short paths which are highly heated.

The invention is capable of modifications and variations within the scope of the appended claims.

I claim:

1. A sole plate for a steam iron having steam discharge ports therein arranged in a longitudinally-spaced series of transversely-alined pairs, and forwardly arched grooves formed in the ironing surface each connecting with one of said transversely-alined pairs of steam discharge ports and being convex toward the front of said iron, said grooves being of different curvature, each groove being of shallower curvature than the next forward groove.

2. A sole plate for a steam iron having a tapering front portion terminating in a pointed nose having a steam discharge port, a series of longitudinally spaced pairs of transversely-spaced steam discharge ports in the ironing surface of said sole plate front portion, a series of forwardly arched grooves convex toward said nose and each connecting one of said pair of said steam discharge ports, the foremost of said grooves also connecting said nose port, the transverse spacing of said pairs of grooves increasing in a rearward direction and the slope of said arches decreasing in a rearward direction, and means in the sole plate for supplying steam to said steam discharge ports and said grooves.

3. A sole plate for sadiron having a tapering front portion terminating in a pointed nose, a series of longitudi-

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nally spaced, transverse, curved, rearwardly concave grooves in the ironing surface of said tapering front portion, each groove having greater length and span and less slope and sharpness of curvature than the grooves forward of it, and steam port means communicating with each groove for supplying steam thereto.

4. A sole plate for a steam iron having a forwardly tapering front portion terminating in a pointed nose, relatively narrow upstanding walls adjacent the outer edge of the sole plate, a hairpin-shaped heating element embedded in said upstanding walls, said upstanding walls and said heating element substantially following the outline of the sole plate and enclosing a relatively large central steam generating chamber comprising a substantial portion of the area of the sole plate between the said upstanding walls, the said upstanding walls being substantially vertically recessed at intervals substantially directly above the embedded heating element to provide a longitudinally arranged series of separate and discrete small secondary steam chambers in said upstanding walls, said secondary steam chambers being separated from one another by transverse partition walls, exit passages for steam extending down through said upstanding walls and opening through the bottom of the sole plate and communicating with the said secondary steam chambers, and means providing communication between the secondary steam chambers and the relatively large central steam generating chamber.

5. A sole plate as claimed in claim 4, wherein passages extend through the tops of said upstanding walls to provide the communication between the secondary steam chambers and the relatively large central steam generating chamber.

6. A sole plate as claimed in claim 4, wherein each said secondary steam chamber includes therein an upstanding substantially centrally heated baffle disposed over the heating chamber and around which steam from the steam generating chamber must pass to reach the exit passages.

7. A sole plate as claimed in claim 4, wherein the

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steam generating chamber is provided with a fluid distributing floor tapering peripherally downwardly from a substantially centrally located hump forming the highest part of the steam generating chamber and to which liquid is delivered, and wherein the said upstanding walls are provided with inwardly projecting relatively short walls dividing the outer edge of the steam generating chamber into a plurality of marginal sump-like pockets adjacent the heating element and from which steam passes into said secondary steam chambers.

8. A sole plate for a steam iron formed with a steam-generating and fluid-distributing floor having a heated central hump sloping downwardly on all sides towards the margins of the floor, heated walls rising from the margins of the floor and forming therewith a marginal sump, spaced heat-conducting partitions projecting inwardly from said walls and only across the lower marginal portion of the sloping wall of the hump and dividing the sump into a plurality of pockets, means for delivering liquid to the uppermost central part of said hump, and a plurality of outlet passages for steam disposed in the upper portions of said heated walls and with each outlet passage in communication with an adjacent pocket.

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