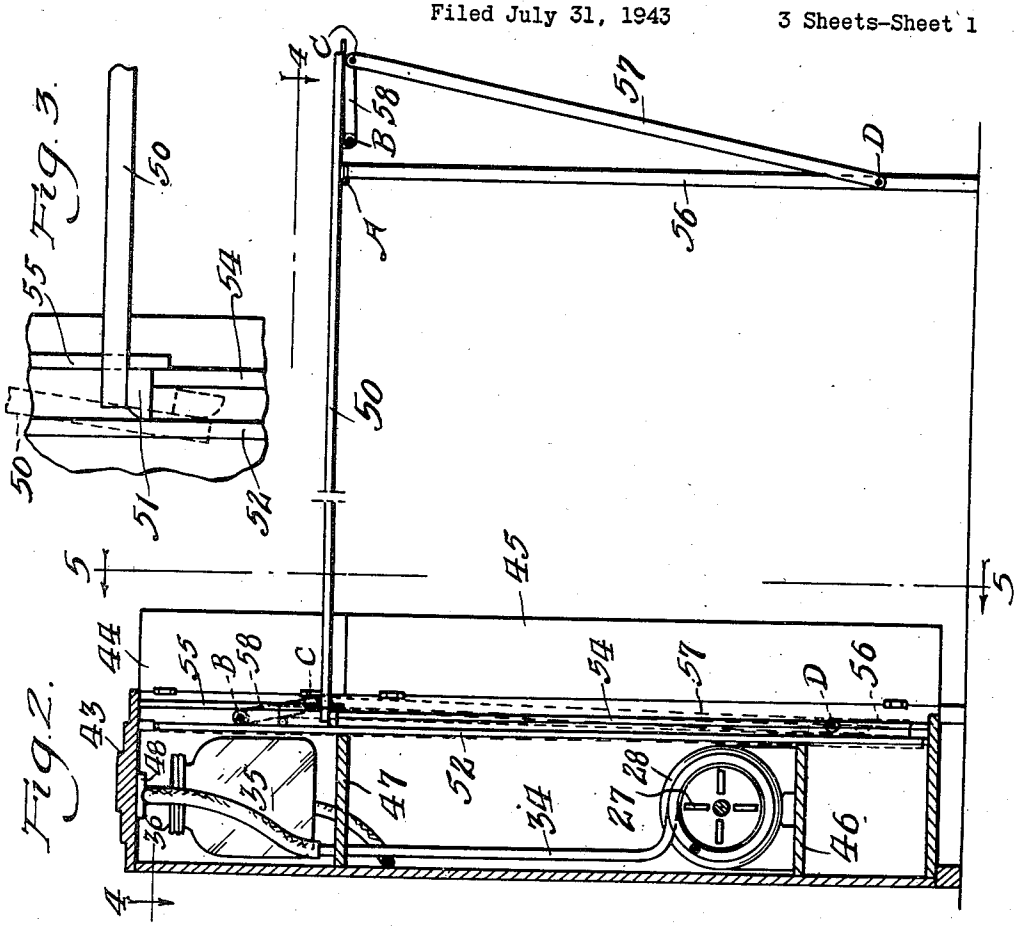
Sept. 16, 1947. A. C. PURPURA 2,427,474

VACUUM HAND IRONING AND DRYING APPARATUS

Filed July 31, 1943 3 Sheets-Sheet 1



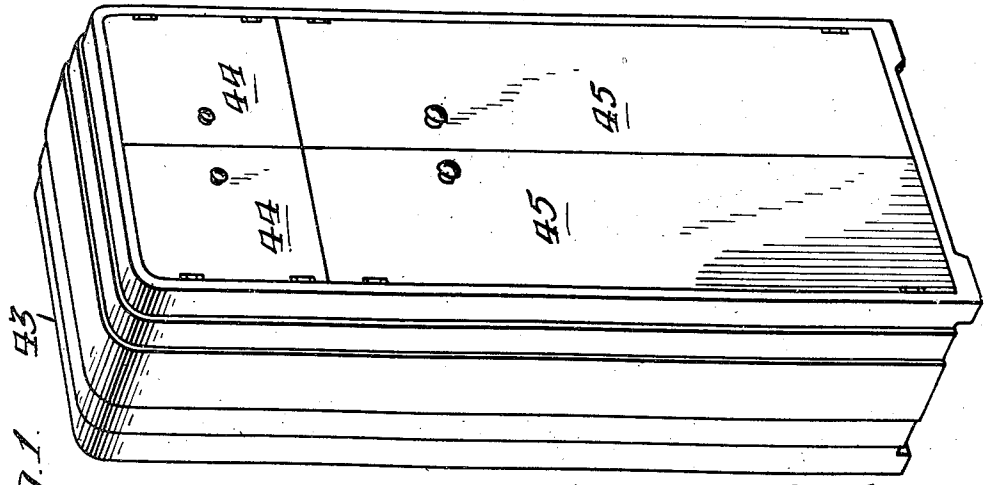


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Fig. 4.

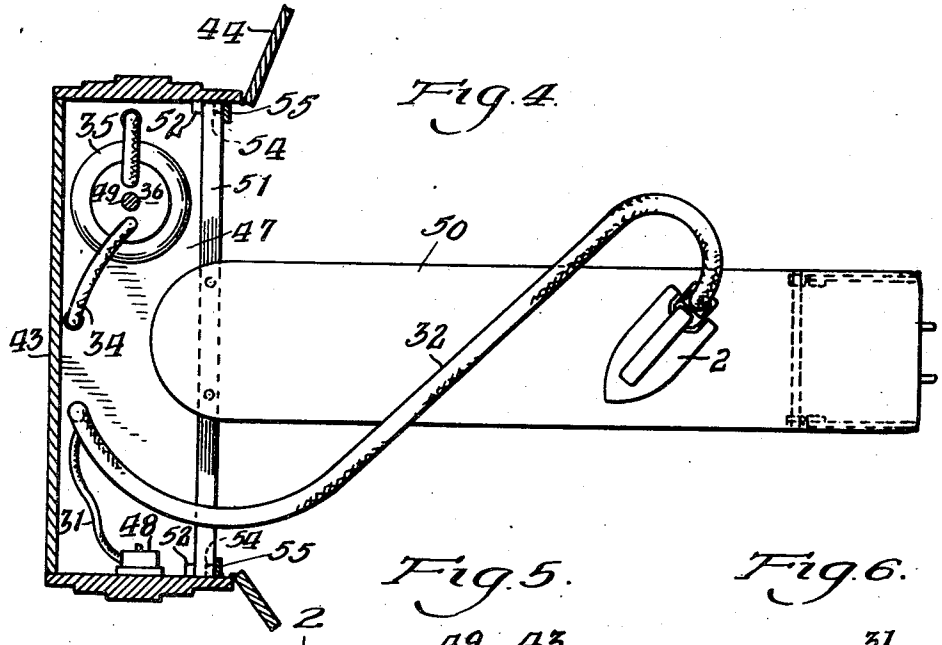

Fig. 5.

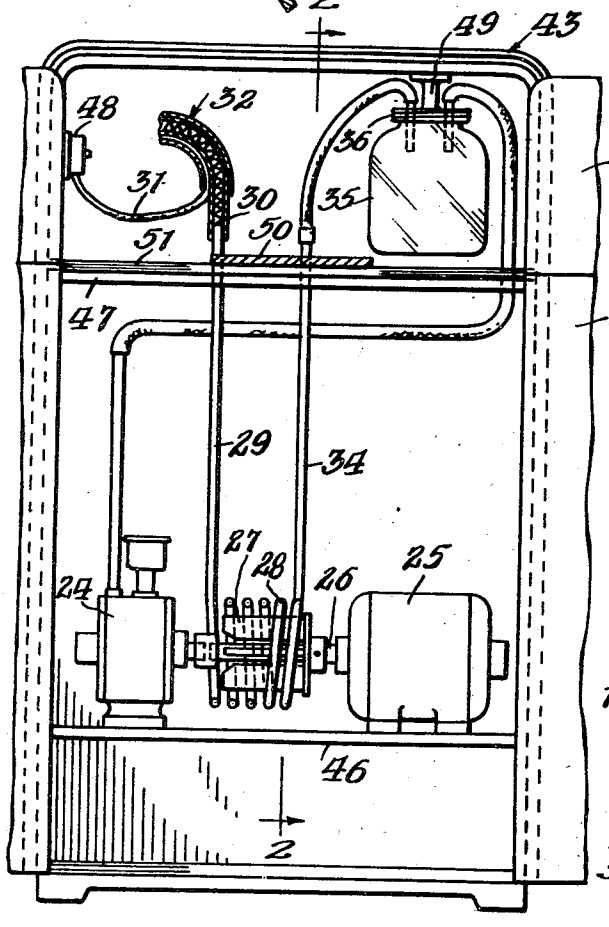

Fig. 6.

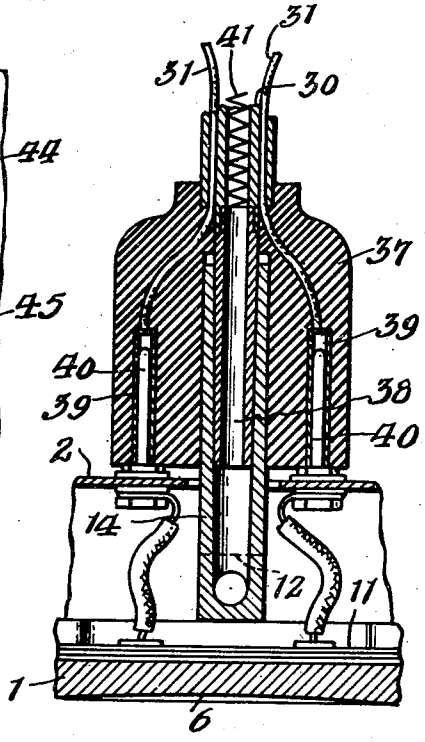

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Fig. 7.

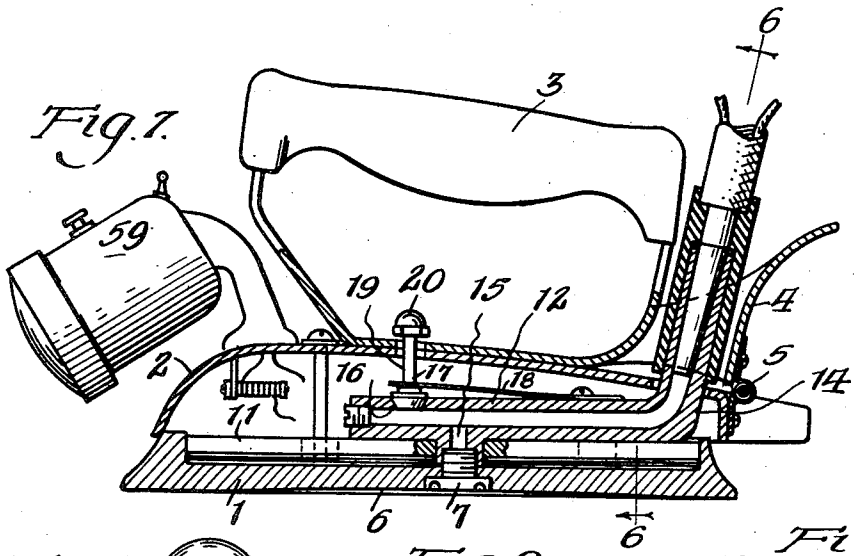


Fig. 8.

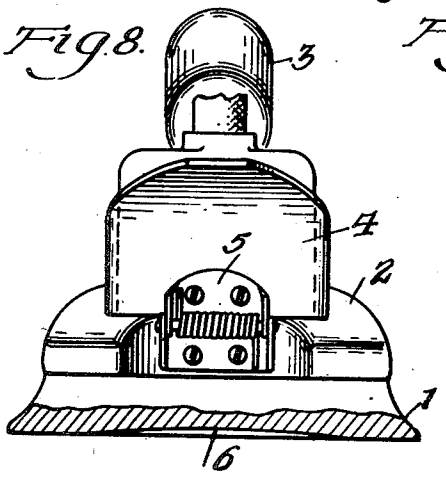


Fig. 9.

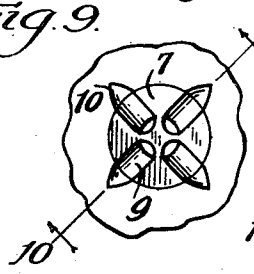


Fig. 10.

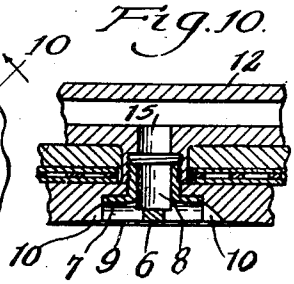


Fig. 12.

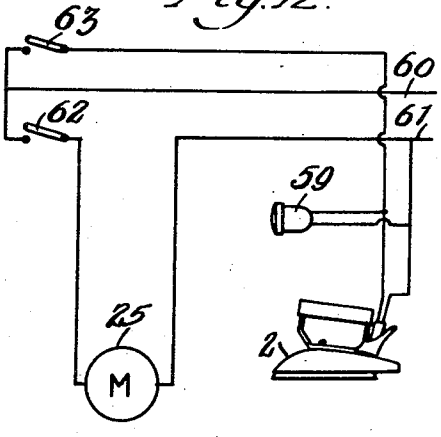
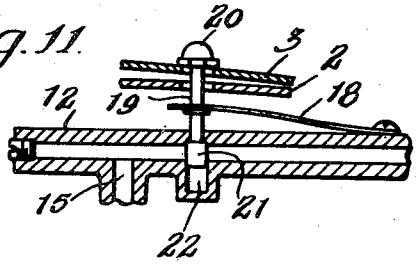


Fig. 11.



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2,427,474

UNITED STATES PATENT OFFICE

2,427,474

VACUUM HAND IRONING AND DRYING APPARATUS

August C. Purpura, Chicago, Ill.

Application July 31, 1943, Serial No. 496,894

11 Claims. (Cl. 38—104)

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The object of the present invention is to make easier and simpler the work of the housewife who irons with electrically heated hand flat irons and to cause the flat irons to fulfill their tasks more rapidly and efficiently than is possible with the ordinary iron.

A subsidiary object of the invention is to provide simple and novel means for carrying away the steam that is created in the fabric being ironed, without lowering the heat transmitting capacity of the iron.

In carrying out my invention the under side or sole plate of the iron is so constructed that a steam collecting chamber or large area lies between the under surface of the iron and the fabric on which the iron is resting. The steam is withdrawn from this chamber by suitable suction means.

A further subsidiary object of the invention is to provide means whereby the user of the iron may easily cause the partial vacuum in the collecting chamber to be destroyed or, at least, be reduced sufficiently to permit the iron to be raised from the fabric being ironed, without having the fabric tend to come up with the iron.

A further subsidiary object of the present invention is to produce a simple, novel, and efficient power plant for creating the necessary suction and condensing the steam into water after it has been withdrawn from the iron.

Another subsidiary object is to produce a simple, compact unit, preferably portable, in which the entire power plant, including motor, pump, condenser and reservoir for the condensed steam, as well as an ironing board that may be opened out therefrom, may be housed in and secured to a small cabinet or the like.

Further objects of the invention have to do with an improved suction tube and an improved coupling for attaching it to the iron.

The various features of novelty whereby my invention is characterized will hereinafter be pointed out with particularity in the claims; but, for a full understanding of the invention and its objects and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawings, wherein:

Figure 1 is a perspective view of a portable cabinet containing all of the apparatus which, together with the cabinet, constitute the present invention in its most highly developed form; Fig. 2 is a vertical section on line 2—2 of Fig. 5, showing the cabinet open and the ironing board extended into ironing position; Fig. 3 is a view of

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a fragment of one of the side walls of the cabinet, showing the inner side, and a fragment of the ironing board at the end which is connected to the cabinet; Fig. 4 is a section on line 4—4 of Fig. 2; Fig. 5 is a section on line 5—5 of Fig. 2; Fig. 6 is a section on line 6—6 of Fig. 7, but on a larger scale than the latter; Fig. 7 is a central, longitudinal, vertical section through the iron and the plug that connects the composite cable thereto; Fig. 8 is a rear view of the iron, with a part thereof, at the bottom, appearing in section; Fig. 9 is a bottom plan view of the iron, only a small fragment, containing the steam outlet, being shown; Fig. 10 is a section on line 10—10 of Fig. 9; Fig. 11 is a view, on the same plane as Fig. 7, illustrating a slight modification, but only a small part of the iron being shown; and Fig. 12 is a diagram of the electrical connections.

The apparatus disclosed in this application is, in the broad sense, similar to that appearing in my prior patent No. 2,402,575 issued June 25, 1946, although most of the details are different. The flat iron itself, illustrated in Figs. 7 to 10, may take any desired form and it may be heated in any suitable way, although it will usually be electrically heated. In the arrangement shown it comprises a heavy sole plate or shoe 1 surmounted by a sheet metal dome-shaped top 2. The framelike handle 3 has a rearward extension 4 that is connected to the rear end of the member 2 by a hinge 5, preferably of the spring type so as normally to hold the handle down. The ironing face contains a large, shallow depression 6 completely spaced apart from the edges of the iron. This recess or depression need not be more than a thirty second of an inch deep. Fitting into a hole in the sole plate at about the center of the depression is a plug 7 having an axial bore 8 extending almost through the same from the top and having lateral channels 9 cut into the bottom face and communicating with the central bore. The bottom face of the sole plate preferably contains short grooves or notches 10 registering with the channels 9. Overlying the heating element 11 within the iron is a conduit 12 that extends rearwardly and then upwardly through the top of the iron in front of the hinge. This upwardly projecting part 14 serves as an element of a two-piece coupling between the conduit and a cable to be hereafter described. The plug 7 is screwed into the under side of the conduit and the latter contains a port 15 that connects the interior of the conduit with the bore in the plug. In the upper side of the conduit, near the front end, is an opening 16 that is normally closed by

a downwardly seating valve 17. A spring 18 normally holds this valve closed. A stem 19 extends from this valve through registering holes, larger than the stem, in the member 2 and the lower bar or arm of the handle. On the upper end of the stem is a head 20, larger than the holes through which the stem passes. Normally the head on the stem stands a little above the uper side of the lower bar of the handle, so that the valve may seat itself without meeting interference on the part of the handle. But, when the handle is swung up, the head is engaged and the valve is lifted, allowing air to enter the conduit and break the vacuum if one exists.

Instead of the valve to let air into the conduit, there may be employed a valve that simply shuts off the conduit. Such a valve is shown at 21 in Fig. 11. This valve, instead of controlling the port 15, normaly rests in a pocket 22 extending down from the bore in the conduit behind the port. When the handle is swung up, as indicated in Fig. 11, the valve 21 emerges from the pocket and extends across the interior of the conduit. When this occurs any vacuum that exists will be broken through leakage of air through fabric that is being ironed and into the depression or chamber in the bottom face of the iron.

It will thus be seen that if the conduit be connected to a suitable suction device, while ironing, steam that is generated anywhere within a large area under the iron is quickly withdrawn through the plug; the recess or depression in the bottom face of the iron being covered by the fabric that is being ironed and constituting a large shallow collecting chamber for steam, this chamber being sealed except for the presence of the outlet through the plug. When the vacuum is great the pull on the ironing board is sufficient to lift it when the iron is lifted. However, if the user first tilts the handle backward, the vacuum is broken and the iron can be raised without carrying the fabric along with it.

The power plant for creating the desired vacuum, withdrawing steam and condensing the steam is illustrated in Figs. 1 to 5. Referring to these figures, 24 and 25 represent, respectively, a pump and an electric motor for driving the same. The pump and motor are connected by a shaft 26, but are spaced far enough apart to provide room on the shaft, between them, for a blower rotor 27. Surrounding the rotor is a stationary coil 28 which is cooled by air blown past the same when the motor is running. The inlet side of the condenser is connected by a pipe 29 to a flexible tube 30 which, together with an electric cord 31, forms a composite cable 32. A second pipe 34 connects the outlet side of the condenser to a bottle 35 or other reservoir, conveniently through the cap 36 thereof. The intake side of the pump is also connected to the reservoir, preferably in the same manner as is the condenser.

The composite cable is connected to the iron by a suitable plug, so that the iron may be heated by current delivered through the cord 31 and steam be withdrawn from the conduit 12 by the pump. The coupling as a whole is shown in Fig. 6. Referring to this figure, it will be seen that the composite cable has at one end a rigid head or plug 37 of insulating material. In this plug are three deep sockets opening out of the free end and arranged parallel with each other. One of the sockets is at the axis of the plug and the other two are disposed on opposite sides thereof. In the central socket is a long metal tube 38, coaxial with but smaller in diameter than the socket. This tube is adapted to be a good fit in the vertical arm 14 of the conduit 12, this arm entering the central socket in the plug when the latter is applied to the iron. In the other two sockets are fixed metal sleeves or bushings 39 that receive terminals 40 rising from the iron on opposite sides of the vertical arm 14 of the conduit in the iron. These terminals are, of course, connected to the heating unit within the iron. The flexible suction tube 30 is joined to the inner end of the tubular coupling member 38 and the cord 31 is divided into two strands each of which is joined to one of the terminals 39.

It will be noted that the thin-walled, flexible suction tube 30 contains an internal core that prevents it from collapsing without forming an objectionable obstruction to the passage of fluids therethrough and without rendering it inflexible. This core preferably takes the form of helical coil 41 of spring wire so as to serve the further purpose of preventing kinking of the suction tube.

In order to adapt the system for convenient home use I house all of the apparatus in a cabinet 43 along with an ironing board. The cabinet as a whole is indicated as being open at the front and as having doors 44 and 45 to close the same except when there is ironing to be done. Within the cabinet are two shelves, 46 and 47, one toward the bottom and the other toward the top. The pump unit is mounted on the lower shelf, while the reservoir is located in the space above the upper shelf. The reservoir is preferably suspended in a manner to bring the bottom thereof a short distance above the upper shelf. Then, if the cap is held against removal from the cabinet, the reservoir can be unscrewed from the cap and emptied of any water contained therein, without disturbing any of the connections to the pump and condenser. The pipe 29 extends up through the top shelf so that the composite cable may be laid on that shelf when not in use. The electric cord 31 is brought to the composite cable from a switch 48 mounted within the upper part of the cabinet on one of the side walls where it is within easy reach of an ironer.

The shelves do not come quite to the front of the cabinet thereby leaving a clear space just behind the doors wherein an ironing board 50 may stand upright when not in use. The ironing board has fastened to one end a cross piece 51 which may be a bar of wood rectangular in cross section. This bar is long enough to span the width of the interior of the cabinet. At opposite sides of the cabinet, just in front of the shelves, are vertical grooves into which the ends of the bar 51 extend. The grooves are so designed that when the bar stands on edge therein it can slide up and down but cannot turn about its longitudinal axis; whereas, when the bar is raised to about the height of the upper shelf, the bar may be turned through an angle of ninety degrees. By this means the ironing board may stand upright in the cabinet with the end having the bar attached being at the bottom, or the board may be raised to about the level of the top shelf and be then swung outwardly until it is horizontal. In Fig. 2 the board is shown in dotted lines in its upright position in the cabinet and in full lines as extended for ironing. Each of the grooves just described can conveniently be formed by fastening strips of wood to the inner faces of the side walls of the cabinet. In the arrangement shown, there is a long strip 52 extending

from top to bottom of the cabinet to define the rear side of each groove. The front side of each groove is defined by a strip 54 that rises from the bottom of the cabinet to about the level of the upper shelf. The strips 52 and 54 are spaced apart from each other a distance about equal to the thickness of the cross bar on the ironing board and much less than the width of that bar. In the upper part of the cabinet, far enough in front of each of the strips 52 to permit the bar 51 to turn about its axis in the space between them, is a short strip 55 that extends down only far enough to overlap the adjacent strip 54 a little. Thus, while the cross bar 51 is in that part of the grooves beside the strips 54 it cannot turn but, when lifted into the widened parts of the grooves, above the upper ends of the strips 54, the bar may be turned and be caused to rest on the upper ends of these strips. Thus the strips 54 serve to support the inner end of the ironing board when the board is in position for ironing. Any suitable support for the outer end of the ironing board, when horizontal, may be provided. In the arrangement shown, there is a main supporting leg 56 hinged to the outer, free end of the board. Cooperating with this leg is a foldable brace composed of a long strut 57 hinged at its lower end to the leg and at its upper end to a link 58 that is quite short; the link being, in turn, hinged to the underside of the board near the hinge that secures the leg to the board. This construction permits the leg to be swung up until it lies against the under side of the board or to be held firmly in an upright position to support the outer end of the board during ironing.

It will of course be understood that the flexible composite cable must be long enough to permit the iron to reach every part of the board for ironing in the usual way.

On the front end of the iron, in position to direct its rays upon the fabric being ironed, is a lamp 59 adapted to destroy with its rays harmful or objectionable germs or spores that may be present in or on the fabric.

In order that the vacuum producing plant need not operate except when desired, I prefer to control the heating of the iron and the energization of the motor independently of each other. This may conveniently be done by a control system such as is shown in the diagram, Fig. 12. In the diagram 60 and 61 are the line wires for supplying current. The iron and the lamp are connected to the line wires in one circuit controlled by a switch 62, while the motor is in another circuit, fed from the same line wires and controlled by a switch 63.

From the foregoing it will be seen that, without adding anything in the nature of an extension to the iron or interfering with the transmission of heat to the entire area of the bottom of the iron, I am able to provide a long, wide chamber for collecting steam directly from the fabric underneath the iron; so that, by connecting a suction apparatus to this chamber, the same ironing procedure as with an ordinary iron of the same size and shape results in much more rapid and effective ironing,

Also, because of the ability to destroy or diminish the vaccum through a slight upward tilting of the handle, it is only necessary to start lifting the iron to release it from the fabric to which it would otherwise cling; the breaking of the vacuum occurring automatically as required.

Further, by interposing a condenser between the iron and the suction pump, the drawing of water into the latter is avoided; thereby permitting the pump to be constructed of materials that are not sufficiently water resistant for use in a pump taking steam directly from the iron.

It will also be seen that because of its peculiar construction the suction tube cannot collapse or kink even though its walls be very thin; so that it may be very light and flexible and thus avoid becoming burdensome to the user.

By employing a coupling consisting of tubular members telescoped upon each other for a considerable length, between the suction tube and the conduit in the iron, a joint that is sufficiently tight to prevent outside air from leaking through is obtained without requiring the user to take more than ordinary care in plugging the cable to the iron.

Finally, the assembly of the entire apparatus and the ironing board in a relatively small cabinet permits ironing to be done in any room and at any place in one's house, without requiring any more preliminary work than that of moving the cabinet to the desired location and plugging into a wall socket; the ironing board being easily set up or stored wherever the cabinet may be. Since all of the apparatus is fastened to the cabinet there are no loose pieces to become mislaid. Also, all the servicing that is required is the occasional emptying of the bottle or jar which needs only be unscrewed, emptied, and then replaced in the cabinet.

I claim:

1. The combination with a hand flat iron having means to collect steam from fabric being ironed, of a suction conduit connected to the iron for carrying away the steam so collected, a handle hinged at its rear end to the iron for vertical swinging movements, a spring held valve for controlling the suction effect of said conduit, a loose connection between the handle and the valve to cause the valve to be operated when the handle is swung up through a small angle and leave the valve free to adjust itself while the handle is down, and a spring yieldingly holding the handle down.

2. A hand flat iron having its heated under face dished slightly over a large area that is surrounded by plane marginal portions for cooperation with fabric being ironed to form a seal around the dished area, a suction conduit having a small inlet in said face for carrying away steam from underneath said area, and means for producing a suction in said conduit.

3. The combination with a hand flat iron having in the heated area of the under face means to collect from over a large area and confine between said face and fabric being ironed steam generated in said fabric and an opening through such face for the escape of the steam, a conduit connected directly to said opening for the reception of steam so collected, means to create a suction in said conduit, and manually controlled means on the iron to make and break the suction in the vicinity of the aforesaid means.

4. An apparatus as set forth in claim 3, wherein the manually controlled means is a valve for shutting off said conduit.

5. An apparatus as set forth in claim 3, wherein the manually controlled means is a valve for placing the space below the iron, in the steam collecting area, in communication with the surrounding atmosphere.

6. The combination with a cabinet, of an iron-

ing board connected to the same for movements from a position within the cabinet to a position in which it extends horizontally from the cabinet while supported at one end by the latter, a vacuum producing plant housed in the cabinet, a flat iron having in the heated pressing surface a small inlet adapted to collect steam from fabric being ironed and having an outlet for the steam so collected, and a flexible suction conduit operatively connected at one end to said plant and having at its other end a device operatively connecting it to the outlet on the flat iron to cause the collected steam to be withdrawn, said conduit being long enough to reach all parts of the ironing board in the extended position of the latter.

7. The combination with a cabinet, of an ironing board connected to the same for movements from within the cabinet to an extended horizontal position outside of and supported at one end by the cabinet, a flat iron having in the heated pressing surface a small inlet adapted to collect steam from fabric being ironed and having an outlet for such steam, a vacuum producing plant housed in the cabinet, said plant including a reservoir in which a partial vacuum is produced when the plant is in operation, the reservoir having a detachable top, means to secure the reservoir top to the cabinet so as to hold the body portion of the reservoir suspended and removable therefrom at will, and a flexible suction conduit operatively connected at one end to the reservoir top and having at its other end a device operatively connecting it to the outlet on the iron, said conduit being long enough to reach all parts of the ironing board in the extended position of the latter.

8. In combination, a cabinet, an ironing board housed in the same and adapted to be extended therefrom into an ironing position, a flat iron having in the heated pressing surface a small inlet adapted to collect steam from fabric being ironed and having an outlet for such steam, a vacuum producing plant in the cabinet including a reservoir in which a partial vacuum is produced when said plant is in operation, a conduit attached at one end to the iron in communication with the said outlet, and a condenser for steam operatively connected at the inlet side to the other end of the conduit and at the outlet side to the reservoir.

9. In combination, a cabinet, an ironing board housed within the same and adapted to be extended therefrom into an ironing position, a flat iron having in the heated pressing surface a small inlet adapted to collect steam from fabric being ironed and having an outlet for such steam, a vacuum producing plant in the cabinet including a reservoir in which a partial vacuum is produced when the plant is in operation, the reservoir comprising a screw cap fixed to the cabinet and a body member suspended from the cap, a

conduit connected to the outlet on the iron, and a condenser for steam in the cabinet and interposed between and operatively connected to the conduit and to the reservoir through the reservoir cap.

10. The combination with an electrically heated flat iron having means to collect simultaneously from a large area of the surface of fabric being ironed and confine below the face thereof steam created in the fabric and a small opening for the escape of such steam, of a suction producing power plant including a suction conduit operatively connected directly to said opening to withdraw steam so collected and also including an electric motor for operating the plant, and means at will to energize the iron and the motor or only the motor.

11. An apparatus for withdrawing steam generated in fabric being ironed, comprising a hand flat iron having means to collect such steam during ironing and a small opening for the escape of such steam, a pump, a reservoir for water connected to the suction side of the pump, a steam condenser, tubular means operatively connecting one side of the condenser to the reservoir, and means including a tubular element connected at one end to the other side of the condenser and connected at its other end to the iron in a manner to recover from said opening in the iron the steam collected as aforesaid.

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