This invention relates to steam generators and more particularly to portable units adapted for use in combination with pressing irons and with steam cabinets employed in vapor treating fabrics, furs or the like.

One of the objects of this invention is the provision of an electrically heated portable device arranged for substantially instantaneous generation of steam from cold water whereby only such quantities of steam as are immediately required are generated, thereby obviating the potentially dangerous accumulation of excessively high pressures in the steam generating chambers.

Another object of this invention is the provision of a device of the above character wherein the steam is very highly vaporized and the liability of discharge of condensate eliminated.

A further object of this invention is the provision of a device of the above character which is relatively light in weight and which permits maximum maneuverability in operation, being efficiently operable at any position in which it may be tilted.

A still further object of this invention is the provision in a device of the above character, of a thermostatic control for the electrical heating means for preventing damage to same while steam is not being generated.

A still further object of this invention is the provision in a device of the above character of means for adjusting the temperature of the heating element and the rate of flow of feed water whereby substantially all of the feed water entering the apparatus is substantially instantaneously converted into steam.

With the foregoing and other objects in view, the invention consists of the novel construction, combination and arrangement of parts, as will be hereinafter more specifically described and illustrated in the accompanying drawings.

In the drawings,

Fig. 2 is a vertical cross sectional view with parts fractionally illustrated in elevation.

Fig. 3 is a cross sectional view taken on line 3—3 of Fig. 2.

Fig. 4 is a vertical cross sectional view of the parts shown fractionally in elevation in Fig. 2.

Fig. 5 is a cross sectional view taken on line 5—5 of Fig. 2.

Fig. 6 is a perspective view of a detail.

Fig. 7 is an elevational view of another detail.

Fig. 8 is a bottom plan view of same looking in the direction of the arrows 8, 8 of Fig. 7.

Fig. 9 is a fragmentary elevational view partly in cross section of a modified form of my invention.

The invention consists of steam generating means comprising a housing provided with thermostatically controlled electrical heating means and water injecting means for controlling the supply of feed water admitted into the steam generating chambers. The housing is constructed of a plurality of component parts which when in assembled relation provide chambers and interconnecting conduits disposed at various elevations. Disposed substantially centrally of said housing and intermediate other chambers in the housing is a longitudinal bore adapted to receive an electrical heating element. The said element is contained in a cylindrical housing having on its outer surface a helical groove or a series of grooves arranged in any desirable pattern to provide a continuous passage for steam through the various chambers. The groove or grooves similarly may be formed in the longitudinal bore of the housing. Feed water is delivered to the injecting means under pressure from a supply tank. The injecting means is provided with a valve adjustable for controlling the flow of feed water whereby to balance the same against the heat output and so control the flow of generated steam. The construction of the device is such that its operating efficiency remains constant through every position of operation.

Referring to the drawings wherein is shown a preferred embodiment of our invention, the numeral 10 indicates, generally, our device connected to a source of feed water supply designated by the numeral 12 and hereinafter to be described.

Our device comprises a body portion 13 to which is secured a sole plate 14 and a handle 15. The boy portion 13 is formed preferably of a casing of light metal, such as aluminum, and is cored to provide intercommunicating steam generating chambers 17 and 18, the chamber 18 being plugged, as at 20. A threaded water inlet opening 21 is provided in the top of the body portion 13 and communicates with the chamber 18. A suitable union device is received in the opening 21 and serves to connect the apparatus to a feed water supply, as will hereinafter be described. Provided in the top surface of the body portion 13 is a central opening 22 internally threaded and arranged to receive a dome shaped
cap member 24. Axially aligned with the opening 22 is a threaded passage 25 communicating between the chamber 17 and 18.

A member 27, shown in detail in Figures 7 and 8, comprises a hexagonally shaped body portion 28 and a reduced thread portion 29 adapted for threaded engagement in the passage 25. The said member is pierced to provide there through a central passage 30 and radially disposed passages 32. The opening 26 is counter-bored, as at 33, to provide clearance for the flow of feedwater and steam through the passages 32.

Positioned within the chamber 17 is a sleeve 34 having a threaded aperture 36 aligned with the passage 26. Suitable for modulating the reduced end portion 29 of the member 27. The ends of the sleeve 34 are tapered interiorly to provide seats for complementary engaging surfaces of the end nuts 37 and 38, the nut 38 being of the cap type and providing a closure for the sleeve 34. Positioned in the sleeve 34 is a cylindrical shell 40 having on its surface a continuous helical groove 41 and having threaded ends for receiving the nuts 37 and 38. It will be understood that the groove above referred to may assume any desired pattern and may be formed in the inner surface of the tube 34. As is shown in Fig. 2, the portions of the shell 40 adjoining the helical groove 41 at each end are of reduced diameter to provide clearance for the passage of fluid through the aligned apertures 43 and 44 of the sleeve 34 and body portion 13 respectively. Arranged within the shell 40 and extending substantially the full length thereof is an electrical heating element 45 having its terminals passing through the shell 40 and connected to contact posts 47. The shell 40 is plugged at both ends, a metal plug being fitted in the end 46 and a ceramic plug being fitted at the other end 48, the latter plug accommodating the terminal portions of the electrical element 45.

Secured to the nut 37, as by screws, is a substantially U-shaped member 49, shown in elevation in Fig. 5. The member 49 is formed preferably of a nut similar to the nut 38, but is cut down in height and has secured on its upper surfaces, as by screws, a strip like member 50 having downwardly directed end portions 51. The member 50 is provided with a pair of apertures 52 in which the contact posts 47 are received. The said posts being in contact with the member 50 and being insulated against electrical contact therewith.

The plate member 53 having a looped portion 54 is secured to the member 45, as by screws, and serves as a shield or guard for the electrical connections and contact posts 47.

The under side of the body portion 13 is recessed to provide a relatively large hollow space 55 and the walls defining same are provided with abutment shoulders 57. A casing 58 provided with flanges 59 is received in the hollow space 55 with the flanges 59 abutting the shoulders 57 and secured thereto. A pair of bores 60 are provided in the casing 58 for passage of the steam. Referring to Fig. 1, it is seen that chambers 51 and 52 formed in the hollow space 55 are substantially aligned with the apertures 43 and 44 and that the floors of these chambers are below the entrances to the bores 58. Thus, a trap is provided for any condensate with may be in the apparatus. A sole plate 13 provided with a plurality of steam discharge orifices 63 is secured, as by screws, to the casing 58 and to the body portion 13.

Suitably mounted on the body portion 13 is handle member 15 in which is contained the feed water control, presently to be described. As seen in Figure 4, the handle member is hollowed out to accommodate two tubular sections 66 and 67. An electric wire 64 is contained in the section 66 and is connected to a connector plug 63 and to a thermostatic control 70 which is arranged for electrical contact with the contact posts 47.

The tubular section 67 is formed of two parts 72 and 73 in threaded engagement with each other, the part 73 having a reduced internal bore 74 which serves as a bearing for the valve stem 75. The said valve stem 75 is secured with collars 72 and 71 and a needle valve portion 76. A diaphragm is mounted on the valve stem 75 and has its peripheral portions anchored in the valve housing 81, thus providing an air tight seal between the needle valve portion 76 and the body of the valve stem 75. The end of the valve stem 75 is threaded to receive a swivel joint 82 which is arranged for sliding movement in the tubular section 73. A pivoted finger engaging lever 80 is in engagement with the swivel rod 84 and is arranged to move the valve stem 75 against spring 83 to unseat the needle portion 76 from the valve seat 69 and thus to open the valve. The movement of the valve stem is limited in one direction by the valve seat 69 and in the other direction by the shoulder 87.

A suitably mounted 89 connects a flexible hose 89 to the valve housing 81, the hose being connected to a source of feed water supplied under pressure. For illustrative purposes, the source of feed water is shown as a tank 91 provided with an air pump 92 for building up pressure within the tank. An arrangement such as above described is desirable because of its portable character.

Communicating with the valve structure hereinabove described, as by a conduit 84, is another valve construction indicated generally by the numeral 95. The said valve construction includes a valve housing 96 and a manually operable needle valve stem 97 and is arranged to provide a variable orifice through which feed water enters the steam generating apparatus. By this means, the operator may continuously adjust the rate of suitably securing the valve stem 75 to the heating element in such relation so as to generate steam substantially instantaneously. The valve 95 communicates with an expansion chamber 99 disposed directly over the opening 21 of the body portion 13.

In Figure 9 is shown a modified construction. Here the sole plate 109 has been modified to accommodate a heating element 101 for heating same so that the apparatus may be used as an electrically heated steam iron.

In operation, the tank 91 is first filled with water and air is pumped in so that the water will feed under pressure to the apparatus. The electrical heating element 45 is then switched on and when a sufficiently high temperature is reached the apparatus is ready for use. When the control lever 83 is rocked upward, the needle valve 85 is unseated and water will flow through the valve, through the conduit 64, through the valve 95, into the chamber 13 where it is almost entirely converted into steam, particularly upon contact with the member 27 which, as will be seen in Fig. 2, engages the shell 40 and is in effect a hot spot.

The passages 32 in the member 27 provides a
maximum surface exposed for contact with the water in the chamber 18. From the chamber 18, the steam passes through the passages 35 into the chamber 17 where it flows in the helical groove 41 towards the ends of the chamber. In this chamber the steam is substantially superheated and all particles of water which may have escaped from chamber 18 are converted into steam. The steam then passes through the aligned apertures 43 and 44 into the chambers 61 and 62, through the bores 63 and is discharged through the orifices 63 in the sole plate.

From the foregoing, it will thus be seen that we have provided an efficient steam generating device in which substantially instantaneous generation of steam is effected in quantities sufficient to meet immediate requirements, without the danger of excessive steam pressure.

We claim:

1. A steam generator of the character described comprising a body member having a longitudinal bore provided with a channel, an electrical heating element disposed within said bore, a chamber formed in said body member over said bore and having a passage communicating therewith, a heat exchanger received in said passage, said heat exchanger comprising a portion having a plurality of longitudinal passages disposed about a central passage communicating with said upper chamber, said upper chamber being arranged to receive a supply of feed water under pressure and to serve as a preliminary vaporizing chamber therefor, the steam formed in said chamber passing through said heat exchanger and being conducted in said channel around said heating element whereby to substantially superheat said steam, and means for regulating the temperature of said heating element and the rate of flow of feed water in such relation whereby substantially instantaneous generation of steam is effected.

2. A steam generator of the character described comprising a body member having two chambers one above the other and communicating with each other by means of a heat exchanger, a heating element disposed in the lower of said chambers and arranged to heat the upper of said chambers, the said upper chamber being connected to a source of water supplied thereto under pressure and serving as a preliminary vaporizing chamber, the steam from said chamber passing through said heat exchanger and being conducted in said lower chamber for super heating, a plurality of steam discharge outlets communicating with said lower chamber and arranged to discharge steam as it is generated whereby the formation of excessive steam pressure in said generator is avoided, and means for regulating the temperature of said heating element and the rate of flow of feed water in such relation whereby substantially instantaneous generation of steam is effected.

3. A steam generator of the character described comprising a body member having two chambers one above the other, and communicating with each other by means thereof, said means comprising a heat exchanger formed of a body portion having a plurality of longitudinal passages disposed about a central passage communicating with said two chambers, a heating element in the low-