March 17, 1959 W. K. TAVENDER ET AL 2,878,360

PORTABLE STEAM GUNS AND STEAM-SUPERHEATING APPARATUS THEREFOR

Filed Aug. 15, 1957 2 Sheets-Sheet 1

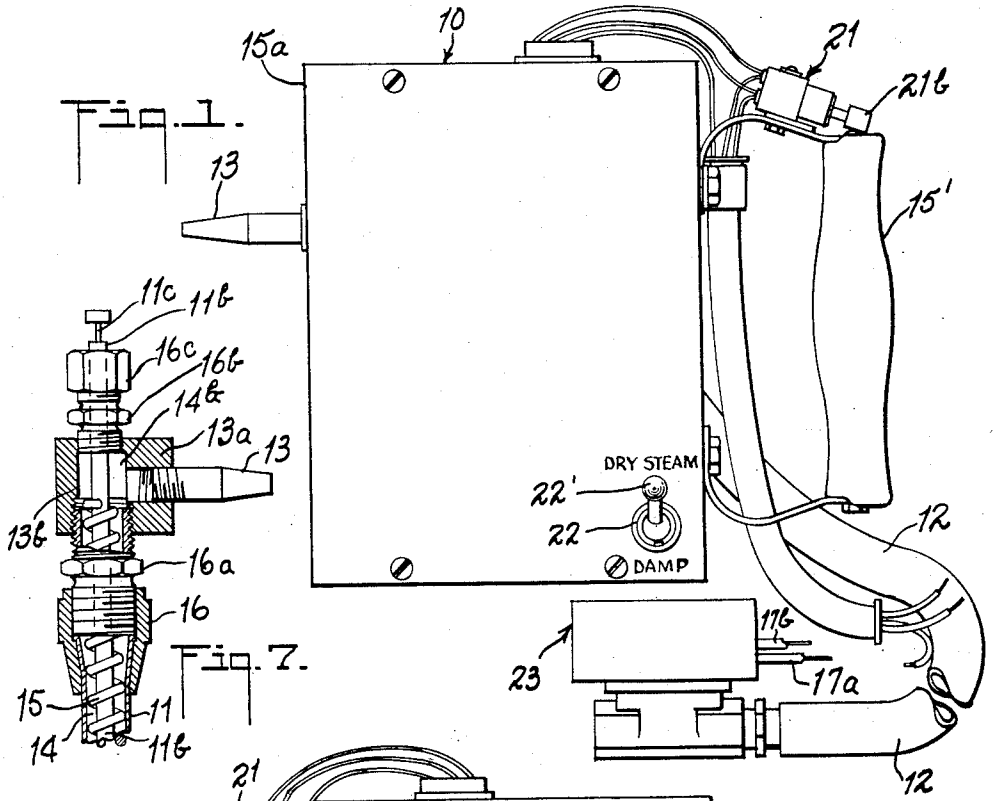


Fig. 1.

Fig. 7.

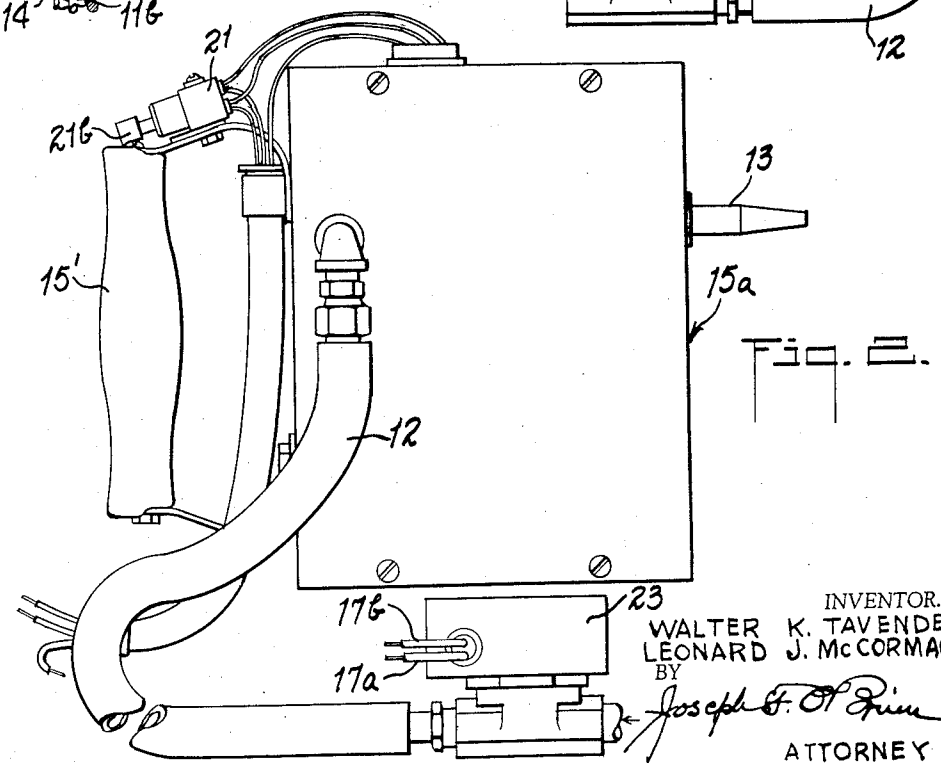


Fig. 2.

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Fig. 3.

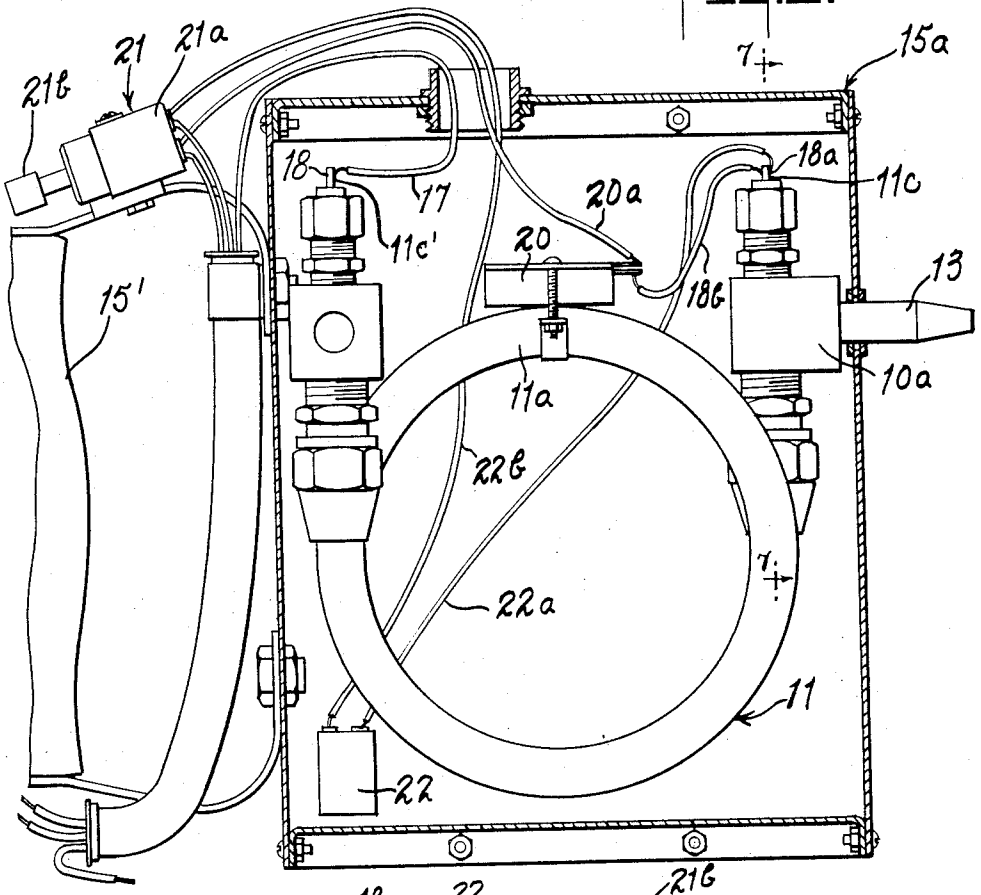
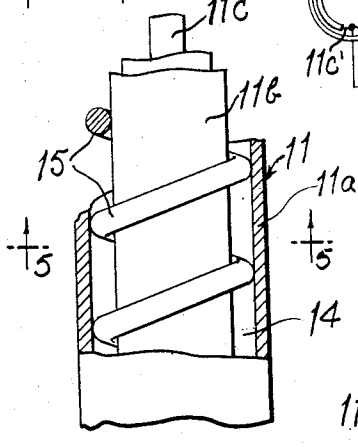


Fig. 4.



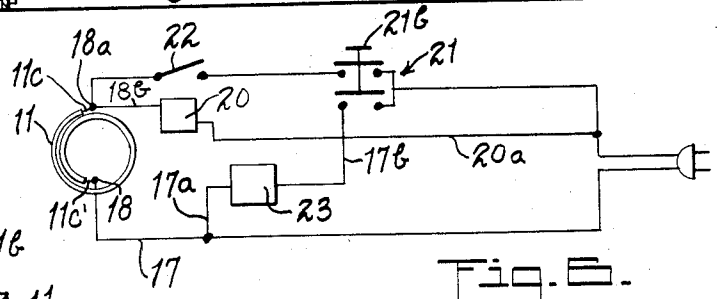
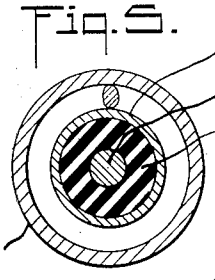


Fig. 6.

Fig. 5.



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PORTABLE STEAM GUNS AND STEAM-SUPERHEATING APPARATUS THEREFOR

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Application August 15, 1957, Serial No. 678,295

6 Claims. (Cl. 219—39)

This invention relates to improvements in portable steam guns and steam-superheating apparatus therefor.

Steam guns and like steaming apparatus are employed largely by retail dry goods stores to freshen garments and to remove wrinkles and fold marks and it will be understood that in such devices where steam is generated in a conventional boiler or electrical steam generator and then passed through steam-conducting pipes or hoses and discharged, steam will flow when the discharge valve is opened and with it will be discharged a considerable amount of condensation until the hose becomes hot, and even after the hose becomes hot, the temperature of the steam in the said conduit will be continuously reduced and cooled by the surrounding air as it passes through such steam-conducting pipe or hose.

One of the objects of our invention is to utilize in such a steam gun or steaming apparatus means for superheating steam during the passage thereof through the steam gun conduit and for discharging such steam in superheated condition so as (1) to avoid condensation of the steam being employed, and (2) to more readily and deeply penetrate the goods and thereby to greatly increase the speed and thoroughness of the operations of freshening garments and removing wrinkles and fold marks therefrom.

The steam gun or steaming apparatus of applicants may be used also for other purposes as, for example, the cleaning of various types of equipment such as used in restaurants and butcher shops for the preparation of food and in garages for the cleaning of automobile seats and other parts, and in all such cases the discharge by the steam gun of steam in superheated condition avoids steam condensation, cleans quicker and enables a more thorough and speedier job to be done.

Another object of our invention is to produce a steam gun or steaming apparatus that will, by the use of an electric heating element disposed axially within a steam-carrying conduit in association with its steam discharge outlet or nozzle, superheat and discharge from such outlet or nozzle in a superheated and thoroughly hot condition steam supplied thereto from a suitable steam supply source such as a steam generator, thus providing a compact, practical means for superheating steam during passage or movement thereof through a steam gun or steam-discharging apparatus and avoiding condensation upon impingement of the steam with the fabric or other work surface and also by providing a supply of hot steam of ample quantity for the purpose intended greatly increasing the speed and effectiveness of the cleaning operation and also providing for the operation steam that is thoroughly dry and free from condensation and which when applied to fabrics or dry goods will penetrate and clean the fibres of the goods and enable such goods or garments to resume normal shape without sagging in any way.

Another object of our invention is in a portable steam gun or steaming apparatus to provide a coil composed of a steam conducting conduit having steam-superheating means so mounted within the same as to enable steam passed therethrough to be thoroughly superheated and thus to completely avoid all cooling and condensation such as occurs when steam is passed directly through a conventional hose or pipe and is discharged from a conventional nozzle.

Another object of our invention is to provide a steam gun that embodies an electrical heating element so arranged in the steam gun conduit close to the discharging nozzle that the steam being supplied will be thoroughly superheated and discharged from a hot nozzle.

Another object of our invention is in a steam gun to utilize a standard electric heating element of the tubular type comprising a centrally-disposed current-carrying wire suitably supported by insulating material within a tube preferably of suitable metal of small diameter. Such tubular heating element is mounted axially within a steam-conducting conduit so as to provide an annular channel therebetween and to apply within such annular channel means that will cause steam passed through the same to follow an elongated path surrounding such axially-mounted element.

Another object of our invention is in a steam gun to provide a steam conduit having mounted axially within the same a standard electrical heating element of tubular type hereinabove referred to and to provide between said tubular heating element and the inside surface of the conduit a helical wire arranged to contact the tubular heating element at one side thereof and the inner surface of the conduit at the opposite side thereof, and thus to provide a helical path or channel between the heating element and the conduit that will cause steam passed through said channel between the conduit and the tubular heating element to traverse a helical path over said heating element and thus to be thoroughly superheated during its passage.

Another object of our invention is in a steam gun to utilize a steam-superheating unit in the form of a coil composed of a tubular steam conduit and enclosed electric tubular heating element mounted to produce a helical steam-superheating channel and to house this coil unit within a suitable enclosure for ready handling by the user.

Another object of our invention is to form our conducting conduit having the tubular heating element mounted therein into a superheating coiled unit having projecting ends and to utilize opposite projecting ends of the charge-carrying wire of said tubular heating element for the necessary electrical connections to produce a heating current within the superheating coiled unit, said heating element and steam-carrying conduit being securely mounted together as an integrated and relatively small portable device that will enable steam to flow through the helical steam channel the full length of said helical channel and tubes to supply superheated steam and will provide means to cause a current of electricity to flow through said charge-carrying wire for the application of heat to steam in said coiled superheating unit.

Another object of our invention is to utilize a portable steam gun that will clean and remove wrinkles from drygoods and like fabrics so effectively as in many cases to avoid the necessity for the pressing of such goods and fabrics.

With these and other objects in view, the invention comprises the combination of members and arrangement of parts so combined as to co-act and cooperate with each other in the performance of the functions and the accomplishment of the results herein contemplated, and comprises in one of its adaptations the species or preferred form illustrated in the accompanying drawings, in which:

Fig. 1 is a side elevation of our steam gun showing one side of its enclosing casing with projecting spout, part of

the liquid supply conduit, electrical wiring, and the electrical operating mechanism;

Fig. 2 is a side elevation of the opposite side of said enclosing casing with projecting spout and showing the liquid supply conduit partly broken away as well as the electrical wiring and electric operating mechanism;

Fig. 3 is a longitudinal section of the casing showing the internally-mounted steam-superheating conduit coil, the projecting spout connected thereto, the body of the electric valve-controlling switch and other electrical connections and operating mechanism;

Fig. 4 is an enlarged fragmentary illustrative view showing the steam-superheating conduit with the tubular electric heating element mounted axially therein and the spirally wound wire arranged between the outer conduit and the heating element to provide a spiral channel for superheating steam during passage thereof from the supply inlet to the discharge spout;

Fig. 5 is a section on the line 5—5 of Fig. 4 looking in the direction of the arrows;

Fig. 6 is a wiring diagram showing electrical connections of the superheating conduit coil with switch mechanism for controlling discharge of superheated steam through the nozzle; also connections with a thermostat for controlling the heat of the superheated steam and connections to a solenoid valve mechanism for controlling the steam supply; and

Fig. 7 is a vertical section of the spout and the connected superheating conduit showing the connection at the spout of the heating element and of the helical coil of wire used for increasing the length of the path of steam through said conduit.

Referring now to these drawings, the apparatus in issue herein essentially comprises a portable steam gun **10** (see Fig. 3) that provides a steam-conducting conduit **11** suitably connected at its outlet end with a discharge nozzle **13** and which at its inlet end is suitably connected with a supply conduit **12** (see Fig. 2) which in turn is connected with a suitable source of steam, such as a steam generator (not shown). Steam is thus after passage through the steam conducting conduit **11** discharged in a suitable stream through said nozzle **13** for use in treating textiles, drygoods and/or other uses.

In accordance with our invention, our steam gun **10** is provided in the steam-conducting conduit **11** with steam superheating means and is short in length and light in weight to permit portability and ready and easy handling. Our apparatus notwithstanding such short length and light weight will produce a completely and thoroughly superheated steam in the steam gun **10** and will enable such superheated steam to be discharged in such hot condition as to avoid condensation and by its heat also to enable more ready and deep penetration of drygoods. With this end in view, we provide means for superheating the steam as it passes from its connection with the supply conduit or source **12** through the conducting conduit **11** and to the connection with the discharge nozzle **13**. For this purpose we utilize a steam-superheating conduit **11** composed of a pair of axially interpositioned tubes comprising an outer or outside steam-conducting conduit **11^a** of relatively large size which is used as an enclosing conduit or tube and a smaller enclosed inner element or tube **11^b** mounted axially within said outer conduit or tube **11^a** and having embodied therein an electric heating element which preferably fills the entire space within the inner tube **11^b** and comprises as shown in Figs. 4 and 5 a centrally-disposed charge-carrying wire **11^c** surrounded by insulating material **11^d**.

Heating elements have heretofore been mounted in tubes and are known as "tubular heating elements." These tubular heating elements have heretofore been used in pressing irons and for other purposes, and in the instant invention we utilize a tubular heating element of standard diameter and mount the same axially within the outer steam-conducting conduit **11** of the gun **10** in such position as to provide a steam-passing channel **14** between the outer surface of the heating element tube **11^b** and the inner surface of the larger steam-conducting conduit **11**. In steam-superheating devices of our invention heretofore produced, our standard heating element tube has been 5/16" outside diameter and the outer steam-carrying enclosing conduit has been 7/16" inside diameter, and when the heating element **11^b** is axially mounted as above indicated this leaves a channel of sufficient width to permit passage of steam in suitable volume therethrough.

It is desirable in order to procure effective superheating of the steam being passed through the channel **14** between said steam-conducting conduit or tube **11** and steam-heating tubular elements **11^b** to cause such steam to follow a long or extended path and with this end in view, a helical coil of wire **15** is employed for mounting the smaller tubular heating element within the larger conduit. Said wire **15** closely engages the outer surface of the smaller tube **11^b** and also closely contacts the inner or internal surface of the larger conduit or tube **11**. The interpositioning between the outer and inner tubes **11** and **11^b** of such helical coil of wire produces a channel **14** of helical contour between such tubes. This wire **14** is preferably of fairly large helical pitch comprising about 3/4" and provides an elongated helical channel **14** through which steam will flow normally under suitable pressure from the source of supply and within which channel the flowing steam will be thoroughly superheated.

In the preferred form of our invention illustrated, the steam-conducting and superheating conduit **11** is, as shown in Fig. 3, formed into a coil and said coil is suitably mounted within an enclosing casing **15^a** through which at one side the discharge nozzle **13** extends and which at the other side is provided with a handle **15'**.

The superheating conduit **11** and its axially-positioned tubular heating element **11^b** are independently connected (see Fig. 7) by fittings **16**, **16^a** and **16^b**, **16^c** with the bore **13^b** of the nozzle block **13^a**. Said fittings cause said heating element **11^b** to extend completely through said bore and above the upper end thereof where one end of the wire **11^c** of said heating element projects above the fittings and forms an electric terminal for one end of the coiled conduit **11** and heating element **11^b**. The channel forming helical wire **15** extends to the steam-outlet portion of the said bore **13^b** of the block **13^a** close to the discharge nozzle **13**. Superheating of steam may thus be continued in said helical channel **14** as it passes points close to the outlet.

A readily-portable steam gun or steam apparatus **10** is thus produced that is not only capable of ready and easy handling but which will enable thorough superheating in a relatively short steam-conducting and superheating conduit, which is preferably coiled, and said superheated steam may be discharged without condensation.

In our preferred embodiment, we utilize a thermostat **20** to maintain the steam within the coiled conduit **11** at a predetermined temperature. As shown, said thermostat is mounted within the casing **15^a** on the upper coiled portion **11^a** of the coiled conduit **11**. Maintenance and discharge of superheated steam at such predetermined temperature is accomplished by electrically connecting the thermostat **20** in a circuit with the coiled superheating unit **11**. As illustrated, wire **18^b** connects one terminal of said thermostat **20** directly to the projecting wire **11^c** of the tubular heating element **11^b** and the other terminal of the thermostat is connected in the circuit by wire **20^a** to a suitable source of current supply, and by wire **17^a** to solenoid valve **23** to wire **17^b** into switch **21**, as shown in Fig. 6.

Discharge of such superheated steam from the coiled conduit **11** is thus controlled by the said finger-operated switch **21** which is conveniently mounted on the handle **15** of the gun **10**. The switch **21** is a conventional switch having a fixed body portion **21^a** and a movable finger-actuated member **21^b** for manually making electrical con-

nection and is spring pressed for automatically breaking electrical connection. The coiled superheating unit **11** is thus embodied in an electric circuit controlled by thermostat **20** and is connected in said circuit by the charge-carrying wire **11c** which projects from the opposite ends of the coiled unit and forms terminals therefor.

In the preferred embodiment of our invention we provide means for delivering dryer steam than will be discharged under control of the thermostat **20**, and for this purpose we provide another switch **22** which is adapted, upon movement of the movable member **22'** thereof to "Dry Steam" position, to short circuit the thermostat **20** and thus to provide hotter steam. One of the terminals of this switch **22** is electrically connected (Figs. 3 and 4) by wire **22a** to the heating-element wire **11c** of the coiled conduit **11** above the connection at **18a** of the thermostat wire **18b**, and the other terminal of said switch **22** is connected by wire **22b** through the operating switch **21** to the source of current supply. This switch **22** therefore when moved to closed position which is marked "Dry Steam" will short circuit the thermostat **20** and thus enables a boosting of the heat in the coiled superheating tubes **11** above the standard temperature which is provided by the thermostat **20**. Dry or higher-temperature steam will only be discharged when switch **22** is closed and switch **21** is also closed. Consequently very hot and dryer steam at the discharge spout is provided. The opposite non-operative position of said knob **22'** of the switch **22** is preferably marked "Damp Steam," and when damper thermostat-controlled steam is required, knob **22'** is moved to that position.

The operator's switch **21** is spring-biased to keep said switch open. When said operating switch is moved by the operator to closed position and the selecting switch **22** is in off or "Damp" position, the thermostat **20** again takes over and the superheated steam is held at the given or standard heat.

The supply of steam from the source through the rubber hose **12** to the superheating conduit **11** is controlled by a solenoid valve **23** which is connected in the circuit through the switch **21**. Electrical connections are made to connect the solenoid valve **23** in the circuit and, as shown, these connections are so arranged so that when the switch **21** is operated and closed, the solenoid valve will be operated to admit steam through the rubber hose or conduit **12** to the coiled superheating conduit **11** from which it passes to the block **10a**, which block is heated through conduction of heat from the heating element as shown in Fig. 7 and is discharged through the nozzle **13**, which is also heated by conduction of heat from the element **11b** and block **10a**.

The electrical operating switch **21** is mounted in a convenient position on the handle of the gun outside of the casing and the gun is relatively light and capable of ready and easy operation.

Having described our invention, we claim:

1. A steam gun comprising a combined steam-conducting conduit and enclosed electric tubular heating element, said conduit being arranged in the form of a coil, and said coil being enclosed within an enclosing housing to enable ready handling by the user, means for supplying steam to one end of said steam conducting conduit, an electric circuit for supplying current to said heating element, said element being connected at opposite ends in said circuit, the parts being arranged to cause steam during the passage thereof from the steam supply means through said steam conducting conduit to be superheated, a discharge nozzle at the end of said steam-conducting conduit opposite to said supply means for discharging superheated steam therefrom, and manually-operable means for controlling the discharge of said superheated steam through said nozzle.

2. A steam gun as claimed in claim 1 in which the combined steam-conducting conduit and enclosed electric tubular heating element are arranged in the form of a coil and said heating elements project beyond the ends of the steam-conducting conduit at opposite ends of the coil thereof and at said opposite ends of the coil function as terminals for connection to a source of current supply to heat said elements.

3. A steam gun as claimed in claim 1 in which the combined steam-conducting conduit and enclosed electric tubular heating element are arranged in the form of a coil, a manually-operated valve is mounted to control discharge of steam from said coiled members, said manually-operated valve is electrically connected with a supply-controlling valve and means is provided for immediately cutting off the supply of steam to the coiled members upon release by the operator of the steam discharge valve.

4. A steam gun as claimed in claim 1 in which the means for controlling the discharge of steam includes a solenoid valve.

5. A steam gun as claimed in claim 1 in which a thermostat is mounted within the enclosing housing and connected in the circuit with said heating element and utilized in the circuit to control the heat of the electrical heating element.

6. A steam gun as claimed in claim 1 in which a thermostat is mounted within the enclosing housing and connected in the circuit with said heating element and utilized to control the heat of the electrical heating element, and another switch is also provided with electrical connections to the thermostat, heating element of the coiled members, and to the operating switch and source of current supply for short-circuiting the thermostat to boost the heat in the coiled members above the temperature which is provided by the thermostat and consequently to enable discharge of very hot steam.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,878,360 March 17, 1959

Walter K. Tavender et al.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 8, for "11^b" read -- 11^c --; line 23, for "14" read -- 15 --; line 73, for "15" read -- 15' --.

Signed and sealed this 28th day of July 1959.

(SEAL)

Attest:

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Attesting Officer

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Commissioner of Patents

UNITED STATES PATENT OFFICE

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