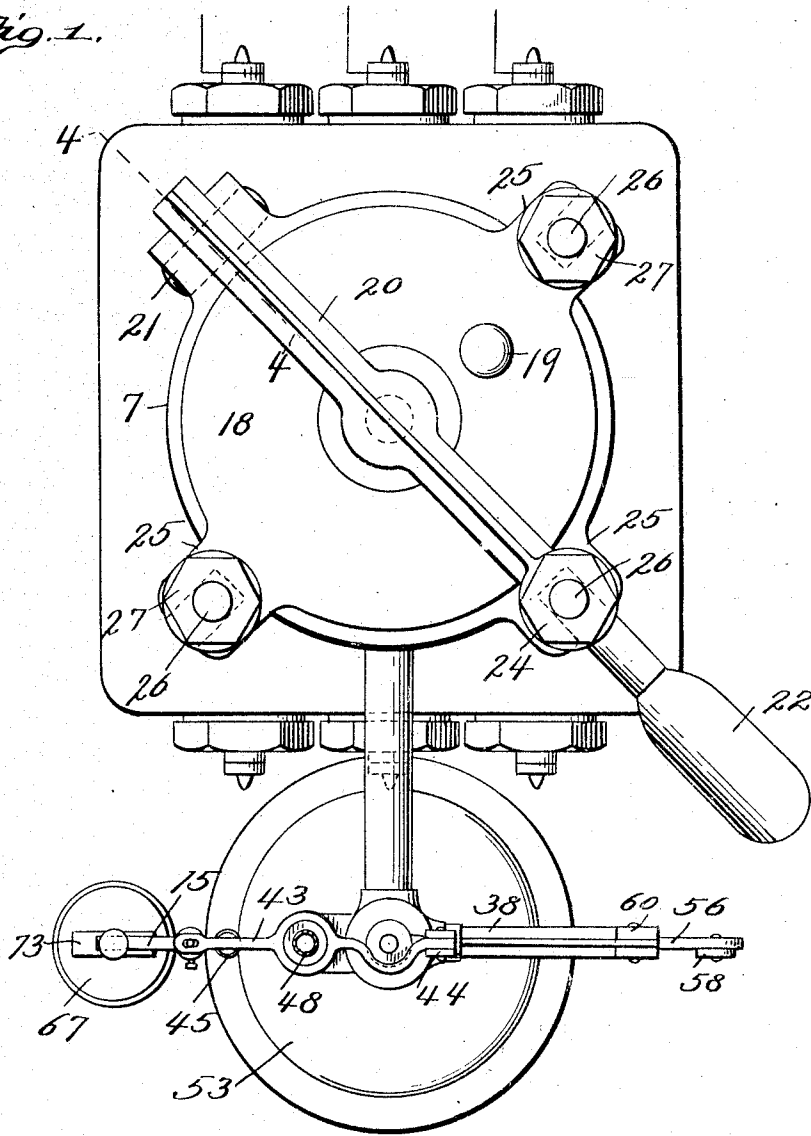


G. B. FRALEY.
DENTAL VULCANIZER.
APPLICATION FILED DEC. 15, 1915.

1,200,183.

Patented Oct. 3, 1916.
3 SHEETS—SHEET 1.

Fig. 1.



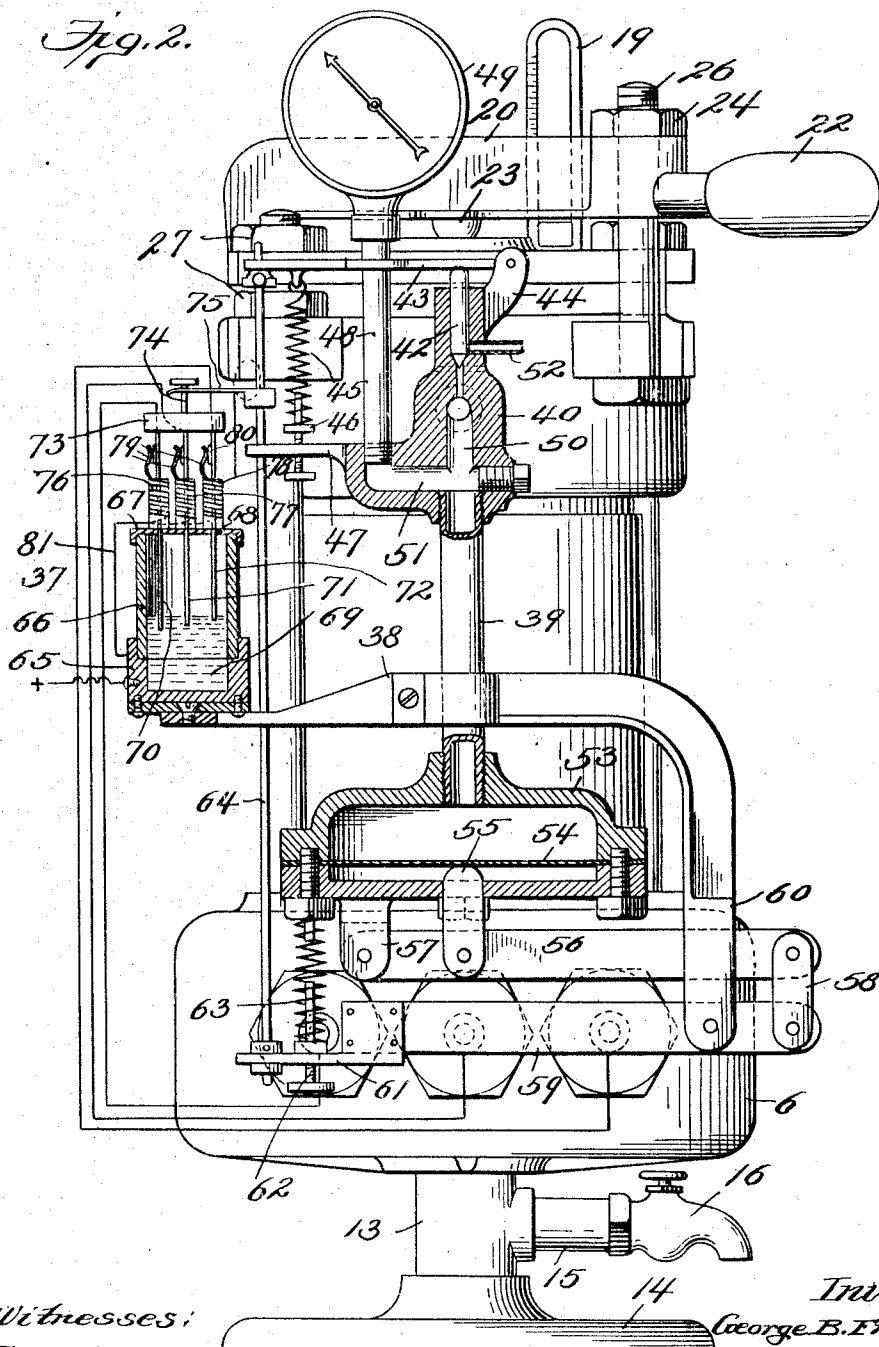
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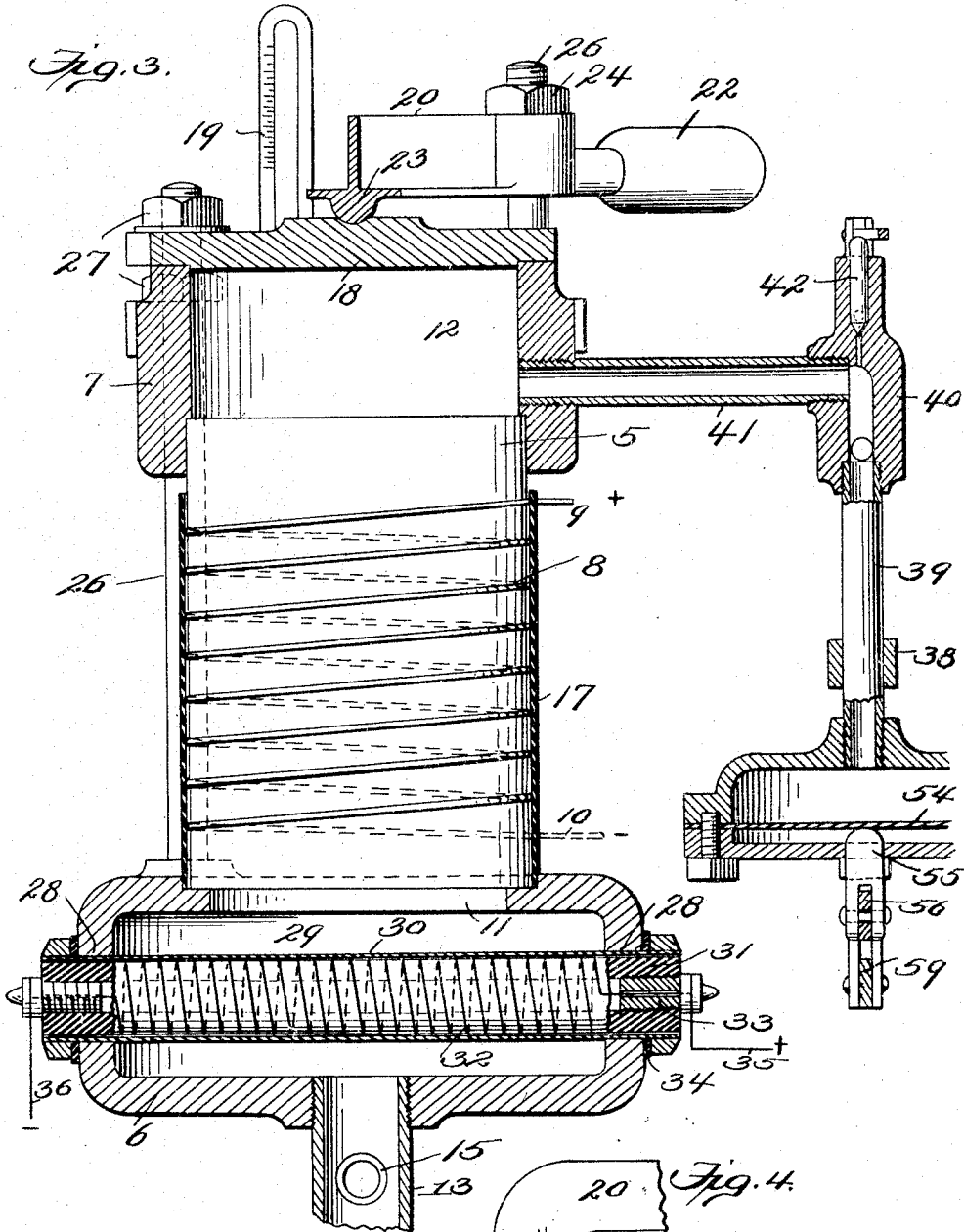
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UNITED STATES PATENT OFFICE.

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DENTAL VULCANIZER.

1,200,183.

Specification of Letters Patent.

Patented Oct. 3, 1916.

Application filed December 15, 1915. Serial No. 67,044.

To all whom it may concern:

Be it known that I, GEORGE B. FRALEY, a citizen of the United States, residing at Liberty, in the county of Sullivan and State of New York, have invented new and useful Improvements in Dental Vulcanizers, of which the following is a specification.

This invention relates to dental vulcanizers of the electric heating type, and one of the objects thereof is to provide a mechanical construction of such character that renewal of defective or damaged parts may be readily accomplished and replacement effected without requiring the use of special tools or an extensive mechanical knowledge.

A further object of the invention is to so dispose the electric heating elements and the connections therefor that they may be readily withdrawn and new similar devices installed in place thereof without disorganization of the remaining elements of the vulcanizer.

A still further object of the invention is to generally improve dental vulcanizers and to heat the same by means which are perfectly safe and wherein the heating elements are utilized to their full energy without waste, and to embody with the usual copper cylinder a subsidiary electric heating coil for superheating the steam generated and held within the cylinder and thereby provide means for quickly vulcanizing repair work or broken bridge plates.

The most essential features of the present improved dental vulcanizer are the safety elements utilized for heating purposes as compared to the usual form of vulcanizer heated by gas or oil lamps and which have proved to be very dangerous and frequently inefficient as well as inconvenient. Moreover, in the present improved vulcanizer the fundamental elements of devices of this class are structurally preserved and the additions and features of improvement are applied thereto in such manner that the organization of the entire vulcanizer including the preferred form of electric heating means may be effected with facility and convenience, with material advantages in an enlarged scope of operation and the maintenance of heat always definitely under the control of the operator.

With these and other objects and advantages in view the invention consists in the preferred construction and arrangement of

parts which will be more fully hereinafter described and claimed.

In the drawings: Figure 1 is a top plan view of a vulcanizer embodying the features of the invention. Fig. 2 is a sectional elevation of the vulcanizer. Fig. 3 is a transverse vertical section taken through the body of the vulcanizer and particularly showing the heating means in direct association therewith and also the diaphragm connections. Fig. 4 is a vertical section taken in the plane of the line 4-4, Fig. 1.

The numeral 5 designates a copper cylinder which constitutes a vulcanizing inclosure or means for holding the devices to be vulcanized, said cylinder being engaged at its opposite extremities and held between a lower pot or water receptacle 6 and an upper head 7, as clearly shown by Fig. 3. The cylinder 5 has an electric coil 8 wound therearound, and the terminals 9 and 10 thereof are connected to a heating source of electrical energy and whereby the cylinder may be heated independently of the primary heating means which will be hereinafter more particularly described. The pot or water receptacle 6 has communication with the bottom of the cylinder 5 through the medium of an opening 11, and the upper end of the cylinder opens into the head 7 or communicates with a chamber 12 within the said head and which serves as an accumulating space or dome for steam and to which a part of the features of improvement is connected. The lower or bottom portion of the pot or water receptacle 6 has a tubular stem 13 secured thereto and projecting downwardly to a supporting base 14, the stem being provided with an intermediate outlet pipe 15 which will be provided with a suitable blow-off cock, as at 16. The cylinder 5 and the coil 8 thereon are surrounded by an insulating sheathing or covering 17; and on the head 7 a cap 18 is removably secured and provided with a suitable thermometer 19. The cap 18 is engaged by a cross-bar or pressure element 20 which is hinged as at 21 and provided with a handle 22, preferably of wood. The cross-bar or pressure element 20 has a boss or projection 23, as more clearly shown by Fig. 3, to bear upon the center of the cap 18, and said cross-bar is held down in place by separable bolt and nut means, as at 24. It will be understood that where the cap 18 engages the head 7 a

suitable ground joint will be formed so as to provide for a tight-fitting or non-leakable association of the cap with the head. The cap is also provided with diametrically
 5 opposed slotted lugs 25 which are engaged by the upper ends of uprights or connecting bolts 26 between the pot or receptacle 6 and the head and cap, said uprights or bolts 26 having nuts, as at 27, whereby they may be
 10 tightly retained in their applied position and to serve their intended function. By releasing the upper nuts of the uprights or bolts 26 the cap 18 may be removed when the cross-bar or pressure element has been re-
 15 leased and thrown over on its hinged connection to thereby give access to the interior of the vulcanizer or copper cylinder for introducing and removing the work.

The pot or water receptacle 6 has its front
 20 and rear walls formed with openings 28 arranged in alinement, there being in the present instance three groups of openings or means for removable insertion of three heating elements 29 therein. These heating
 25 elements are to a greater extent surrounded by the water within the pot or receptacle 6 and each element comprises an outer copper tube 30, an insulating tube 31, and a heating coil 32. The tube 30 is threaded at
 30 both ends, and in each end is fitted a tubular brass stud 33 through which extend the ends of the coil 32, a packing being introduced as at 34 around the stud. The outer
 35 ends of the brass studs 33 constitute the heating element terminals to which the connections 35 and 36 leading to the heating organization are attached, as clearly shown by Fig. 3. As hereinbefore specified, the heating elements 29 are readily removable
 40 from and insertible in the openings 28, the electrical connections being respectively secured to and detached from the outer ends of the studs 33 to accommodate the insertion and withdrawal of the said elements.

The electric controlling and heating device or organization is generally indicated by the reference character 37, see Fig. 2, and is mounted on an arm 38 clamped or
 45 otherwise secured to a pipe 39 extending upwardly and opening into the lower portion of a safety valve and pressure casing
 50 or casting 40 having a pipe 41 secured to and opening into the upper portion thereof and also connected to the head 7 and opening into the chamber 12 above the copper
 55 cylinder 5, as shown by Fig. 3. The pipe 41 constitutes the means for attaching the entire electric controlling and heating organization to the main body of the vulcanizer. In the upper part of the casing
 60 or casting 40 a suitable form of safety valve 42 is mounted to operate and has engagement with the usual lever 43 fulcrumed at one end to an upward projection or ful-
 65 crum support 44 forming part of the casing

or casting 40. As will be seen in Fig. 2, the upper end of the safety valve 42 engages the under side of the lever 43 adjacent to the fulcrum point of the latter, and
 70 connected to the opposite extremity of the said lever is a spring 45 which is also attached to an adjusting screw or analogous device 46 held by an arm 47 projecting out-
 75 wardly from the lower portion of the casing or casting 40. The lever 43 has a pipe 48 extending therethrough and communicating with a pressure gage 49 at its upper
 80 end and attached to and communicating with the interior of the lower portion of the casing or casting 40. The lever 43 is freely movable on the pipe 48 and is held in
 85 proper operating position thereby, and such arrangement also condenses the organization of the cooperating parts of the improvement. The pipe 41 connects with a
 90 vertical passage 50 of the safety valve casing or casting 40, and this passage in turn intersects a lower horizontal passage 51 into which opens the lower end of the pres-
 95 sure gage pipe 48. It will be seen that the passage 51 is a considerable distance below the entrance or point of communication of the pipe 41 with the safety valve casing
 100 or casting, the point of entrance of said pipe 41 relatively to the casing or casting providing a steam port whereby the steam will be regularly conducted into the safety
 105 valve casing or casting. The safety valve also has a relief pipe 52 for obvious purposes. By disposing the passage 51 below the entrance of the steam into the safety
 110 valve casing or casting 40 by way of the pipe 41, a certain amount of condensation is permitted to always remain in the passage 51 to act against the gage spring for
 115 cooling purposes. The pipe 39, which opens into the bottom of the safety valve casing or casting 40, also opens into the upper portion of a regulator 53 embodying therein
 120 a diaphragm 54 which engages a plunger or pressure transmitting member 55 movable through the bottom of the regulator and fulcrumed to a lever 56 pivotally connected
 125 at one end to a hanger 57 depending from the bottom of the regulator. The lever 56 is in turn connected by a link 58 at the end opposite that connected to the hanger
 130 57 to a lower lever 59 which is fulcrumed to the depending extremity 60 of the arm 38, the latter extending in goose-neck form from the pipe 39 to one side of the apparatus and having the extremity 60 just explained. The free end of the lever 59 has a bracket 61 secured thereto and engaged by
 135 an adjusting screw 62 for controlling a spring 63, in turn attached to the bottom portion of the regulator 53 outside of the hanger 57 and whereby the levers 56 and 59, constituting a compound lever, may be
 140 returned to normal position and maintained

in said position until excess pressure is brought to bear on the said compound lever through the medium of the plunger 55 actuated by the diaphragm 54.

5 It will be understood that the levers 56 and 59 will be held in the position shown by Fig. 2 under all normal conditions of steam pressure, but as soon as an excessive pressure exists in the apparatus it will operate the diaphragm 54 to depress the plunger 10 55 and the latter in turn presses the levers 56 downwardly and raises the free end or the bracket 61 of the lever 59 by reason of the particular mounting of the said lever 15 59 as shown. As soon as the excessive pressure becomes dissipated or ceases to exist, the levers 56 and 59 will be immediately returned to their normal positions through the action of the spring 63. The bracket 20 61 also has a rod 64 secured thereto and movable upwardly through the outwardly projecting portion of the arm 38 and also through the arm 47, the upper end of this rod 64 being in engagement with the outer 25 free end of the lever 43 which is actuated by the safety valve 42. The rod 64 is a lift rod and is particularly intended to cooperate with the electrical controlling apparatus, which embodies a metal cup 65 30 fixed to and insulated from the free end of the arm 38 on which it rests, said cup having a glass tube 66 rising therefrom and provided with a cover or cap 67 with a plurality of openings 68 therein. Mercury 35 69 is placed in the cup 65 and extends upwardly a short distance into the glass tube 66, and engaging the mercury 69 are sliding contacts 70, 71 and 72, varying in length, the contact 70 being slightly longer 40 than the contact 71 and the latter contact slightly longer than the contact 72. The contacts 70, 71 and 72 are preferably in the form of rods and are secured to a head 73 of suitable insulating material and having 45 a stud 74 rising therefrom and engaged by an arm 75 secured to the lift rod 64. High resistance coils 76, 77 and 78 are arranged around the rods above the cap or cover 67 and have contact with the said rods through 50 the medium of sliding contact plates or fingers 79 always engaging projections 80 on the rods above the coils 76. The high resistance coils 76 are connected to the mercury cup 65 by a wire or electrical connection 81 and the mercury cup is also connected 55 to the wire 35 of the heating coils or elements from the insulated head 73, and connecting with the upper ends of the contact rods 70, 71 and 72 are the wires 36, and 60 by this means it will be seen that both terminals of the heating coils or elements have regular metallic connections with the mercury cup and the contact rods 70, 71 and 72. The high resistance coils 76, 77 and 65 78 are shunted across the contact rods 70,

71 and 72, and while they are shown as applied directly on the upper side of the cap or cover 67 it will be understood that they may be located at some other point so long as they effect the operation sought in 70 relation to the said contact rods.

Normally the contact rods 70, 71 and 72 have their lower extremities located in the mercury 69 to a certain depth in accordance with the variation in length of the 75 said rods, and these lower extremities of the rods will remain down in the mercury until the desired steam pressure is obtained through the operation of the heating elements or coils 29 on the water in the pot 80 or receptacle 6, and when the steam pressure exceeds that which is predetermined, the diaphragm 54 of the regulator 53 is depressed and the plunger 55 likewise moved 85 to operate the levers 56 and 59 and lift the rod 64 as hereinbefore explained, and the first operation will be the elevation or clearance of the shorter rod 72 above the mercury 69 and thereby open the circuit of one of the heating elements or coils 29 which 90 naturally reduces the amount of heat in the vulcanizer, and if this elimination is not sufficient to bring the pressure back to normal or predetermined amount the lifting rod 64 will continue to rise and elevate 95 the lower extremity of the next shorter contact rod 72 clear of the mercury 69, thereby cutting out a second heating element or coil 29, and so on; and when the pressure falls the parts will all be restored to normal 100 position and the lifting rod 64 will resume its depressed condition and permit the contact rods 70, 71 and 72 to lower into the mercury 69. It will be understood that the rods 70, 71 and 72 are raised by the rods 105 64 through the medium of the arm 75 engaging the stud 74 which is connected to the head 73. The high resistance coils 76, 77 and 78 serve two purposes, namely, they prevent arcing in the mercury cup when 110 the circuit therewith is broken through the movements of the several rods, and they are so proportioned and calculated as to their resistance as to cause a given amount of electric current to pass through the heating 115 coils to prevent the vulcanizer from cooling down too suddenly.

As hereinbefore indicated, the coil 8 surrounding the copper cylinder 5 serves as a means for superheating the steam in the cylinder 120 when using the vulcanizer for repair work on broken bridge plates and whereby such work can be quickly vulcanized. This subsidiary heating means or coil 8 renders it possible to bring the machine up to 125 the proper temperature in a few minutes, and then said heating means may be shut off and the vulcanizing operation can be finished by the regular heating elements or coils connected to the controller apparatus. 130

Another advantage of the improvement is that the copper cylinder is above the water in the pot or receptacle 6 such a distance that the water will not reach the said cylinder and by this means the vulcanizing molds are always held in the steam passing upwardly through the cylinder. By disposing the heating elements or coils 29 as explained they are completely surrounded by water, thereby fully utilizing the heating capacity of each element without the least waste. The advantage of the blow-off cock 16 located as shown and hereinbefore described is that means are thus provided for cleaning out the scum accumulating from the sulfur in the rubber vulcanized.

The heating elements or coils 29 may be quickly taken out of the pot or receptacle 6 by detaching the electrical connections or wires 35 and 36 therefrom and replaced by other similar devices when found necessary, and, moreover, the vulcanizer may be easily interiorly reached or rendered readily accessible by the arrangement of the parts as explained. It will be seen that the operation of the vulcanizer is largely automatic and that there is no danger by reason of the positive control of the heating means or elements 29 in a sensitive manner as soon as excess pressure becomes present in the apparatus, and after the pressure has been reduced to a normal or desired condition the heating elements will be caused to automatically resume their operation and perform their heating functions.

What is claimed is:

1. In a vulcanizer, a water receptacle, a containing device disposed over the water receptacle and open thereto, a plurality of heating elements mounted in the water receptacle to generate steam, and mechanism for automatically minimizing the heat of the heating elements in sequence proportionately to the steam pressure generated.

2. In a vulcanizer, a water receptacle, a containing device disposed over and open to the water receptacle but clear of the contents of the latter, heating means disposed in the water receptacle, and subsidiary heating means for the containing device operable independently of the heating means for the said receptacle.

3. In a vulcanizer, a water receptacle, a containing device mounted over and open to the water receptacle but clear of the contents of the latter, heating elements mounted in the water receptacle, and mechanism for minimizing the heat of the heating elements in sequence in accordance with the steam pressure generated.

4. In a vulcanizer, a water receptacle, a containing device disposed over the water receptacle and in communication with the latter, electric heating elements removably mounted in and exposed to the contents of

the water receptacle, and electrical means connected to the electric heating elements and having automatically operable means to minimize the heat of said elements in sequence when the steam pressure becomes excessive and to actively restore the heat of the minimized elements to normal heating capacity when the steam pressure becomes normal.

5. In a vulcanizer, a water heater embodying a plurality of electric heating elements removably mounted therein and disposed in such manner that the contents of the heater will surround the electric heating elements, a containing device mounted over and in communication with the water heater, an automatically operating pressure regulator having communication with the containing device at a point to take off the steam generated, electrical controlling devices connected to the heating elements, and mechanism interposed between the pressure regulator and the electrical controlling devices and having means engaging a portion of the electrical controlling devices for automatically minimizing the heat of the electric heating elements in sequence when excessive pressure is reached and actively restoring the elements when normal pressure is resumed.

6. In a vulcanizer, a water heater embodying a plurality of electric heating elements removably and replaceably mounted therein, a containing device mounted over and in communication with but clear of the water contents of the said heater and provided with an upper chamber for the reception of steam passing through the containing device, a pressure regulator in communication with the said chamber, electrical controlling means connected to the heating elements, and means interposed between the pressure regulator and the said electrical controlling means and actuated by the said regulator to effect heat minimizing of the electric heating elements in sequence in the water heater.

7. In a vulcanizer, a water heater consisting of a receptacle having a plurality of electric heating elements removably and replaceably mounted therein, a cylinder mounted over and fully open to the water heater and provided with a head and a closure forming a chamber therewith, a pressure regulating apparatus and safety valve with attachments and a compound lever organization and lift rod together with electrical controlling means for the said heating elements all connected and supported as a unit by means interposed between the chamber above the cylinder and the pressure regulating apparatus for establishing communication between the latter and the said chamber.

8. In a vulcanizer, a water heater, a containing device disposed over and in communication with the said heater, electric

heating elements removably and replaceably disposed in the heater and surrounded by the contents of the latter, and electrical controlling means separately connected to the said elements and automatically operable to minimize the heating effect of the elements in sequence to regulate the heat generation in the water heater.

9. In a vulcanizer, a water heater having electric heating elements mounted therein, a containing device mounted over the heater and in communication with the latter, electrical devices connected to the said heating elements and comprising a mercury cup with a plurality of contacts movably depending thereinto and individually connected to the heating elements, and mechanism for automatically disengaging the contacts from the mercury in the cup.

10. In a vulcanizer, a water heater having electric heating elements mounted therein, a containing device mounted over the heater and in communication with the latter, electrical devices connected to the said heating elements and comprising a mercury cup with a plurality of contacts of different lengths movably depending thereinto and individually connected to the heating elements, and mechanism for automatically disengaging the contacts from the mercury in the cup.

11. In a vulcanizer, a water heater for generating steam, a plurality of electric heating elements mounted therein, a containing device disposed over and in communication with the heater and having a chamber above the same for the accumulation of steam therein, automatically operating steam pressure control devices in part having communication with said chamber, electrical controlling devices embodying a mercury cup connected to said elements and a plurality of contacts of different lengths normally depending into the mercury in the cup and individually connected to the said elements, and means between a part of the said steam pressure control devices and the contacts to minimize the heating effect of one or more of the heating elements when the steam pressure becomes excessive.

12. In a vulcanizer, a water heater for generating steam having a plurality of electric heating elements therein, a containing device mounted over and in communication

with the water heater and having a steam accumulating chamber above the same, steam pressure operated means in communication with the said chamber, electrical controlling means connected to the heating elements and including a plurality of contacts for breaking the circuits relatively to said elements, and means interposed between the said contacts and a part of the steam pressure operated means for effecting a minimization of the heating effect of one or more of the electric heating elements when excessive pressure is present in the vulcanizer.

13. In a vulcanizer, a water heater having a plurality of electric heating elements therein, a containing device mounted over the heater and in communication therewith and having a chamber above the same, an automatically operating electrical controller comprising circuit making and breaking means electrically connected to the said elements and a plurality of contacts with relation to which the said circuit making and breaking means are shiftable, the said contacts having a plurality of high resistance coils associated therewith and cooperating with the said circuit making and breaking means, and pressure regulating means in communication with the chamber above the containing device and embodying means for shifting the said circuit making and breaking means.

14. In a vulcanizer, a water heater having a plurality of electric heating elements associated therewith, a containing device mounted over the heater and provided with a chamber and automatically operating mechanism controlled by the pressure in the chamber and including a series of circuit making and breaking elements individually connected to the heating elements and operable in sequence by positively acting shifting means through the medium of abnormally high pressure to cut out one or more of the electric heating elements and to actively restore the said elements when the pressure lowers.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

GEORGE B. FRALEY.

Witnesses:

WILLIAM B. HAND,
VERA INTEMANN.