Gas to Heating Apparatus.

No. 198,084. Patented Dec. 11, 1877.

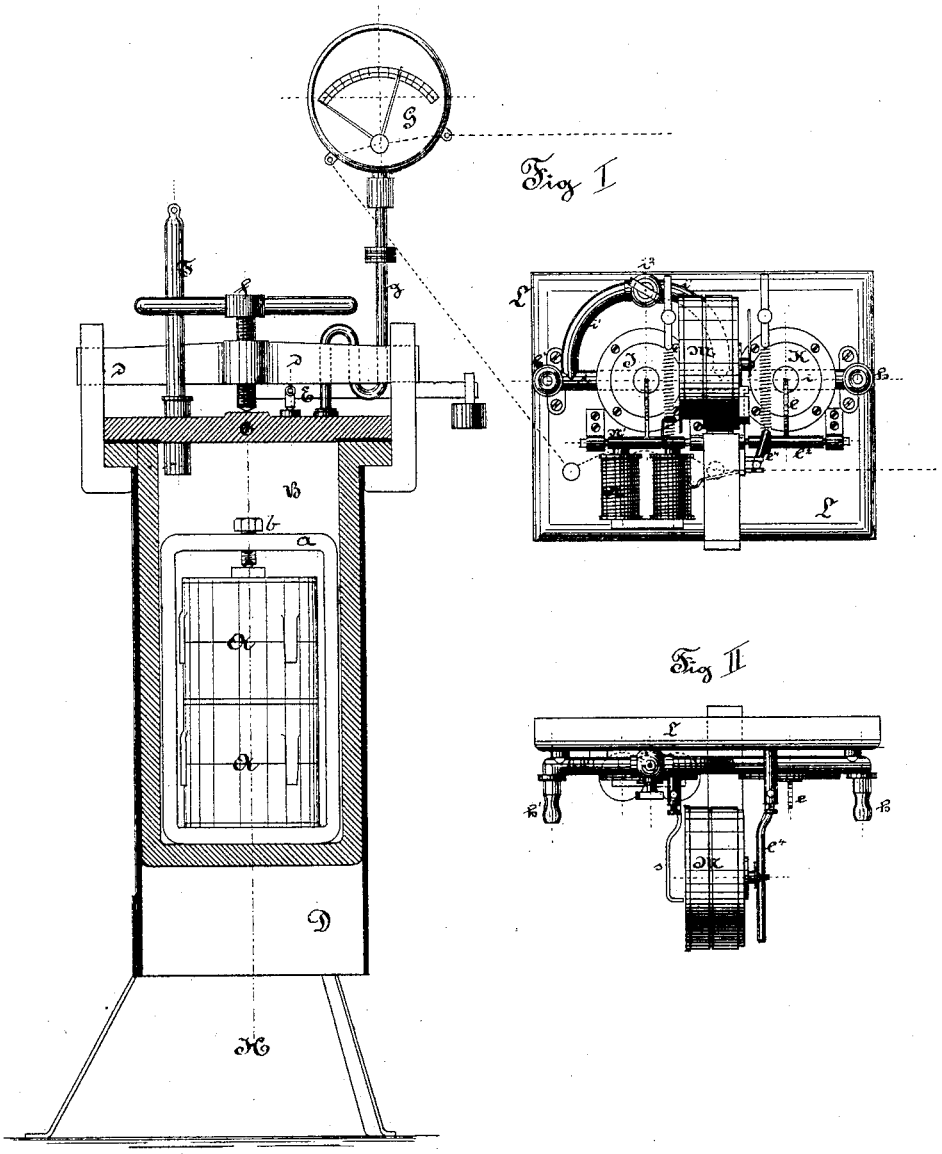
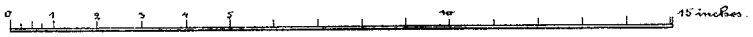


Fig I



Fig II





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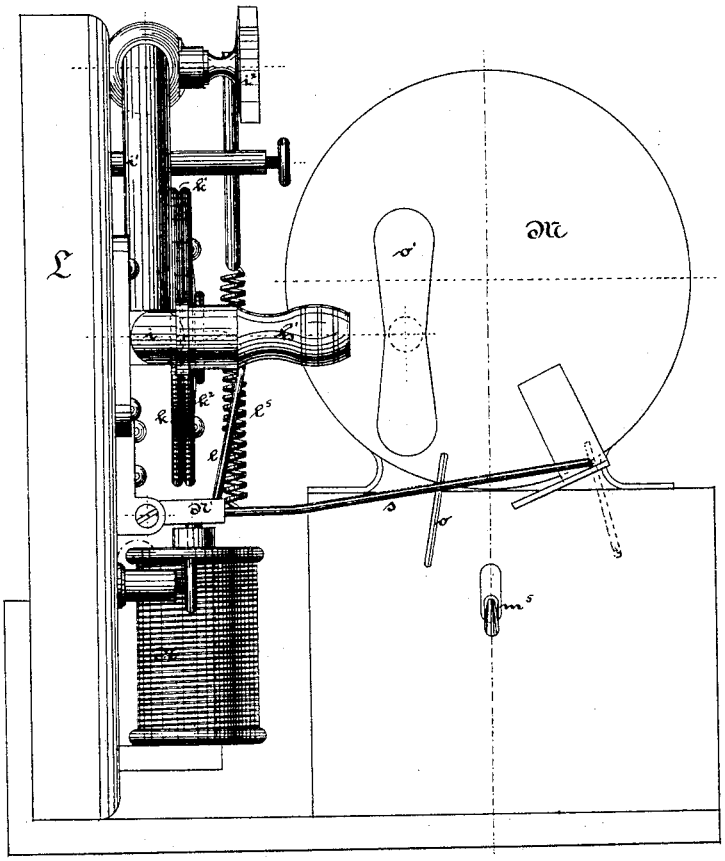
## Electrical Regulator for Governing the Flow of Gas to Heating Apparatus.

**No. 198,084.** **Patented Dec. 11, 1877.**

Fig. III



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## Electrical Regulator for Governing the Flow of Gas to Heating Apparatus.

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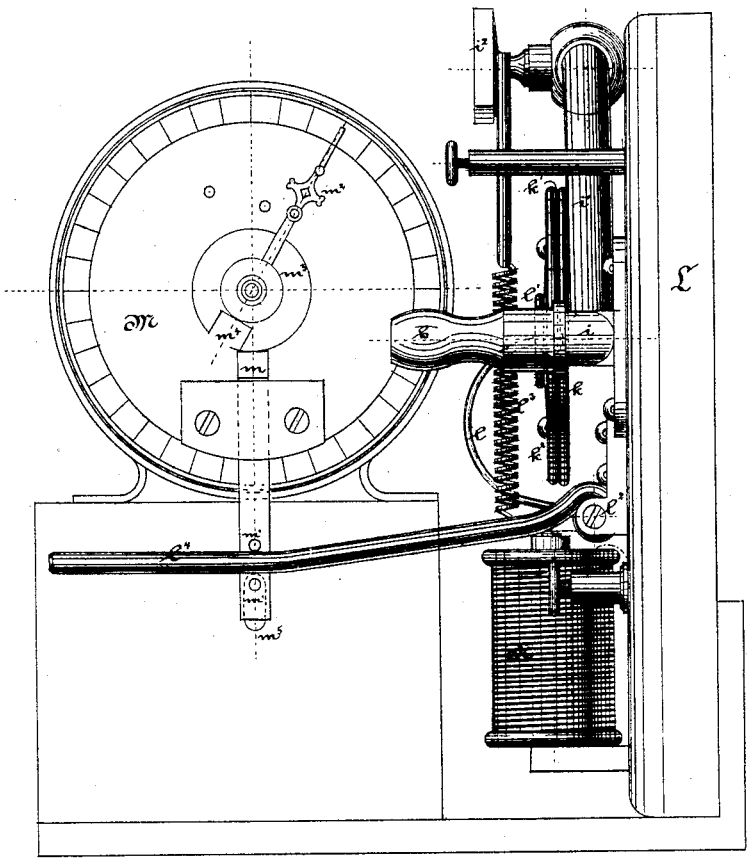
Fig. IV





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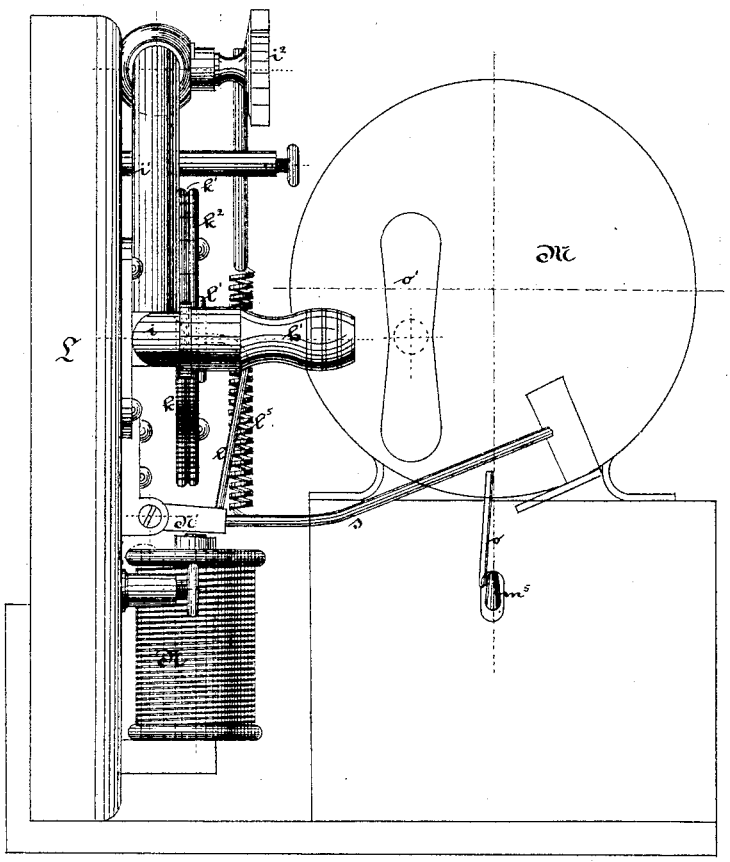
## Electrical Regulator for Governing the Flow of Gas to Heating Apparatus.

**No. 198,084.** **Patented Dec. 11, 1877.**

Fig. V.

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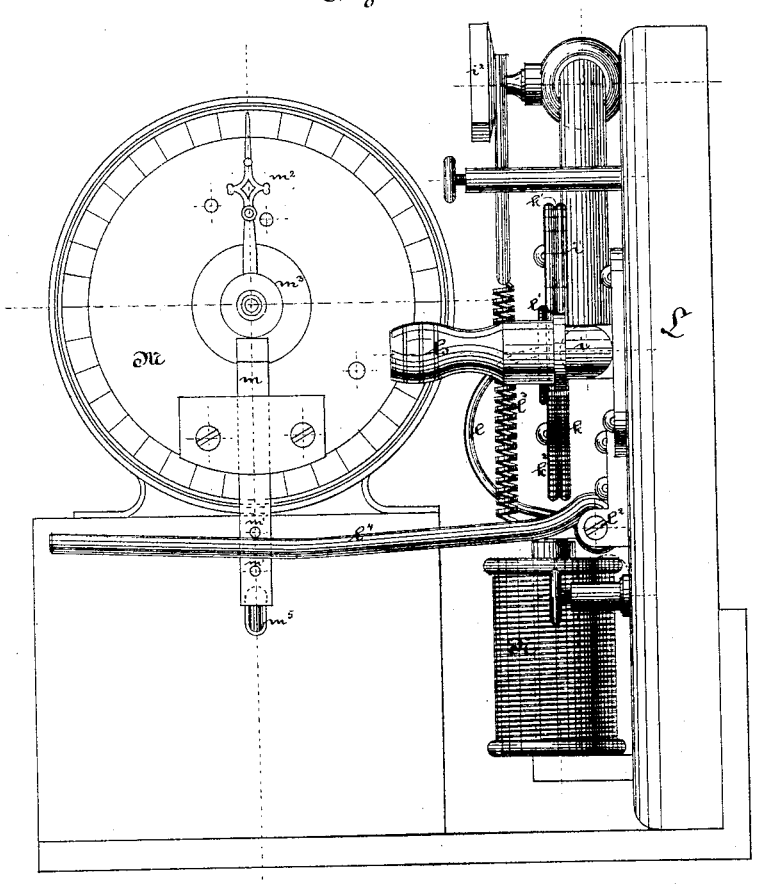
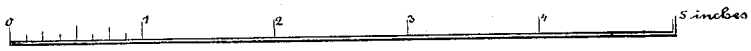
## Electrical Regulator for Governing the Flow of Gas to Heating Apparatus.

**No. 198,084.** **Patented Dec. 11, 1877.**

Fig. VI.



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## Electrical Regulator for Governing the Flow of Gas to Heating Apparatus.

**No. 198,084.** **Patented Dec. 11, 1877.**

Fig. VII

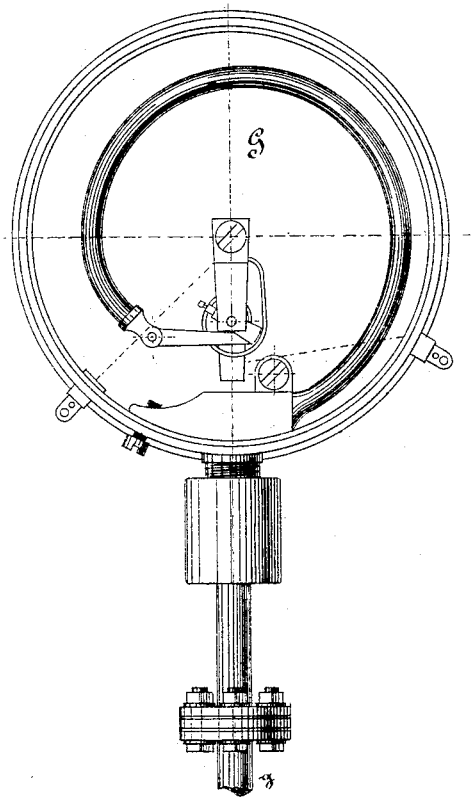



Fig. VIII

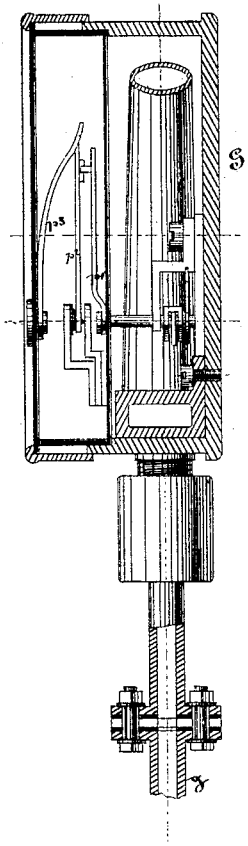



Fig. IX

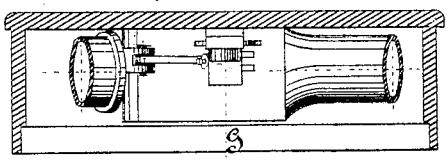
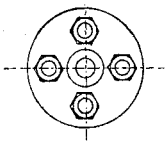



Fig. X

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## Electrical Regulator for Governing the Flow of Gas to Heating Apparatus.

**No. 198,084.** **Patented Dec. 11, 1877.**

Fig. XI

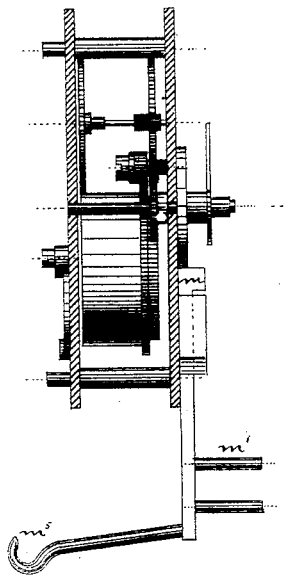



Fig. XII

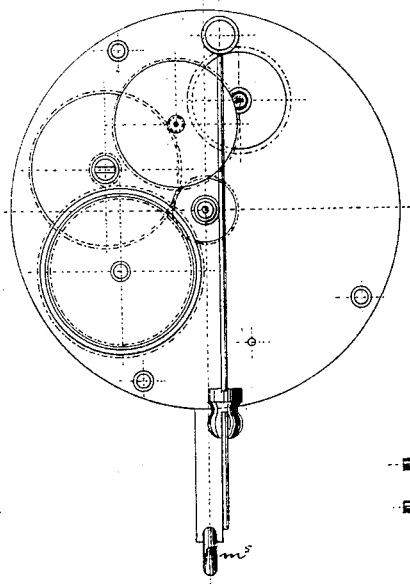



Fig. XIII

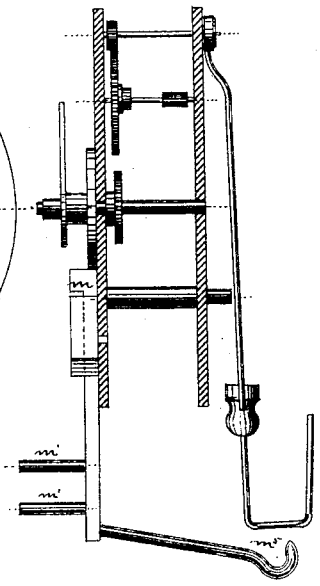



Fig. XIV

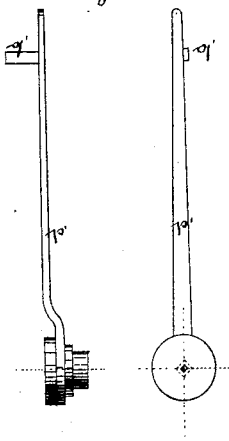



Fig. XV

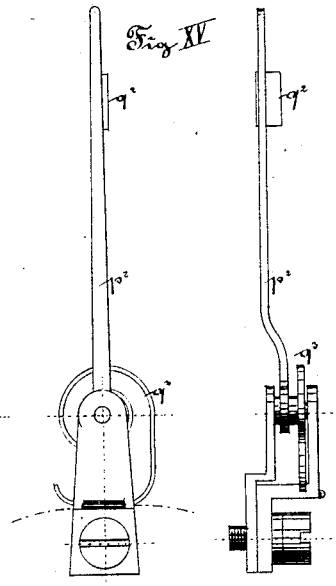
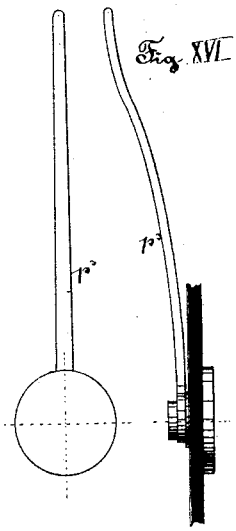



Fig. XVI



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# UNITED STATES PATENT OFFICE.

JOSEPH DAVIDSON, OF BERLIN, PRUSSIA, GERMANY.

## IMPROVEMENT IN ELECTRICAL REGULATORS FOR GOVERNING THE FLOW OF GAS TO HEATING APPARATUS.

Specification forming part of Letters Patent No. **198,084**, dated December 11, 1877; application filed September 6, 1877.

*To all whom it may concern:*

Be it known that I, JOSEPH DAVIDSON, of Berlin, Prussia, have invented Improvements in a Self-Acting Apparatus for Regulating and Stopping the Pressure of Gases and Fluids, of which the following is a specification:

The present invention relates to an automatic apparatus for regulating the flow of gases used for heating purposes, and for shutting the same off entirely at the proper time.

The invention consists essentially in the employment of an electro-magnetic regulator, in connection with a valve in a gas-conduit, supplying gas to a Bunsen burner, or other source of heat, whereby, when the steam in a dental vulcanizer or other apparatus has reached the maximum degree of pressure, a manometer of a novel construction will cause the opening or breaking of an electrical circuit and the closing of the valve in the main gas-conduit.

The invention also consists in the combination of a clock-work or chronometer mechanism with a second or main supply-valve, whereby the gas is shut off entirely at the proper time.

Other features of the invention will be hereinafter more fully described, and then indicated in the claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a sectional view of a dental vulcanizer, showing also the relative arrangement of the electro-magnetic regulator. Fig. 2 is a plan or top view of the latter. Figs. 3 and 4 are side elevations of the regulator with the chronometer mechanism disconnected therefrom. Figs. 5 and 6 are similar views, indicating the position of the parts when the chronometer mechanism has closed the main-supply valve. Figs. 7 to 10, inclusive, are detail views of the manometer. Figs. 11 to 13, inclusive, illustrate the construction of the chronometer mechanism. Figs. 14 to 16, inclusive, are detail views of the various pointers of the manometer, and their circuit breakers and closers.

Before entering into a description of the construction and operation of my apparatus, I desire briefly to refer to the fact that, for chemical and industrial purposes, it is often necessary to expose certain objects or products to an equable steam-pressure. This is generally accomplished by resorting to a steam-bath, which requires the careful observance and regulation of the source of heat, so that the steam-pressure or temperature will never be too great.

When the success of the operation depends upon an equable steam-pressure, it will easily be observed that close attention must be given to the source of heat; but even this can never be perfectly certain, and slight or great variations of pressure are almost sure to take place.

In order to avoid these results, I have devised an apparatus whereby a perfectly equable steam-pressure can be maintained, and the heat controlled in a perfect manner, and shut off entirely at the desired time.

In the present instance, I have shown my apparatus in connection with a vulcanizer for dental plates, and I may state that the principle thereof is that, when the steam-pressure in said vulcanizing-vessel is in excess of the desired degree, an electrical circuit and armature will be the means of decreasing the flame of a Bunsen burner, or other heating medium, while a chronometer mechanism will serve to extinguish said flame at a determined time.

Referring to Fig. 1, letters A A indicate the dental molds, which are held together by means of the frame *a* and screw *b*. The vulcanizing-vessel, into which the molds are placed, is indicated by the letter B. This vessel is filled with water. The vessel B is made steam-tight by means of the cover C, and is placed into a sheet-metal casing, D, having supporting-feet. The cover is drawn down or made tight by means of the yoke *d* and screw *f*, and contains a safety-valve, E, a thermometer, F, and a tube, *g*, for the attachment of a manometer, G.

The vulcanizer is heated by means of a burner located at the point H, and the gas for supplying said burner passes through the regulator, which possesses two valves, I K, serving, respectively, to regulate the flame and to shut off the flow of gas, when the vulcanizing process is at an end. The gas enters at *h* and passes into a tube, *i*, secured to the board L. Said tube is provided with two holes at the points where the valves I and K are located, between

which holes there is fitted a metal plug for closing the tube thereat. A disk, $k$, is secured to the tube $i$ over the holes in the same, and to said disk is attached an india-rubber sheet or diaphragm, $k^1$, by means of a clamping-ring, $k^2$, and a suitable number of screws.

Immediately opposite or over the first hole in the tube is arranged a cover or valve, $l^1$, which is fastened to a bent arm or rod, $l$, carried by an axis or rock-shaft, $l^2$. This cover or valve $l^1$ is borne down upon the hole in the tube by means of a spiral spring, $l^3$, so that the hole will be closed by the interposed elastic sheet $k^1$.

At the outlet end of the tube $i$ is placed a mouth-piece, $h'$, for the reception of an elastic conducting-tube leading to the burner.

Between the valves I K is arranged the inlet end of a branch pipe, $i^1$, which is of a semicircular form, and has its outlet end in communication with the tube $i$ near the mouth-piece $h'$. An ordinary stop-cock, $i^2$, is introduced into the branch pipe.

As already described, the valve K serves to shut off completely the flow of gas to the burner, this being done in the following manner: On the axis or rock-shaft $l^2$ is a projecting arm, $l^4$, which is made to engage with the studs $m^1$ $m^1$ of a slide-piece, $m$, fitted to move in a guide-piece, $n$, of the clock or chronometer M. The pointer $m^2$ of said clock or time-piece is provided with a disk, $m^3$, having a notch, $m^4$. When the pointer has moved over the dial until the cut or notch in the disk of the pointer is directly opposite the slide-piece $m$, the latter will be caused to enter said notch, thus raising it, (the slide-piece,) and permitting the valve K to close for shutting off the flow of gas. At the same time an extension or arm, $m^5$, of the slide-piece $m$ will arrest the motion of the pendulum, consequently stopping the time-piece.

The pointer $m^2$ can be moved on its arbor, so as to be set at any desired angle in respect to the notch in the disk.

A key, $o'$, is used for winding up the clock or time-piece. The valve I is moved by means of the electro-magnet N and the armature N′, which are normally in contact, so as to close the electrical circuit. When the latter is broken, the spring $l^5$ will draw the armature away from the magnet, in consequence of which the arm $l^1$ will close the valve I and stop the flow of gas through the tube $i$.

The necessary amount of gas for producing a small flame passes through the branch tube $i^1$, the position of the cock in the same determining the flow of gas.

The electrical circuit is broken by means of the manometer G, when the steam in the vulcanizer exceeds or registers a certain pressure.

The manometer is provided with three pointers, $p^1$ $p^2$ $p^3$, of which $p^1$ is moved in the customary manner by means of the steam-pressure. This pointer $p^1$ is provided near its point with a platinum projection, $q^1$, which lies in close contact with a corresponding projection, $q^2$, of the pointer $p^2$. This latter is longer than the pointer $p^1$, and is forced to lie in contact with the same by means of a coiled spring, $q^3$, on the arbor of the pointer.

The pointer $p^3$ is curved or bent at its point, and is seated in the glass plate of the manometer, and is also provided with a milled head for setting it on the scale or figures of the manometer-dial.

The pointers $p^1$ and $p^2$ are connected, respectively, with the positive and negative wires of the circuit, so that the latter will be closed so long as the contact points or projections of the pointers touch each other. When the steam-pressure rises, the pointer $p^1$ will be moved by the direct action of the steam, and the pointer $p^2$ will move with it by the action of the spring, and the circuit remain closed so long as the two pointers touch. When the pointer $p^2$ strikes the pointer $p^3$, previously set in the desired position, it will be arrested or stopped, and the pointer $p^1$ made to move without it, which will cause the breaking or opening of the electrical circuit.

The operation of the apparatus may be described as follows, viz: When the vulcanizer is in use the water in the same will gradually be converted into steam and rise into the manometer, the valves I and K being open and the electrical circuit closed. The time-piece or chronometer is not in action because its pendulum is arrested by means of an arm, $s$, projecting from the armature N′, as shown in Figs. 4 and 5. After the steam-pressure exceeds the maximum degree of pressure indicated by the pointer $p^3$, the pointer $p^2$ will be detained by the former and the circuit broken, thus releasing the armature N′, and permitting the closing of the valve and stopping the flow of gas through the main conduit or tube $i$. The gas passing through the branch pipe will cause the flame to burn small, and at the same time the arm $s$ will be raised, thus liberating the pendulum and setting the time-piece in motion. By reason of the small flame the pressure in the vulcanizer will soon sink to the pressure indicated by the pointer $p^3$—say, ten atmospheric pressures—causing the two pointers $p^1$ $p^2$ to come in contact and close the circuit, and, as the armature is thus again attracted by the magnet, the valve I will be opened and the flame made to burn at its normal strength until the circuit is again broken. This operation can take place until the clock or chronometer closes the valve K, as has been already described. In case the circuit is broken by any casual causes, the valve I will close, thus not affecting the safety of the apparatus. In case the operation of closing the valve depended upon the closing of the circuit, then it might be that the pressure of steam could endanger the apparatus and surroundings, as the flame could burn with the battery out of order.

I have shown my apparatus in connection with a vulcanizing apparatus for the sake of

exemplification, but I wish it to be understood that it is adapted for use with steam-generators in general; and I also do not confine myself to the precise details of construction herein shown and described.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of an electro-magnet, an armature, electrical-conducting wires, and a manometer having circuit closing and breaking pointers, with a gas-supply valve and a conduit-pipe, substantially as and for the purpose set forth.

2. The combination of an electro-magnetic regulator and a chronometer or time-piece mechanism with a gas controlling or regulating valve, and a valve for shutting off the flow of gas entirely, substantially as and for the purpose set forth.

3. The manometer having a circuit-breaking pointer, and the indicating and circuit-closing pointers, in combination with electrical conducting-wires, magnet, armature, and a gas-supply valve, substantially as and for the purpose set forth.

4. The slide-piece of the chronometer, having a projecting arm for arresting the motion of the pendulum when the main supply-valve is closed, as and for the purpose set forth.

5. The armature provided with an arm for starting and stopping the pendulum of the chronometer mechanism, as and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOSEPH DAVIDSON.

Witnesses:

JOHANNES BRANDT,

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