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APPARATUS FOR HEATING VEHICLES.

No. 273,758. Patented Mar. 13, 1883.

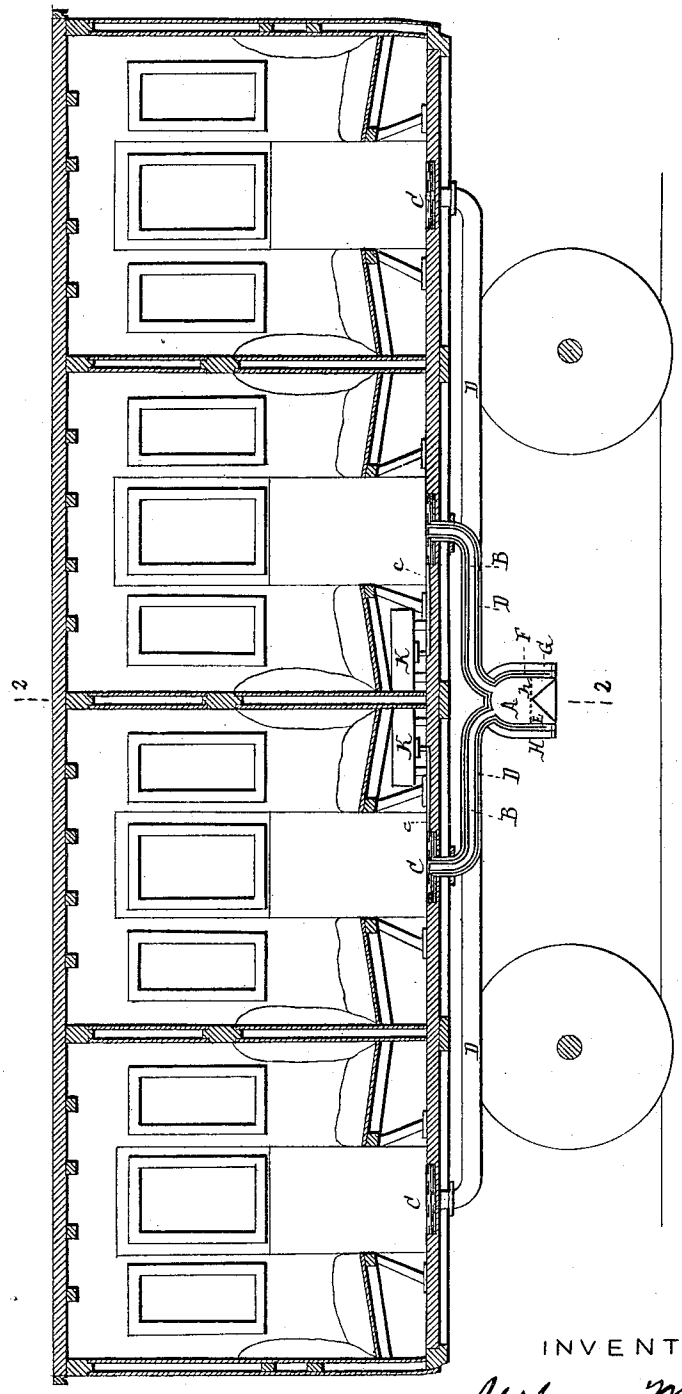

Fig. 1.

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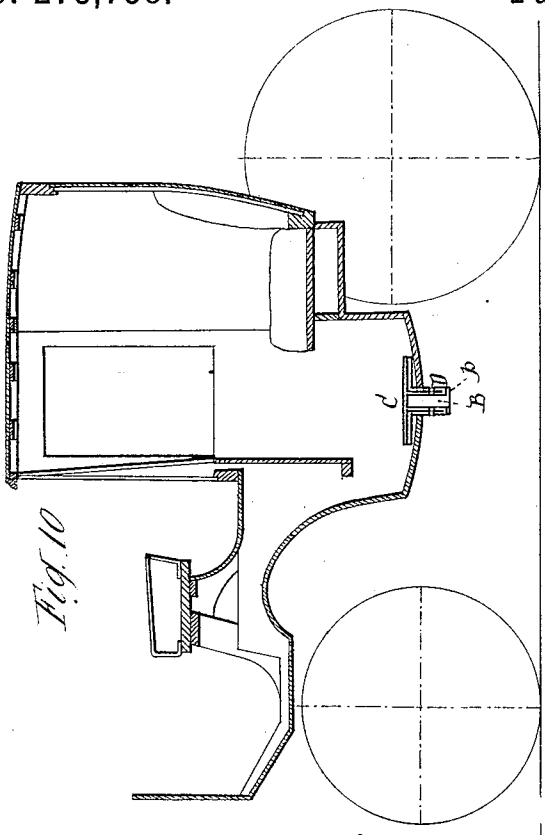

Fig. 10

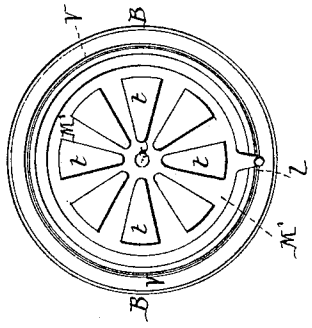

Fig. 15

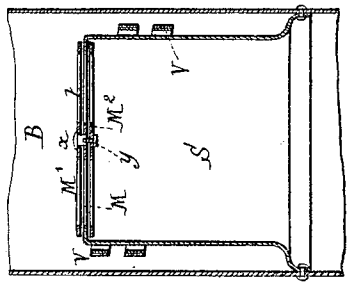

Fig. 14

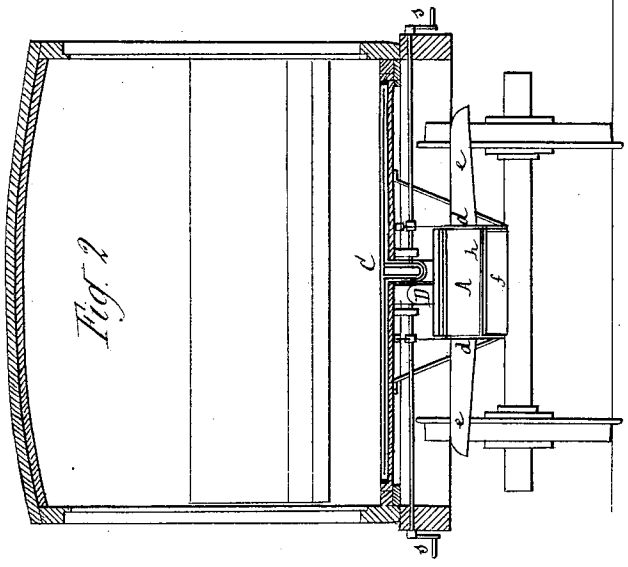

Fig. 2

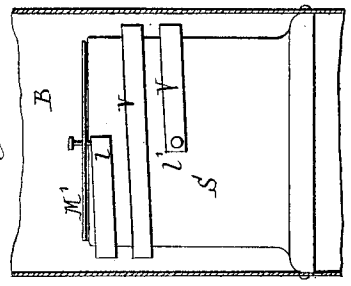

Fig. 13

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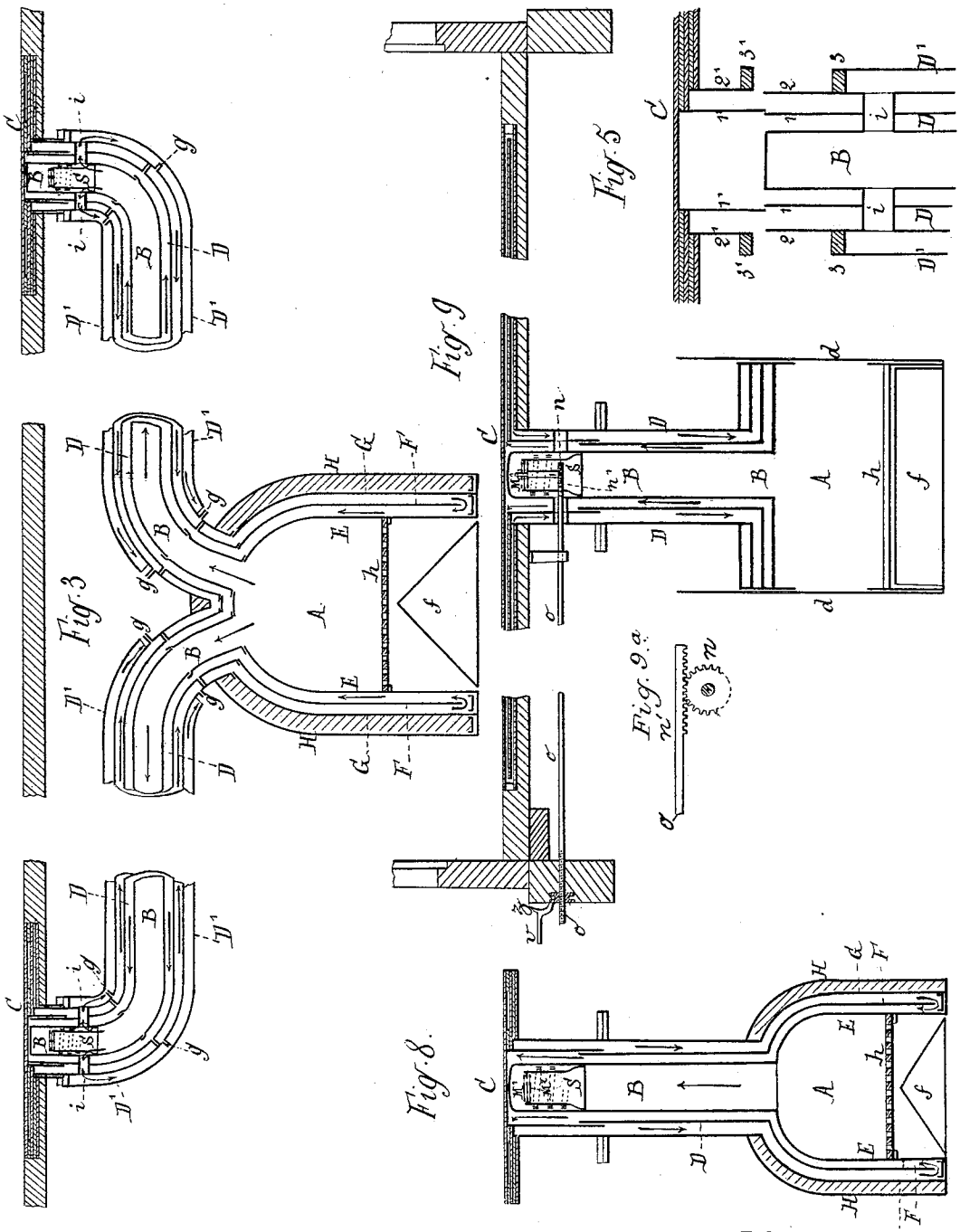

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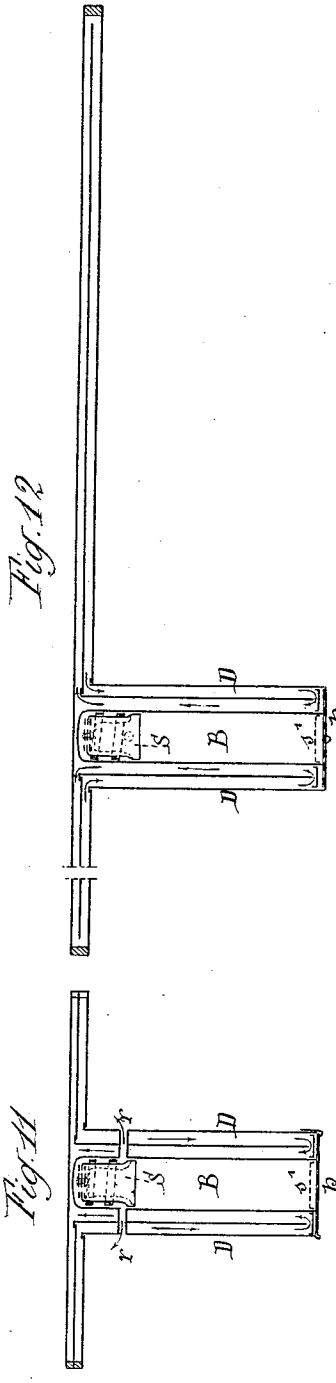

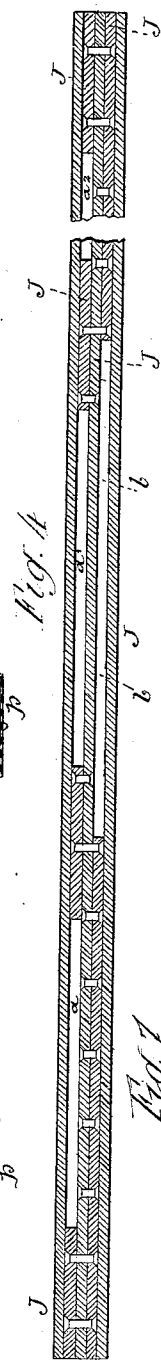

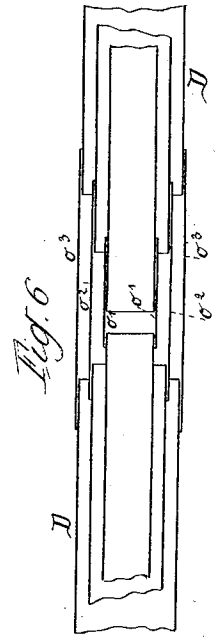

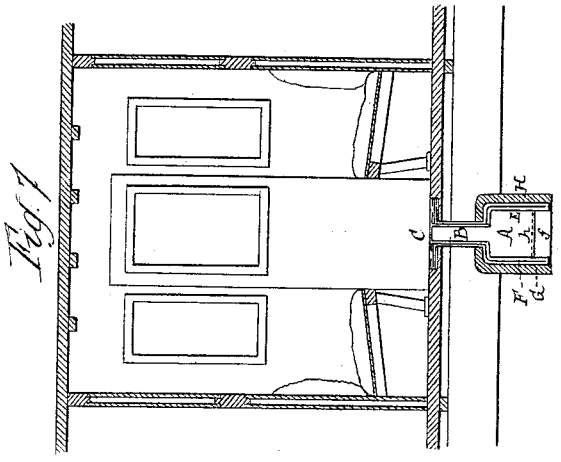

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UNITED STATES PATENT OFFICE.

ALPHONSE MOREL, OF PARIS, FRANCE.

APPARATUS FOR HEATING VEHICLES.

SPECIFICATION forming part of Letters Patent No. 273,758, dated March 13, 1883.

Application filed June 5, 1882. (No model.) Patented in France January 20, 1880, No. 134,665, and October 14, 1881, No. 145,333; in England January 28, 1880, No. 382, January 21, 1881, No. 270, and May 15, 1882; in Belgium January 28, 1880, No. 50,414; in Germany January 31, 1880, No. 10,476; in Italy December 3, 1880, No. 12,394; in Spain December 14, 1880, No. 1,232, and in Austria Hungary February 12, 1881, No. 39,102.

To all whom it may concern:

Be it known that I, ALPHONSE MOREL, a citizen of the French Republic, residing at Paris, France, have invented certain Improvements in Methods and Apparatus Employed for Heating Cars, Carriages, &c., of which the following is a specification.

My invention relates to a mode of heating especially adapted to cars and other vehicles, the calorific medium being water heated by combustibles burned in a furnace suspended below the floor of the vehicle and caused to circulate through conduits or channels formed by concentrically-arranged envelopes and tubes. To regulate the heat an automatic register is employed actuated by a thermometric band or spiral.

The novel features of the invention will be more definitely set forth in the claims.

In the drawings which serve to illustrate my invention, Figure 1 is a longitudinal vertical mid-section of a compartment-car provided with my improved heating apparatus; and Fig. 2 is a vertical transverse section of the same, taken on line 2 2 in Fig. 1. Fig. 3 is a detached and enlarged sectional view of the heating apparatus; and Fig. 4 is a longitudinal section of the foot-warmer, drawn to a very large scale. Fig. 5 is an enlarged sectional view illustrating the mode of attaching the foot-warmer to the heating apparatus; and Fig. 6 is an enlarged view, showing the manner of connecting the conduits or pipes. Fig. 7 is a sectional view illustrating a modified form of the apparatus employed for warming a single compartment of a car, and Figs. 8 and 9 are enlarged sectional views of the same, Fig. 8 being taken at right angles to Fig. 9. Fig. 9^a is a detail of Fig. 9. Figs. 10, 11, and 12 illustrate the application of my invention to warming carriages, the latter views being vertical sections taken at right angles to each other and enlarged. Figs. 13, 14, and 15 are respectively an elevation, section, and plan of the automatic register, regulator, or damper enlarged.

A is a furnace, arched or bell-shaped in cross-section, Fig. 3, and provided with a grate, *h*.

B B are the main conduits for the products of combustion, and C C are the foot-warmers, built or laid in the floor of the vehicle.

K K in Fig. 1 are the water-reservoirs, shown as arranged under the car-seats, and preferably above the level of the furnace. These communicate with the channels in the foot-warmers C by means of pipes *c c*, covered to prevent radiation of the heat.

E is the inner wall of the furnace, G the outer wall or envelope proper, and F is an intermediate wall, envelope, or partition, which divides the space between E and G, so as to form a circulatory conduit or channel for the water, which moves in the direction of the arrows—that, is down between F and G, around the bottom of F, and up between E and F. This double circulatory channel extends up to the bottom of the car, the envelopes of conduit or flue B being continuous with those of the furnace.

To prevent direct radiation of heat from the furnace, an outer envelope, H, is employed, the space between it and G being filled with some non-conducting material. The products of combustion pass up through B to the car-floor, or nearly so, when they pass out through lateral openings *i i* and back through an annular return-conduit formed by an exterior envelope, D′, to or nearly to the furnace, where they escape at *g*. By this construction the calorific effect is greatly enhanced, as the water-channels are surrounded on all sides by the heated gases.

I have not attempted to show the finer details of construction in Fig. 1; but these will be found on a larger scale in Fig. 3.

In Fig. 4 I have shown the construction of the foot-warmer on a very large scale. This is preferably constructed from five metal plates, J J, of the size required. The upper, middle, and lower plates are of the same size and unbroken; but the intermediate plates are cut away to form circulatory channels—as, for example, in the drawings, *a a′* a^2 represent the hot-water channels, and *b* the channel for the returning cold or cooler water. The interior plates are riveted together and the exterior plates are brazed to the others. These channels may be formed in any shape, and are subdivided to suit the circumstances of the case. The upward channel between the envelopes E and F communicates with the channels *a a′* a^2

in C, and the downward channel between F and G with the channel *b*, thus forming an endless circulatory conduit. The connection between the foot-warmer and the envelopes of the conduits B is sufficiently illustrated in Fig. 5, where the parts are shown separated. The ends 1 2 of the envelopes surrounding conduit B telescope with short tubular sections 1′ 2′ on the foot-warmer. This brings together attaching-flanges 3 3′ on the two parts, respectively. The upper end of conduit B is closed, as the products of combustion escape at the lateral openings *i*, before mentioned. The necessary connections in the conduits and envelopes may be accomplished with tubular sleeves, as shown in Fig. 6, said sleeves being therein lettered o' o^2 o^3. I prefer the employment of externally-arranged sleeves for this purpose, although other modes of connecting the parts may be employed.

In order to be able to charge the furnace readily, I provide it with vertically-sliding doors *d d* at its ends, (see Figs. 2 and 9,) and suspend these, by preference, from cranks on a rod mounted in rotative bearings under the car, provided with suitable operating-cranks, *s*. To the doors *d* are attached spouts *e*, Fig. 2, which receive and deliver the fuel. The ash-pan *f* is made of an inverted-V shape in its cross-section, and is attached to the doors *d*, so as to form a bottom to the furnace. When the doors are lowered the pan descends, and the ashes accumulated thereon fall down the double inclined surface of the pan. This feature, however, forms no part of my present application, and may or may not be employed.

The mode of constructing a furnace of this character for warming an ordinary carriage is clearly illustrated in Figs. 8 and 9. In this case only one foot-warmer is required, and this is connected with the furnace by means of a short vertical branch.

The reservoirs K are mainly a convenience. They serve to give room for the heated water to expand, and enable me to use a larger quantity of water than could be contained in the channels and conduits alone.

A modification of the furnace for carriages, horse-cars, &c., is illustrated in Figs. 10, 11, and 12. This is a cylindrical furnace for charcoal. The bottom is closed by a perforated door, *p*, over which is arranged a gauze cover, *s′*, to prevent the fuel from stopping up the air-holes in said door *p*. Gauze may also be arranged over the outlets *r* for the escape of the products of combustion.

In Figs. 3, 8, 9, 11, and 12 I have shown my automatic temperature register or regulator, on a small scale, in its place in the conduit B, and in Figs. 13, 14, and 15 I have shown said regulator in side elevation, vertical mid-section, and plan, respectively, detached and on a larger scale. This regulator I will now describe with reference particularly to the last three figures.

S is a drum-like chamber, open at the bottom and covered at the top, and fixed in the conduit B, so as to close the same. The top or cover M of the chamber S is pierced with slots or apertures, preferably radial, and over it is mounted on an axial pivot, *x*, a disk, M′, provided also with radial slots *t t*, which may be brought, by turning the latter disk, into coincidence with the slots in M; or said disk may be turned so as to close or nearly close the slots in M. To regulate the area of the apertures through which the gases from the furnace must pass, and in consequence the draft, it is only necessary to provide an automatic device for actuating the disk M′. To this end I employ a thermometric band or spiral, V, made from two superposed metal strips which expand unequally at a given temperature. One end, *l*, of this spiral is fixed to the margin of the disk M′, and the other end, *l′*, to the drum S or other fixed part. Any undue increase in the temperature will be imparted to the spiral V, and it will then be caused to act upon the disk M′, and thus reduce the area for the passage of the gases. In order to regulate the size of the apertures or slots by hand and independently of the automatic regulation, I employ a disk, M^2, precisely like M′, but arranged under the cover M. This disk is rotatively mounted on an independent axis, *y*, Fig. 14, and may be set by hand to suit the particular apparatus used or the peculiar circumstances of the case; or it may be mounted to operate substantially as illustrated in Figs. 9 and 9^a. In this construction a toothed wheel or segment, *n*, is fixed on the prolonged axis of disk M^2, and a rack, *n′*, is arranged to engage the said wheel. This rack is secured to a rod, *o*, arranged to slide in bearings under the car. The end of the rod is screw-threaded and provided with a cranked nut, *v*. When this nut is turned it is obvious that the rack *n′* will be moved longitudinally, and thus rotate the disk M^2. The cranked nut may be provided with a pointer, *z*, whereby the position of the disk M^2 can always be known.

Where a liquid admitted in small quantities is employed as a fuel the spiral S may also be arranged to admit said fluid in regulated quantities.

It will be observed that the foot-warmer is constructed so as to provide a large warming-surface, while the hot-water passages are very contracted, the object being to use as little water as possible in the warmer and to obtain the maximum of radiation therefrom. The current of water returning to the furnace in the circulatory system is much cooler than the outgoing current, as will be understood. By thus arranging the furnace exteriorly to the vehicle all danger from fire in case of accident is avoided, and the heat is much more uniformly distributed.

Having thus described my invention, I claim—

1. A heating apparatus for vehicles, &c., comprising a furnace arranged below the bottom of the vehicle, an endless conduit for the water, arranged to form a circulatory system,

the return portion of the conduit being arranged to envelop the outgoing portion, the main conduit for the products of combustion arranged within the water-conduits, and provided with a return-conduit arranged exteriorly to the water-conduits, and a foot-warmer provided with water-channels which connect with and form continuations of the water-conduits, all combined and arranged substantially as and for the purposes set forth.

2. The combination, with the water-conduits and the furnace, of the foot-warmer, constructed of plates J J, arranged as shown, to form channels for the water, substantially as set forth.

3. The combination of the furnace A, the conduit B, the envelopes F G, arranged to form a circulatory water-conduit, the outer envelope, D′, to form a return-flue for the gases, the foot-warmer C, the exterior envelope, H, and the non-conducting material arranged between the envelopes G and H, all arranged substantially as and for the purposes set forth.

4. The combination, with the furnace and its conduit for the gases, of the automatic register or regulator, comprising a chamber, S, with radial slots in its top M, the radially-slotted disk M′, mounted rotatively on the chamber, and the thermometric band V, having its one end attached to the disk M′ and its other end attached to a fixed part, all substantially as and for the purposes set forth.

5. The combination, with the furnace and its gas-conduit, of the chamber S, arranged in said conduit, and having a slotted top, M, the disk M′, the thermometric band V, and the slotted disk M^2, all arranged to operate substantially as set forth.

6. The combination of the furnace and its gas-conduit, the chamber S, provided with a slotted top, M, the disk M′, the thermometric band V, the inner disk, M^2, the toothed wheel *n*, rack *n′*, rod *o*, and cranked nut *v*, all arranged to operate substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

ALPHONSE MOREL.

Witnesses:
ROBT. M. HOOPER,
CH. ROUGEMONT.