(No Model.) 4 Sheets—Sheet 1.

R. M. MARCHANT.

APPARATUS FOR CONDENSING STEAM.

No. 259,029. Patented June 6, 1882.

Fig. 1.

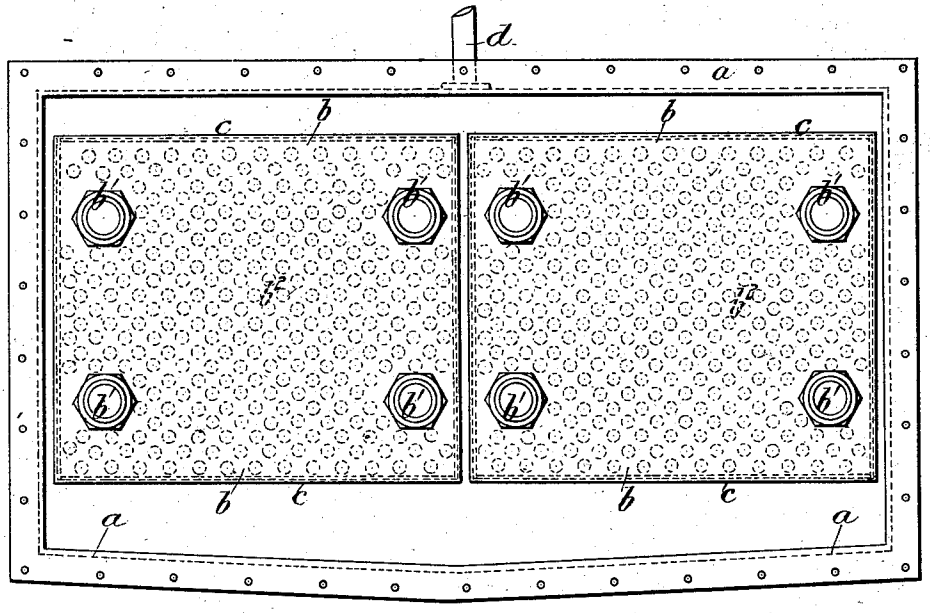
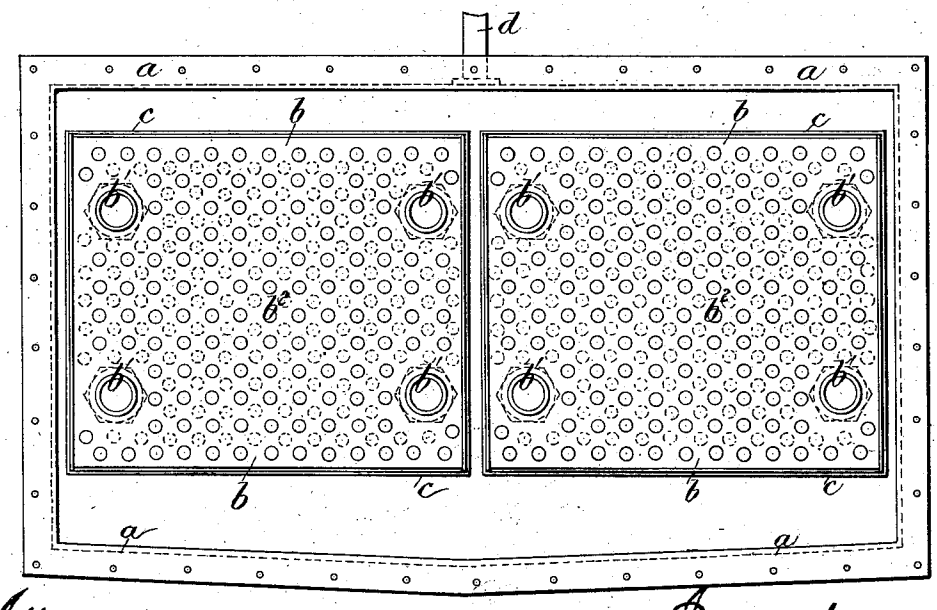


Fig. 3.



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R. M. MARCHANT.

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Fig. 2.

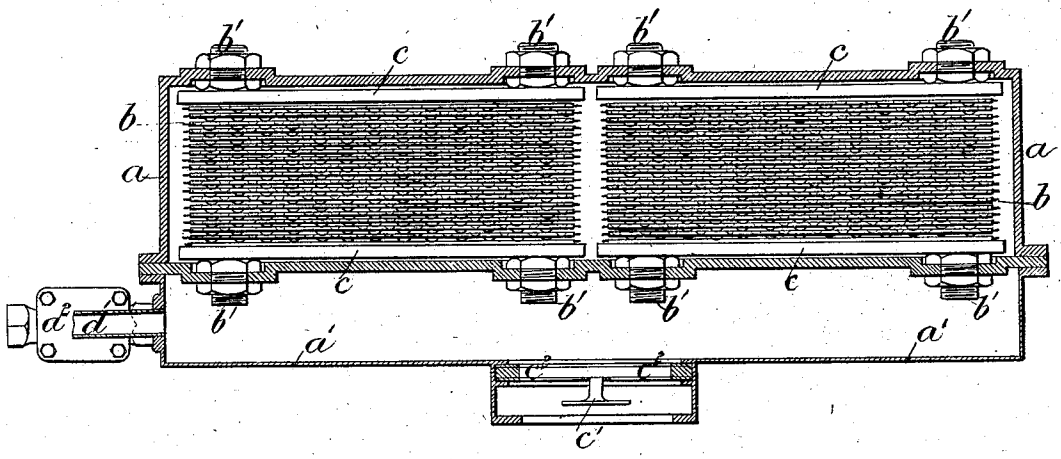
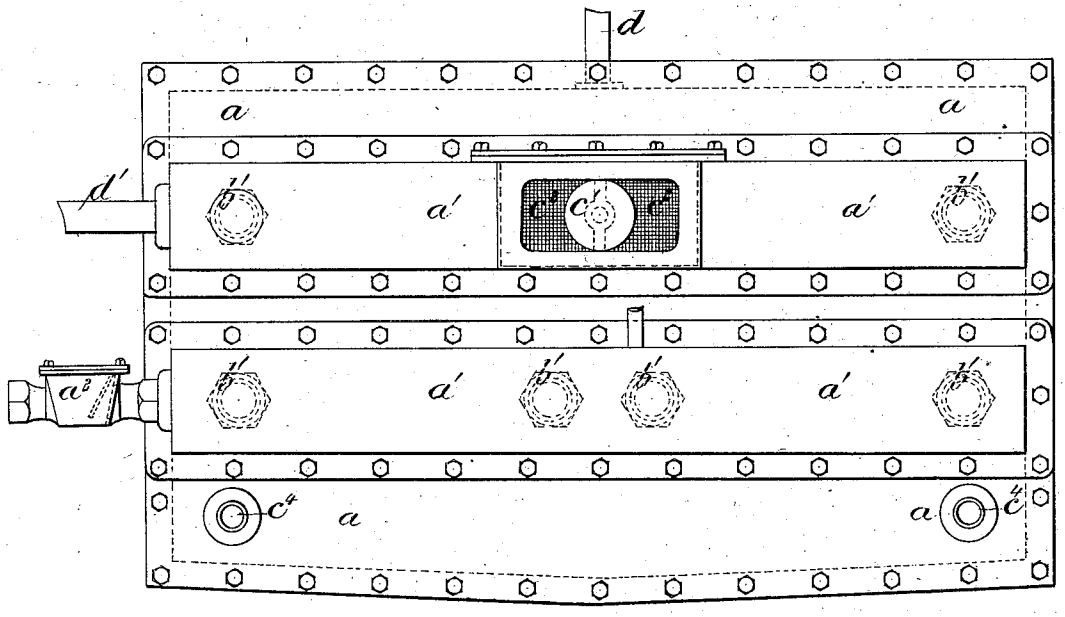


Fig. 4.



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APPARATUS FOR CONDENSING STEAM.

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Fig. 5.

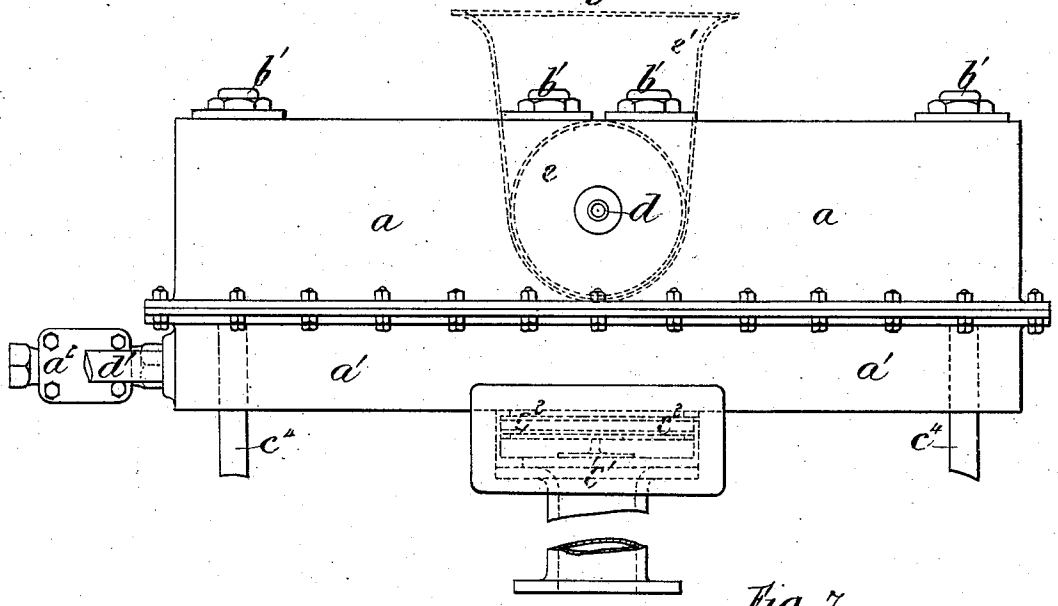


Fig. 6.

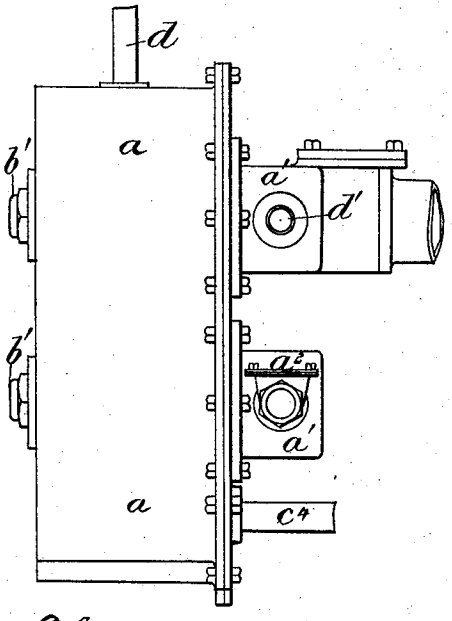
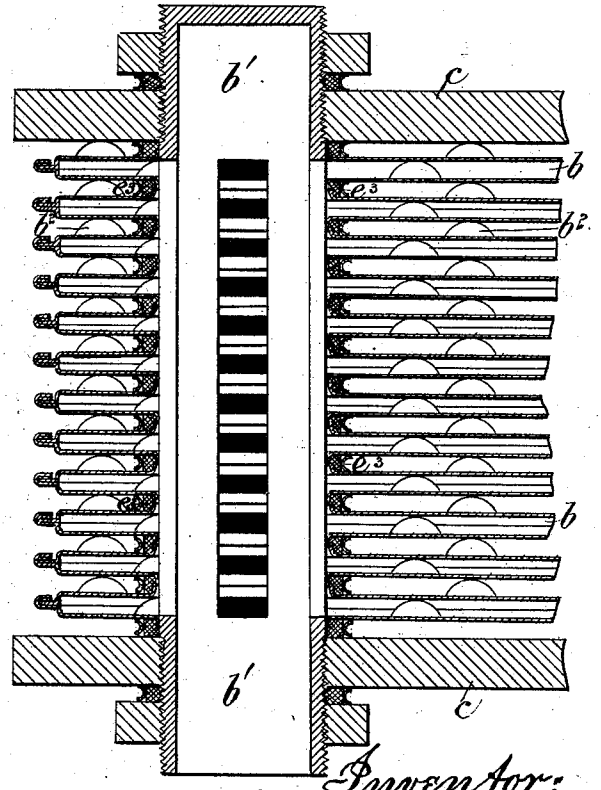


Fig. 7.



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R. M. MARCHANT.

APPARATUS FOR CONDENSING STEAM.

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Fig. 8.

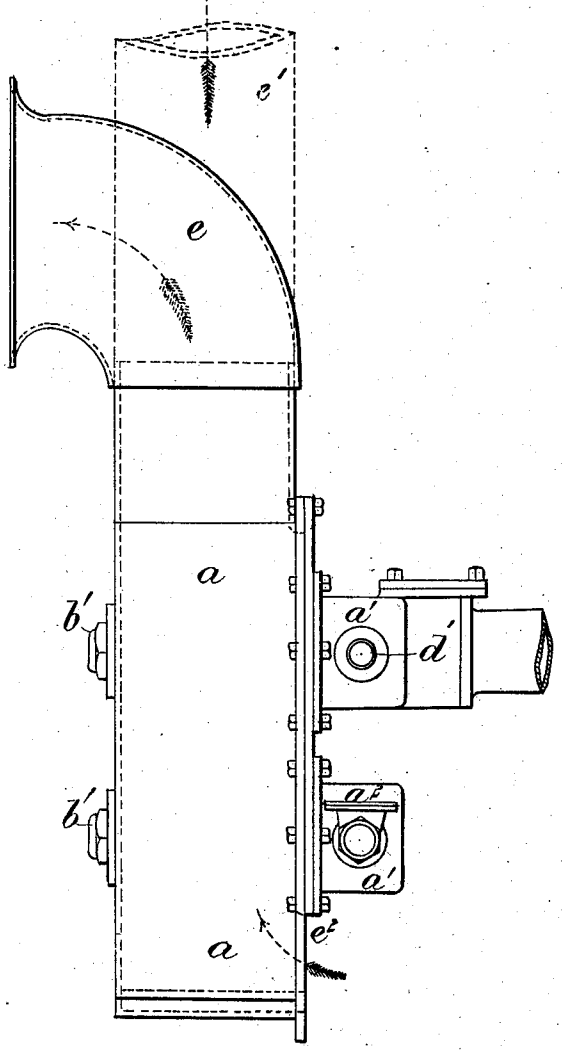
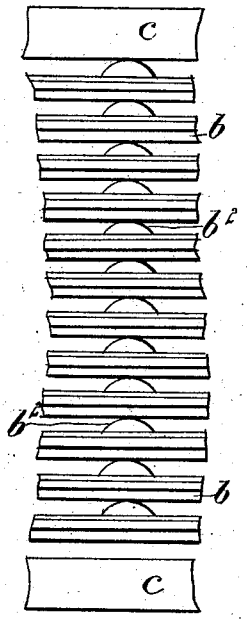


Fig. 9.



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UNITED STATES PATENT OFFICE.

ROBERT MUDGE MARCHANT, OF CLERKENWELL, COUNTY OF MIDDLESEX, ENGLAND, ASSIGNOR OF ONE-HALF TO JAMES SUTER AND WILLIAM FREDERICK LOTZ, OF LONDON, AND WILLIAM DOWNIE, OF SOUTHAMPTON BUILDINGS, CHANCERY LANE, COUNTY OF MIDDLESEX, ENGLAND.

APPARATUS FOR CONDENSING STEAM.

SPECIFICATION forming part of Letters Patent No. 259,029, dated June 6, 1882.

Application filed September 29, 1881. (No model.) Patented in England January 28, 1880, No. 374.

To all whom it may concern:

Be it known that I, ROBERT MUDGE MARCHANT, a citizen of Great Britain, residing at Saint John's Square Passage, Clerkenwell, in the county of Middlesex and Kingdom of England, have invented certain new and useful Improvements in Apparatus for Condensing Steam or other Vapors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters or figures of reference marked thereon, which form a part of this specification.

My invention relates to apparatus for condensing steam or other vapors by means of cold water or air admitted to the condenser, so as to act upon the steam or vapor by surface-condensation; and the said invention consists in the construction and combination of parts hereinafter set forth and claimed.

The accompanying drawings represent a condenser constructed according to my invention.

Figure 1 is a front elevation of the condenser-case with the cover off, showing the condensing-compartments with the front cast-iron plate for these in position in the case. Fig. 2 is a sectional plan with the front cover on the condenser-case, and showing the condensing-compartments and front and back cast-iron plates in position, and the front ends of the slotted pipes connected with the upper rectangular box-connector, into which is received the exhaust steam or vapor through the gauze protector. Fig. 3 is a front elevation of the condenser-case with the cover off, and with the front cast-iron plate protector removed, so that the exterior cups of the front condensing-compartment are seen. Fig. 4 is a front elevation of the condenser-case with the cover on, and with the rectangular box-connectors in position, and provided with the attachments necessary for a water-condensing medium and for the supply of both steam and water for the circulation of these to the boiler, where steam-pumps are used which pump both steam and water. Fig. 5 is a plan of the condenser, showing the connections necessary for both a water and an air condensing medium, those for the air being shown in dotted lines. Fig. 6 is a side elevation of the condenser-case, showing the connections for water as a condensing medium. Fig. 7 represents in section the method of connecting the condensing-compartments with the slotted pipes. Fig. 8 represents a side elevation, where air is used as the condensing medium; and Fig. 9 represents a plan view of the top of the compartments.

In the above figures, a is the condenser-case; a', the rectangular box-connectors; a^2, a valve through which the condensed steam is sucked, where steam-pumps are used to pump both steam and water; b, the condensing-compartments; b', the slotted pipes; b^2, the cups forming the distance-pieces in support; c, the cast-iron plates exterior to the condensing-compartments, and holding any required number of these together. c' is a circular plate suspended below the center of the wire-gauze c^2, and acting as a shield or splash-board to receive and distribute the exhaust-steam or other vapor, its object being to receive any occasional particles of grease and keep these from collecting in the center of the wire-gauze. c^4 are pipes conveying water to the condenser as its condensing medium. d is a pipe conveying the heated water from the condenser. d' is a pipe conveying any proportion of the exhaust-steam to steam-pumps, where these are used to pump both steam and water. e is a cowl set toward the back of any locomotive, so as to suck the air used as a condensing medium through the condenser. e' is a pipe conveying the air to any chimney or sucking-fan, when air is used as a condensing medium to stationary engines. e^2 is the passage for the air-entrance, constructed for the whole width of the condenser-case by removing the cover below the level of the lower rectangular box-connectors, such entrance being required where air is used as a condensing medium. e^3 e^3 represent the spun rings outside the rubber packing.

Each of my plates *c* is perforated with two or four holes for the reception of the connections of the pipes hereinbefore referred to, these holes being near the top and bottom of each plate, each hole at the top being preferably opposite one at the bottom. The cups b^2 formed on said plates keep them at the proper distance from each other. The edge of each hole for a pipe-connection is raised so as to form a rim equal to the depth of these cups, and every alternate plate has a slightly larger hole, with an external taper to such raised edge, for the purpose of receiving the untapered edge of the hole of the adjoining plate. I construct the indentations or cups b^2 so that when the plates are fitted together in pairs these indentations or cups determine the distance between the two sides of the compartment formed by each pair of the plates, and in such manner that the indentations or cups which determine the distance between the compartments are clear of and at equal distance from and alternate with the indentations and cups which separate the plates of each compartment. The depth of such indentations or cuppings determines the distance between the sides of each compartment, and also the distance between the compartments when fixed, as hereinafter explained. To effect such an arrangement, one-half the number of the plates are indented or cupped to a templet giving one position to the indentations or cups, and the other half are worked from another templet, giving to these indentations or cups an intermediate position. This can be easily effected with a press-tool. The plates thus prepared are then securely fastened together at the edges and in pairs, so that each pair shall become a water or air tight compartment, capable of being connected at the holes before described with any number of similar water or air tight compartments. I prefer to fasten the edges of the plates by lapping these edges over, so that the exterior edge of the compartment is formed of four thicknesses of plate, and the corners by the laps over are formed with eight thicknesses of plate. For this purpose I take two of the plates hereinbefore described as cupped to different templets in such manner that these cups should alternate, and I set the edges of each plate (of the pair of plates so selected to form one compartment) up to half the depth of those indentations or cups which determine the space between the pair of plates forming one compartment, and I give each set an external flange rectangular to such vertical set, and parallel to the plate, and preferably of three-quarters of an inch in width. The set to one plate is so given that the cups on it are internal to the compartment, and the set to the other plate is so given that the cups on it are external to the compartment, the cups internal to the compartment forming the interior supports between the two plates forming the compartment, and the cups external to the compartment forming the exterior supports in the space existing between one compartment and the next, which space such cups external to the compartment determine.

I dip the edges of the plates in a tin bath, so as to tin the copper edge of the plate, and I then lap over the edges and solder all securely together with a sweating-joint. After having been tested to about twenty pounds pressure per square inch, the compartment is ready for connection with any required number of other compartments. The compartments thus prepared are threaded or placed together on a top and bottom pipe or pipes, such pipes being slotted longitudinally so as to communicate with the interior of the several compartments. Between each compartment and that next adjoining is threaded on or placed a rubber ring, and external to such rubber ring is threaded on or placed a spun ring constructed on thin copper-plate, with a semicircular section on its exterior, so that it is capable of compression when the compartments are set up together, as hereinafter described, and in this manner the rubber is confined between the edges of the holes hereinbefore described, and the copper ring external to the rubber; and when the whole is set up, the rubber, by compression between the two, is made to form a perfect joint between such two copper protections.

I place a cast-iron or other plate on each side external to any number of compartments used to form the condenser, and these plates are perforated with holes the same as the compartments, and through these holes the slotted pipes are passed, having screwed ends to each such slotted pipe. The joint is again made in the usual way, and the whole set up by screwing the nuts on the end of the pipes to the required pressure. Any number of such compartments can be fixed in a case, in which provision is made to receive the projecting ends of the slotted pipes which pass through the case, and are again jointed by the setting up of washers and nuts against the case; and the end of the slotted pipes is made to communicate by any suitable connections with the source of the steam or vapor to be condensed. In the condenser-case shown in the drawings such communications with the ends of the slotted pipes are made by means of rectangular boxes, which are jointed and bolted on to the front of the condenser-case, and made to communicate, as the conditions of the application may require, with any other communications or conduits to the boiler.

The steam or vapor passes through the compartments, all grease and impurities being kept out by the application of a gauze-wire purifier at the entrance. The steam or vapor becomes condensed by the cold water or air which circulates through and fills the condenser-case. The steam or vapor is delivered through the slotted pipes at the top of the condenser, and in its passage through the condenser meets at opposite sides of the plates the water or air which is supplied to the bottom of the condenser-case. The water or air leaves the case

at the top and enters a tank, a chimney, or other suitable provision for a continuous circulation of the condensing medium. The material of the plates around the holes is raised to form annular flanges, which interlock to bind the plates of each pair together, substantially as hereinbefore described.

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

1. In an apparatus for condensing steam and other vapors, a series of plates arranged in pairs and united at the edges to form chambers, said plates being provided with cups or indentations facing alternately inward and outward, the indentations which extend within the chambers serving to brace the same and the other cups or indentations serving to separate the chambers from one another.

2. In an apparatus for condensing steam and other vapors, a series of plates united at the edges in pairs, and provided with raised annular flanges surrounding the holes in said plates, said annular flanges of each pair of plates interlocking, substantially as set forth.

3. In an apparatus for condensing steam and other vapors, a series of plates united to form pairs, each pair inclosing a compartment, and the several compartments being separated by elastic packing-rings, substantially as and for the purpose set forth.

4. In an apparatus for condensing steam and other vapors, a wire screen and a shield extending below or outside of said screen and serving to protect the central part of that screen from grease, substantially as set forth.

5. In an apparatus for condensing steam or other vapors, a series of plates arranged and united at the edges in pairs, as hereinbefore described, the said plates being formed with indentations or cups, and with holes having raised edges, and being threaded on slotted pipes, and made tight at the joints, all substantially as and for the purposes hereinbefore described.

In testimony whereof I affix my signature in the presence of two witnesses.

R. M. MARCHANT.

Witnesses:
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ARTHUR P. O'HALLORAN.