No. 692,854. Patented Feb. 11, 1902.

J. T. HOPE.

STEAM RADIATOR.

(Application filed Mar. 18, 1901.)

(No Model.)

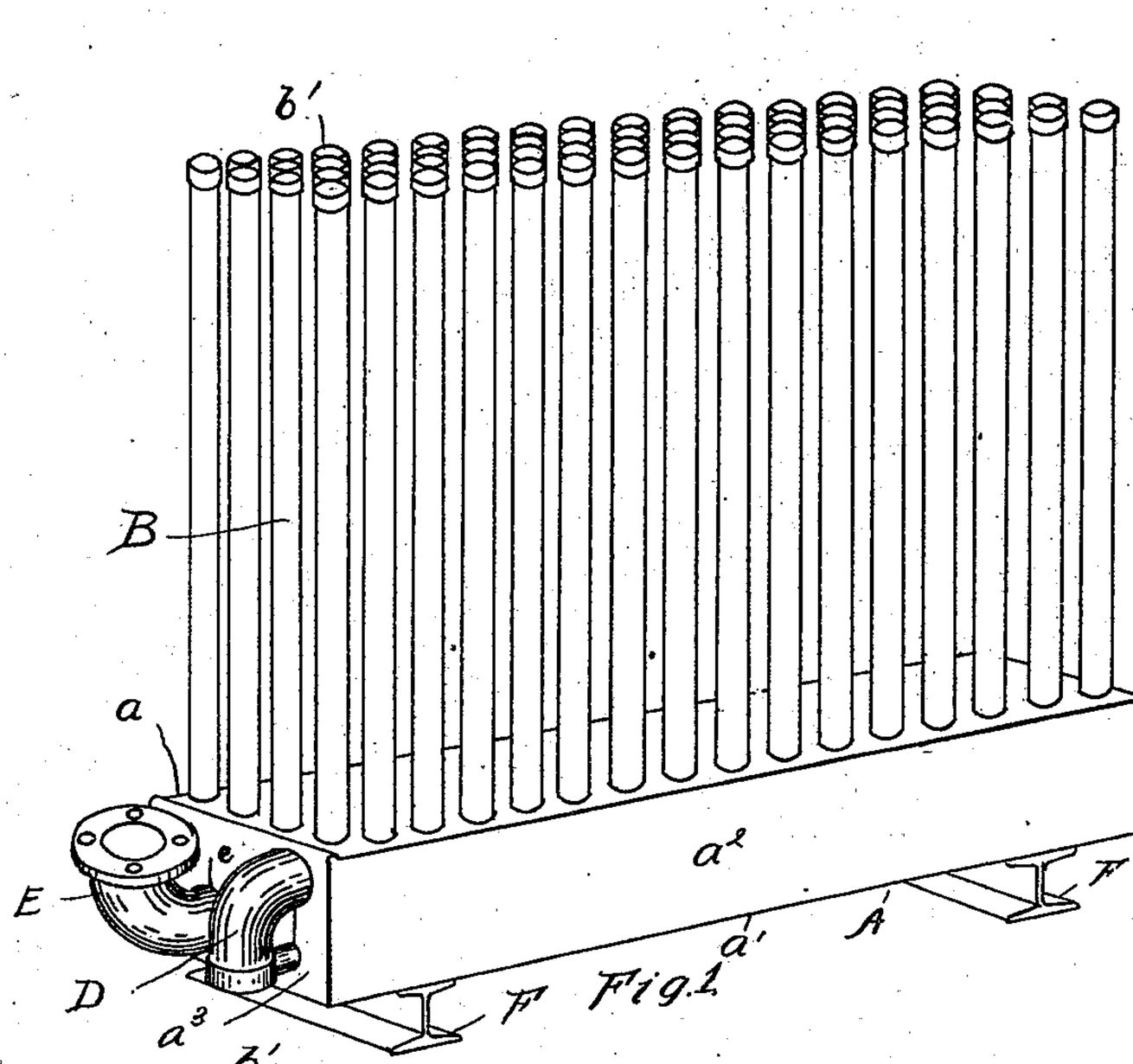

Fig. 1.

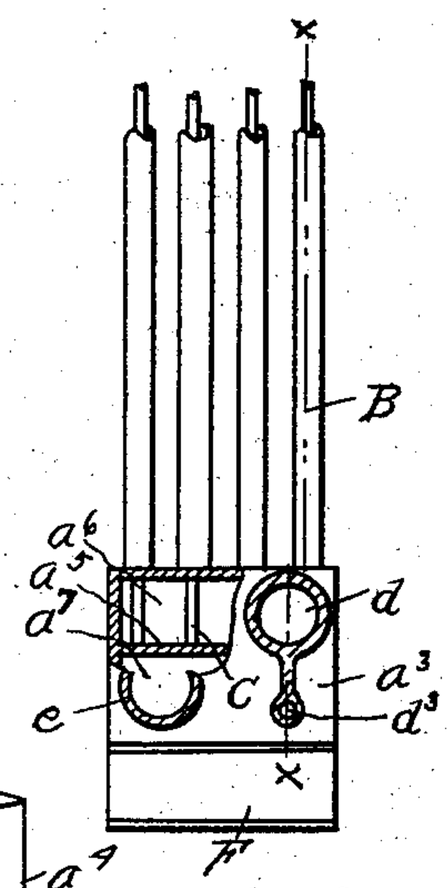

Fig. 3.

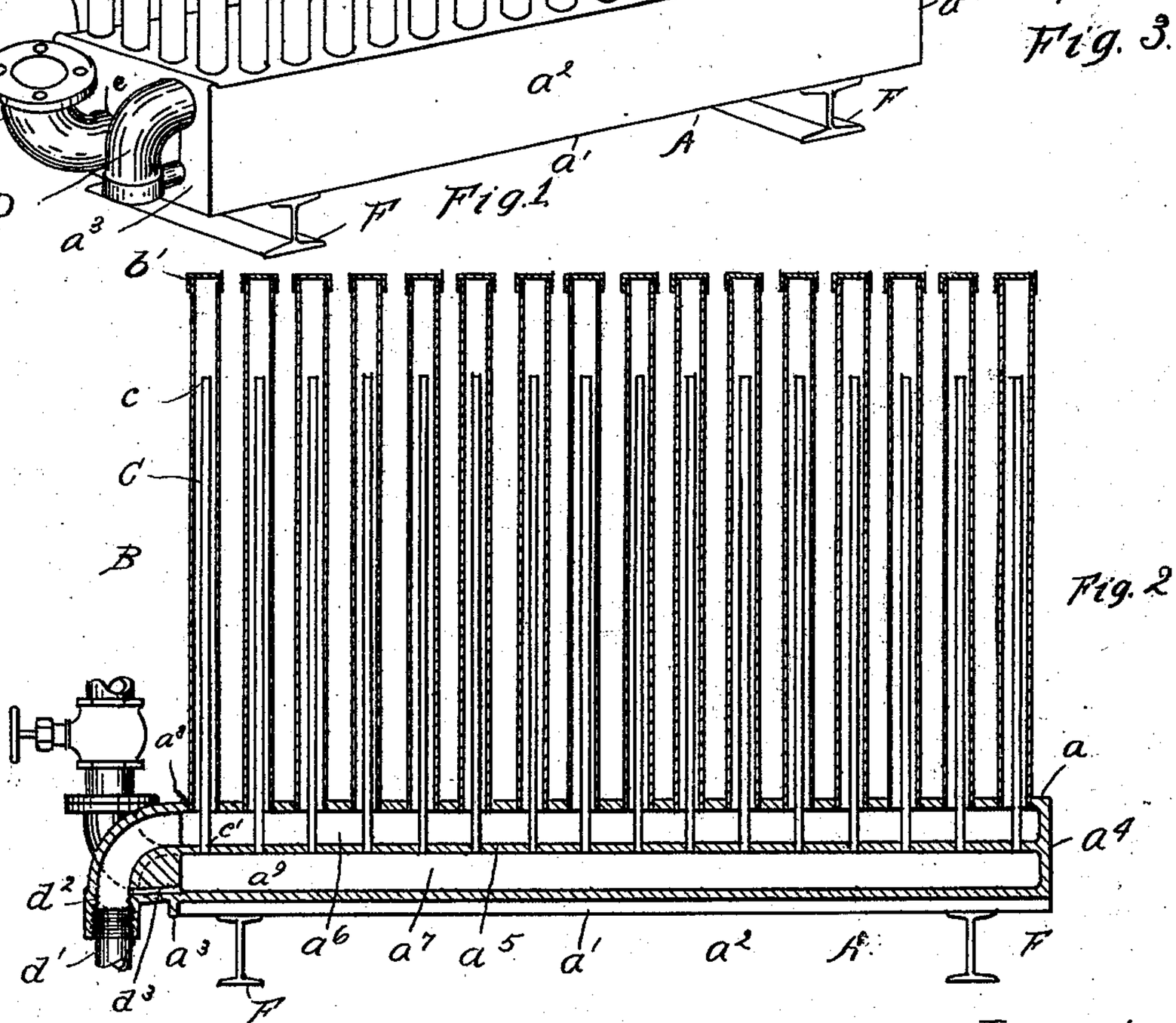

Fig. 2

Witnesses

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STEAM-RADIATOR.

SPECIFICATION forming part of Letters Patent No. 692,854, dated February 11, 1902.

Application filed March 18, 1901. Serial No. 51,754. (No model.)

To all whom it may concern:

Be it known that I, JOHN T. HOPE, a citizen of the United States of America, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Steam-Radiators; and I do hereby declare that the following is a full, clear, and exact description of the invention, such as will enable others to make and use the same, reference being had to the accompanying drawings, forming a part of this specification.

The objects of my invention are, first, to prevent the live steam in the steam-radiating tubes from coming into contact with the water of condensation and obtain the maximum heating efficiency of the tubes; second, to effect a circulation of the steam; third, to effect a delivery at the end of the steam-circulating tubes of approximately dry steam, and, fourth, to provide for the drainage of the condensation in the steam-supply chamber direct to the steam-return pipe.

My invention consists in the novel construction and combination of parts, such as will be fully described, and specifically pointed out in the claims.

In the drawings, Figure 1 is a view in perspective of the improved steam-radiator. Fig. 2 is a longitudinal sectional view taken upon the line $x\ x$ of Fig. 3. Fig. 3 is an end view in detail of the base of the radiator with the steam-supply and drain pipes removed, also showing broken portions of the radiator-tubes and a portion of the end of the base broken away to show the diaphragm between the steam circulating and condensing chambers.

Similar letters of reference indicate corresponding parts in all the figures of the drawings.

Referring to the drawings, A represents the base of the improved steam-radiator, which consists of a longitudinal cast box of the proper width and height, of which a represents the top, a' the bottom, a^2 a^2 the sides, and a^3 a^4 the respective ends of the box. Within the base or box A is a partition or diaphragm a^5, which is arranged in position, as shown in the drawings, equidistant from the top a and the bottom a' of the box and extends horizontally from the inner surface of one side a^2 to the inner surface of the other side a^2 and from the end a^3 to the end a^4 of said box; above which diaphragm is the receptacle a^6 for the condensation and below said diaphragm the receptacle a^7 for the inflowing live steam. In the top a of the box, a short distance from one end of the box and also from the vertical line of the inner side of the box, is a screw-threaded opening a^8.

B represents one of the vertical steam-radiating return-tubes, which is the proper size to conduct steam and of considerable length, the lower end b of which is externally screw-threaded and fitted within the screw-threaded opening a^8 in the top a of the box. The upper end of the tube B is closed or hermetically sealed by a cap b'.

In the top a of the box A are a series of screw-threaded openings of the same size as the opening a^8, arranged at short distances apart from each other and in series nearly to the other end a^4 of the box, and also a series of openings corresponding in size extending in series in a transverse direction to the box, nearly to the other side of said box. Within the series of openings are radiator-tubes, which are the same as the radiator-tube B. Within said radiator-tube B is a concentric steam-circulating outgoing pipe C, smaller in circumference than the tube B, or approximately three-eighths of an inch in diameter, the outer tube B being about one inch in diameter. The outer surfaces of the pipe C are arranged at equal distances from the inner side of tube B, the open upper end c of pipe C extending to a point within the tube B a short distance from the cap b'. The lower open end c' of the pipe C is externally screw-threaded and extends downwardly through receptacle a^6 to the diaphragm a^5, in which are screw-threaded openings a^9, in a vertical line with the pipes C, communicating with the receptacle a^7, in which openings are fitted the screw-threaded ends of the pipes C.

In the end a^3 of the base or box A is a pipe-opening d, extending through said end above the diaphragm a^5 into the receptacle a^6. Extending around said opening d and integral with the end a^3 of the base is a return-pipe elbow D, the other end of which elbow extends downwardly, and in said end is fitted the upper end of the return-pipe d', which is

shown broken away. This pipe carries away the condensed vapor or water from the receptacle a^6 and extends to the place of discharge, which in ordinary use conducts the water back to the steam-boiler. Extending from the inner side of elbow D to the outer surface of the end a^3 of the box is a web d^2 of considerable thickness. Through the end a^3 of the box, near the inner side of the bottom a' of the box or base A, is an opening or passage d^3, which also extends through the web d^2 and through the inner side of the elbow D, said opening being inclined in a slight degree toward the elbow D.

In the end a^3 of the base or box A, below the diaphragm a^5, is a pipe-opening e, in which is fitted one end of a live-steam-supply-pipe elbow E, the other end of which elbow is extended in an upward direction, and with which is connected an ordinary steam-supply pipe, which furnishes steam from the boiler at the pressure required for proper circulation of the steam. The base A is shown mounted upon the transverse I-beams F F.

In operation steam is admitted through supply-pipe E into the receptacle a^7, which passes upwardly through the small-sized steam-circulating pipes C, out of the upper end of said pipe, driving the cold air downwardly in the tube B into the receptacle a^6 and causing the upper ends of the tubes B to radiate immediately the heat of the steam. This steam circulates or passes downwardly in contact with the inner surfaces of the tubes B, imparting its heat subsequently to the tubes, the steam condensed in coming into contact with the surfaces of tubes B falling into the receptacle a^6 and being conducted from the base A through pipe D.

It will be observed that live steam escaping from near the top or upper end of tubes C comes into contact with the inner surfaces of said tubes, where the condensation takes place, and the water falls by gravity down the tubes B into the receptacle a^6. A resistance to condensation is increased by the inflowing steam in the receptacle a^7, which imparts heat to the diaphragm a^5, and consequently the water falls upon a heated instead of a cold surface in the base A. During the passage of the steam through pipes C very little condensation takes place or commingles with the live steam, and therefore no reduction in temperature results, there being no opportunity for the steam to become chilled by the water and cause pounding in the radiator. Should any condensation take place from any cause in the steam-receptacle a^7, the water passes through the small passage or duct d^3 into the steam-return-pipe elbow D, leaving the steam in the lower receptacle dry.

It is obvious that the invention may be applied to various forms of steam-radiators, more especially for indirect hot-blast heating, where condensation is so rapid that the ordinary radiator does not circulate the steam with sufficient rapidity. The means of steam circulation in the radiator tubes may also be employed for the circulation of refrigerants, such as ammonia or cold brines.

In the admission of steam to the type of apparatus herein shown, and which are employed in many cases for indirect radiation, the object which is sought to be accomplished is the perfect circulation of the steam through the circulating-pipes, so as to carry off the water of condensation as rapidly as formed. This result heretofore has been counteracted by the short circuit of the steam, which causes an outward pressure in the return-tubes, and in the various traps heretofore employed the steam will exert a back pressure sufficient to pass through the trap and upwardly within the return-tubes while the main pressure is in the outgoing steam-pipes, thus preventing the circulation of the steam. In my invention the steam enters the lower receptacle and makes a complete circulation of the tubes and passes out of the base to the drain-pipe without the aid of traps. The orifice or duct d^3 to the pipe-elbow D being small in size the whole pressure of the steam is exerted within the lower receptacle of the base of the radiator to insure perfect circulation, and the water of condensation, with the exhaust-steam, passes off with the water of condensation from the live steam in the lower receptacle a^7 in the base.

Such modifications may be employed as are within the scope of the invention.

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

1. In a heating apparatus, the combination with a hollow base, divided by a diaphragm into a lower steam-inlet and an upper steam-outlet receptacle, of a steam-supply pipe connected with the lower steam-inlet receptacle, and a drain-pipe elbow on the outer side of the base connected with the upper steam-outlet receptacle, return heating-tubes connected with the latter receptacle, and outgoing steam-circulating pipes leading from the lower steam-outlet receptacle within the return-tubes, said drain-pipe elbow having a duct for the condensed steam leading to the lower steam-inlet receptacle.

2. In a steam-radiator, a hollow base divided by a diaphragm into a lower steam-inlet and an upper steam-outlet receptacle, a steam-supply pipe connected with the lower steam-inlet receptacle, and a drain-pipe elbow connected with the upper steam-outlet receptacle and a web connected with said base and elbow, said elbow having a duct for the condensed steam leading to the lower steam-inlet receptacle through said web.

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Witnesses:
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