

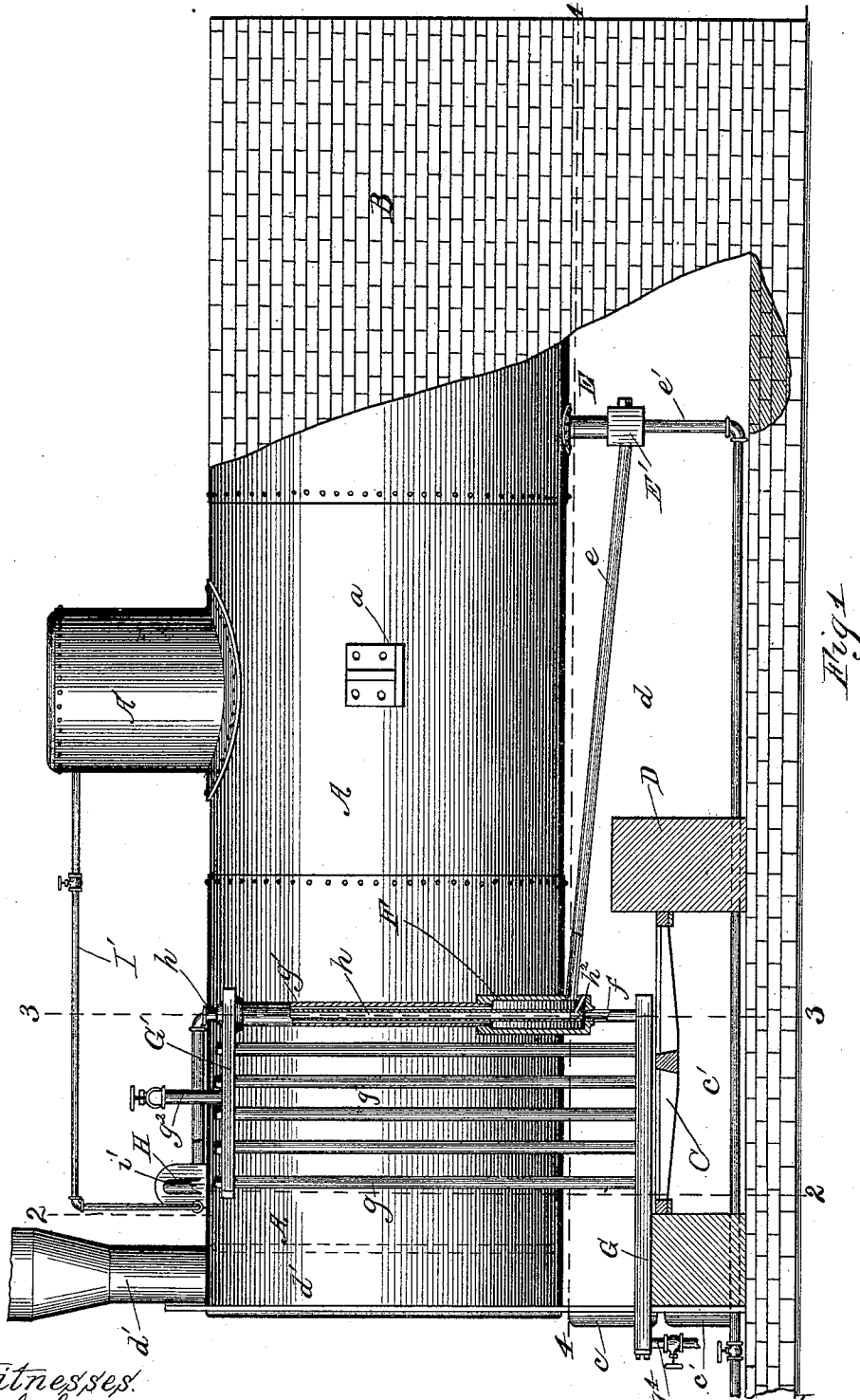
(No Model.)

4 Sheets—Sheet 1.

O. D. ORVIS.
STEAM BOILER.

No. 471,135.

Patented Mar. 22, 1892.



Witnesses,
W. C. Corlies
J. L. Tunisow

Inventor
Orel D. Orvis
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attys.

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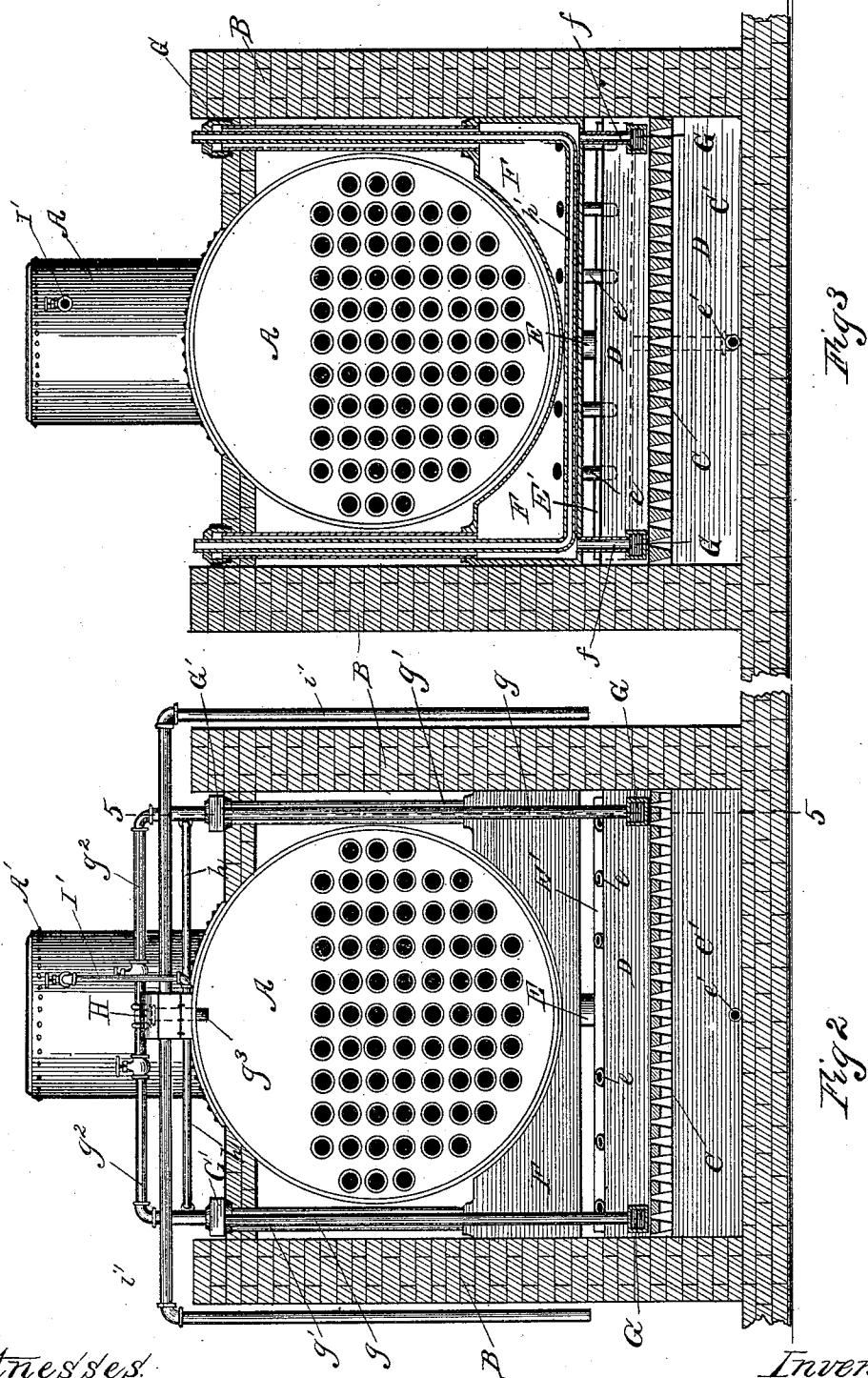


Fig 3

Fig 2

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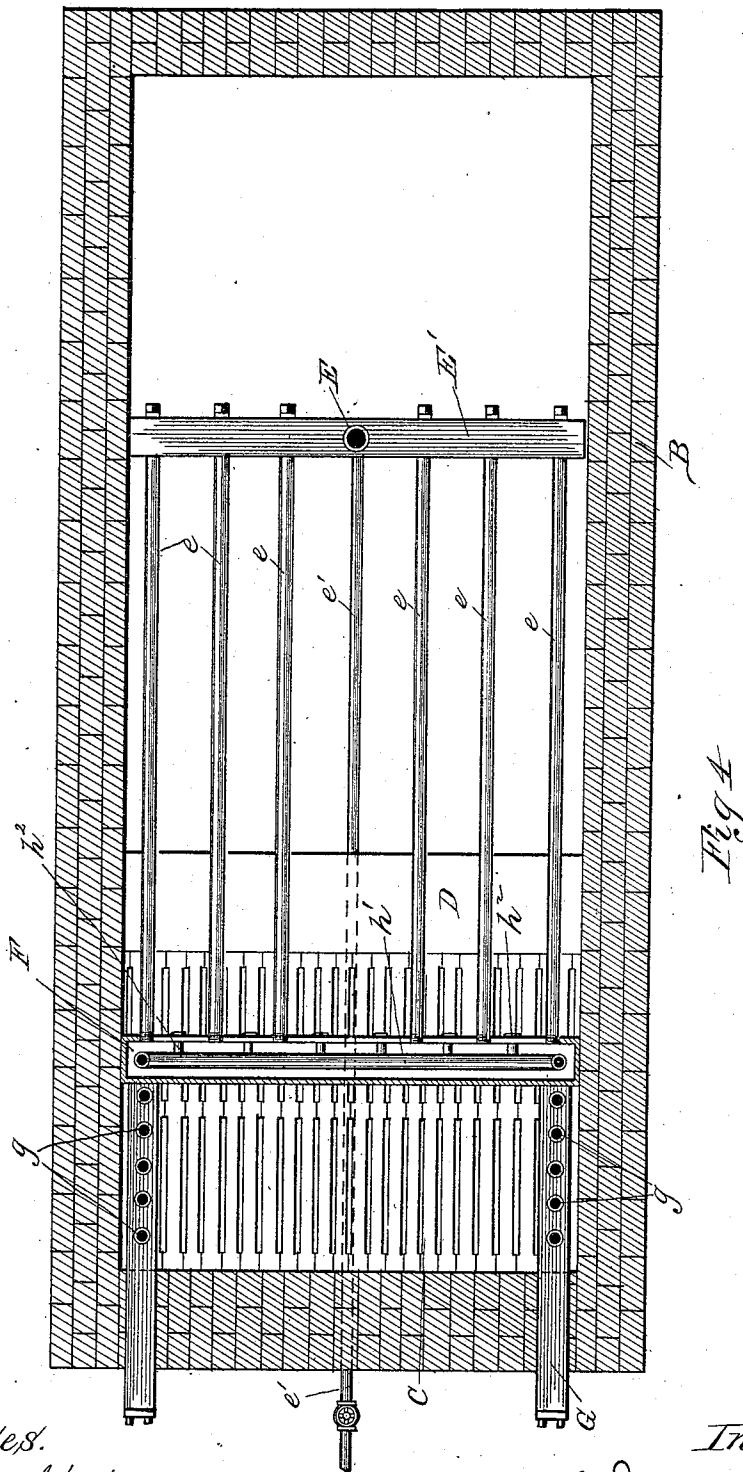
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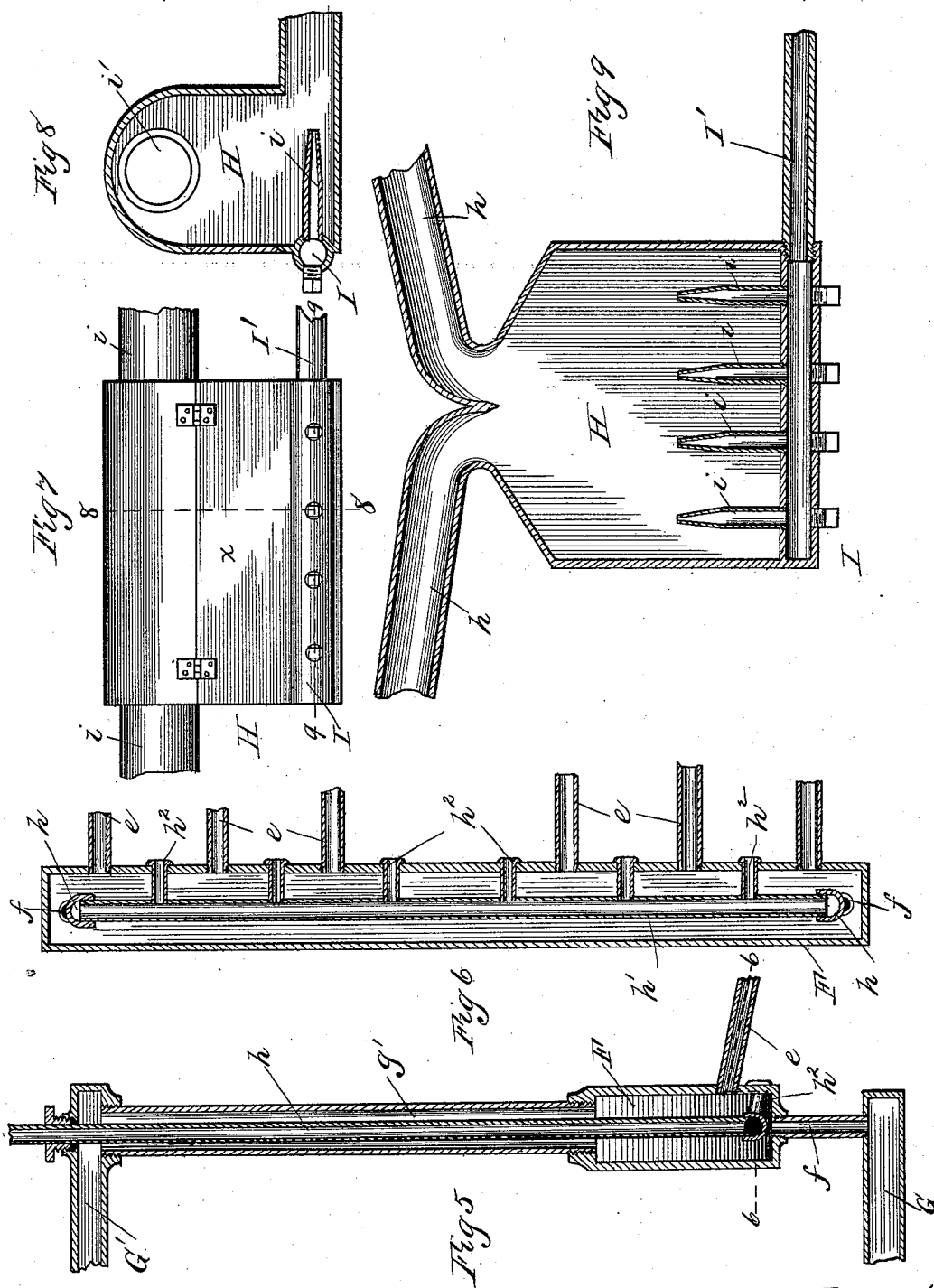
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UNITED STATES PATENT OFFICE.

OREL D. ORVIS, OF CHICAGO, ILLINOIS.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 471,135, dated March 22, 1892.

Application filed April 30, 1891. Serial No. 391,033. (No model.)

To all whom it may concern:

Be it known that I, OREL D. ORVIS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have
5 invented certain new and useful Improvements in Steam-Boilers; and I do 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
10 make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to steam-boilers; and
15 it consists in a system of generating-pipes, in combination with a system of pipes for feeding the generating-pipes with water from the boiler and with means for discharging the
20 steam generated into the steam-space of the boiler.

It consists, further, in the combination, with such a circulating system, of a smoke-consumer consisting of a vacuum-box and pipes
25 for conveying a supply of air and delivering it within the furnace.

It consists, further, of various minor features in connection with the circulating system and smoke-burner, as hereinafter more fully described.

30 In the accompanying drawings, Figure 1 shows a side elevation of a steam-boiler and its furnace, some portions being broken away and some of the parts being shown in vertical section. Fig. 2 is a transverse vertical
35 section on the line 2 2, Fig. 1. Fig. 3 is a transverse vertical section on the line 3 3, Fig. 1. Fig. 4 is a plan section on the line 4 4, Fig. 1. Fig. 5 is an enlarged detail of one portion of the circulating system and smoke-burner.
40 Fig. 6 is a sectional view on the line 6 6, Fig. 5. Fig. 7 is an end elevation of the vacuum-box. Fig. 8 is a sectional view on the line 8 8, Fig. 7. Fig. 9 is a plan section on the line 9 9, Fig. 7.

45 In the drawings the boiler is represented by A and its steam-dome by A'.

The brick setting of the boiler and the furnace-walls are represented by B.

50 a is a bracket on the side of the boiler for engaging the side wall.

C represents the grate-bars, and C' the ash-pit.

c and c' are the doors to the furnace and ash-pit, respectively.

D is the bridge-wall; d, the combustion-chamber in the rear of the bridge-wall, and
55 d' the chimney-flue.

None of the parts thus far mentioned show any novel features.

A water-leg E extends downwardly from
60 the rearward part of the boiler to a cross-head or distributing-head E'. A water-jacket F, which may have its upper side conformed in shape to the contour of the boiler and its
65 lower side horizontal, extends across the furnace, its ends abutting against or being adjacent to the side walls B. This water-jacket may be of any desired width from front to
70 back. I prefer to make it about six inches wide. Inclined pipes e extend upwardly from the cross-head E' to the water-jacket F. These
75 pipes may extend through or above the bridge-wall D and they may be of any desired number. In the drawings six such pipes are shown.

At each end of the water-jacket F is located a pipe f, extending downwardly and
80 communicating with a water or distributing head G, lying at the sides of the furnace and directly above the grate. A series of generating-pipes g, extend vertically from the water-heads G, reaching approximately to the
85 top of the boiler A and terminating in collecting-heads G'. A pipe g² leads upwardly from each of the heads G' over the top of the boiler and communicates with a down-pipe g³, leading to the steam-space of the boiler.

In the drawings a valve is located in each of the pipes g² for use while repairs are in progress. A drain-pipe e' extends downwardly from the cross-head E' and forward
90 to the front of the furnace. The water-heads G extend forward through the front wall of the furnace and are provided with drain-pipes g⁴. The water-jacket F is preferably constructed so that its ends extend upwardly
95 at the sides of the boiler and receive the pipes g', as shown, so that the steam generated in the jacket will find a direct upward passage to the boiler, thereby causing no disturbance of the circulation of the water. It
100 will be seen that the rapid generation of steam in the jacket F and pipes g will cause a circulation through the entire system, the water being carried continuously from all parts of

the boiler toward the water-leg E. This movement of the water in the boiler will check the tendency to precipitation, and the detritus will find its way to the water-head E'. The capacity of this cross-head being greater than that of the water-leg E and the movement of the water being thereby checked, the tendency to precipitation will be increased and the water-head E' will serve the purpose of a mud-drum. The mud can be readily removed by opening the valve at the forward end of the drain-pipe e', when the circulation in the pipes e will be reversed and the movement will be toward the pipe e' from all sources. The water-heads G will also serve as receptacles for mud, which is readily drained from them by opening the valves in the drain-pipes g³. The constant and active circulation of water not only makes it possible to locate the water-jacket and air-pipe, as described, but renders them perfectly safe.

A vacuum-box H is located above the boiler. A steam-head I extends across its front end, and steam-nipples i project laterally from it into the box. The steam-head I is served by a pipe I', leading from the steam-dome A'. Air-induction pipes i' enter the box H upon each side, and I prefer to extend them to the side of the boiler and downwardly, so that their open ends are in convenient reach. I have found by experiment that this form of construction prevents the noise occasioned by the use of air-ports which are not prolonged by pipes such as I describe, and it enables the engineer to determine the volume of air being introduced.

The box H terminates in two pipes h h, which lead to opposite sides of the boiler, and extend downwardly through the rearward end of the heads G' and through the pipes g', which form a part of the system of generating-pipes, but are made larger than the pipes g for the purpose of jacketing the pipes h h. The pipes h h terminate in the water-jacket F, communicating with a cross-head h'. Nipples h² extend laterally from the head h' through the rearward side of the water-jacket F, so that the air drawn into the box H by the action of the steam-jets from the nipples i is conveyed through the pipes h to the head h' and discharged from the nipples h² upon the bridge-wall D or at such other point in the combustion-chamber as may be preferred, being mingled with the gases leaving the burn-

ing fuel and effectually consuming the carbon which has escaped combustion.

The vacuum-box H is provided with a hinged door x upon one of its sides for convenience in cleaning.

By the carrying of the air into the combustion-chamber through a steam and hot-water jacket the air is raised to a high and at the same time to a uniform temperature, and yet is not so highly heated as to vitiate it or to expand it as to check the velocity and consequent volume.

The vacuum-box described is novel in being provided with a dome for accumulating a large volume of air, whereby friction is reduced, and the steam-jets being discharged into a chamber of considerable capacity the same advantage is secured and the volume of air introduced is greatly increased.

It has heretofore been found difficult to locate an air-pipe across the crown of a furnace so as to secure the discharge of oxygen at this point. By combining the air-pipe for promoting combustion with the generating system already described I am able to locate it, as stated, and protect it from the intense heat by the constant circulation about it of water.

I claim—

1. In a steam-boiler, the combination, with a system of steam-generating pipes located within the furnace fed from the water-space of the boiler and discharging into its steam-space, of a smoke-burner comprising an air-pipe jacketed within parts of the generating system, a series of nipples from the air-pipe through the walls of its jacket and discharging into the furnace, a vacuum-box for feeding the air-pipe, comprising an air-chamber having external openings, and a steam-pipe leading from the boiler into the box and discharging therein through nipples, substantially as described.

2. In a vacuum-box, the combination, with an enlarged air-dome tapering to delivery openings or pipes, of air and steam pipes entering the dome and nipples from the steam-pipe for discharging jets into the air-chamber, substantially as described.

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

OREL D. ORVIS.

Witnesses:

D. H. DUNN,

FRANK G. WARD.