No. 736,857. PATENTED AUG. 18, 1903.

G. MARLOW, Sr.

AIR AND STEAM FEEDING ATTACHMENT FOR BOILER FURNACES.

APPLICATION FILED NOV. 11, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 2.

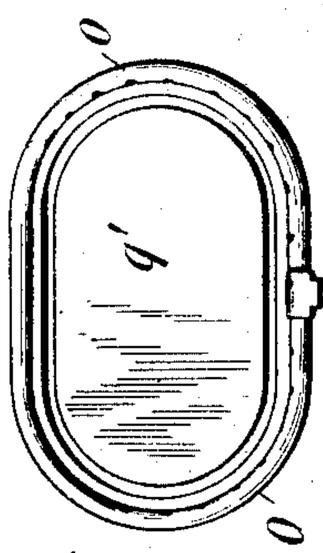
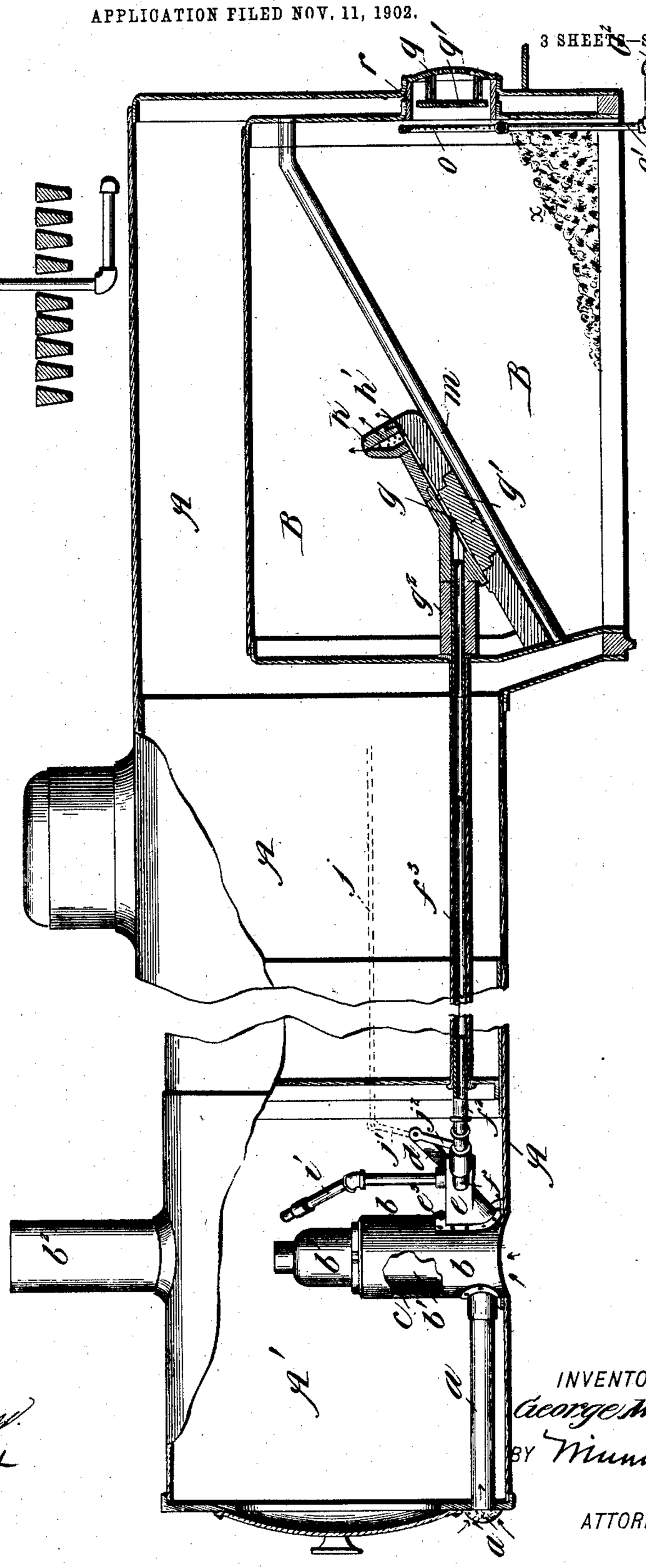


Fig. 1.



WITNESSES:

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Amos W. Hart

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NO MODEL. 3 SHEETS—SHEET 2.

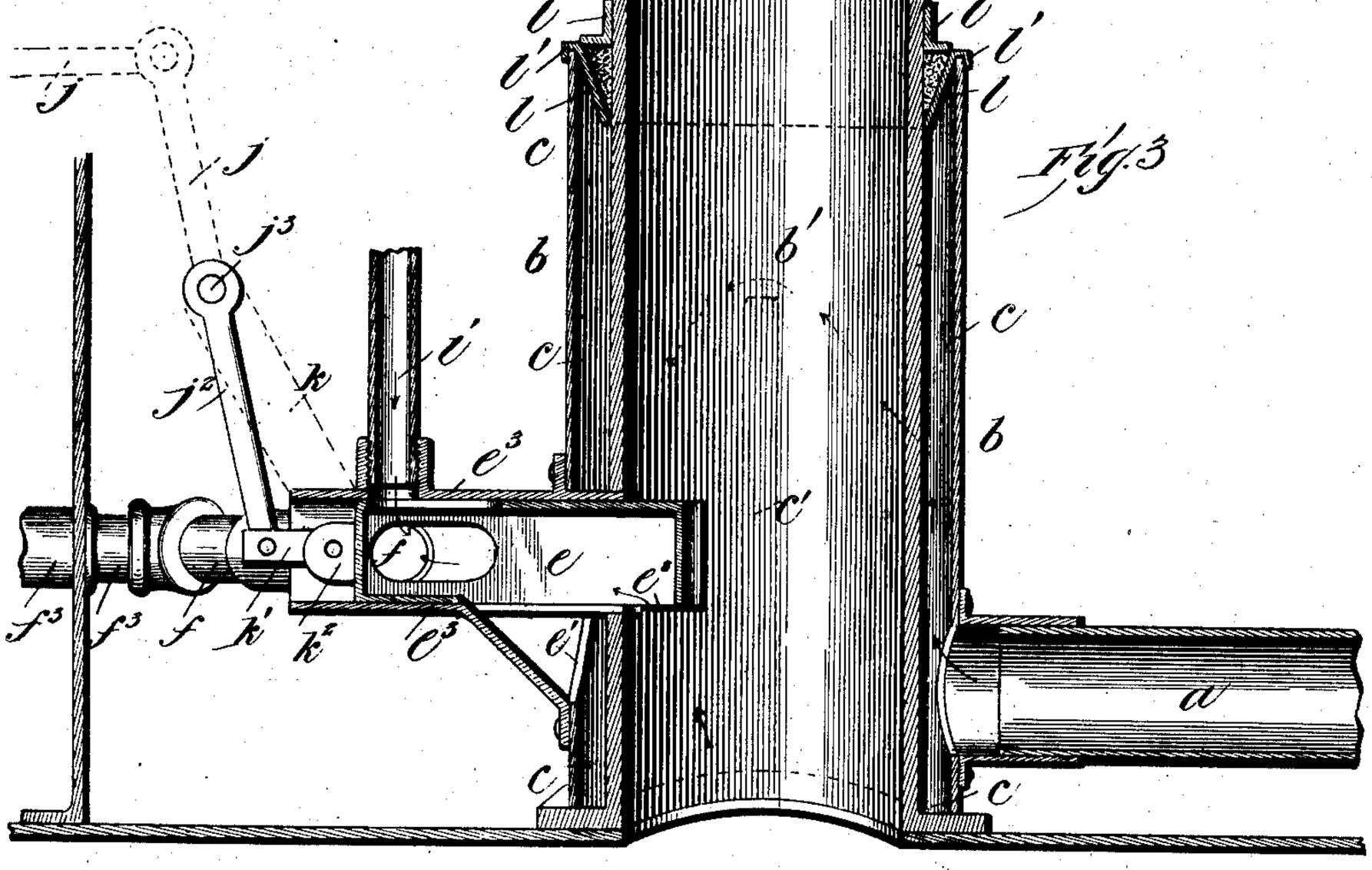

Fig. 3.

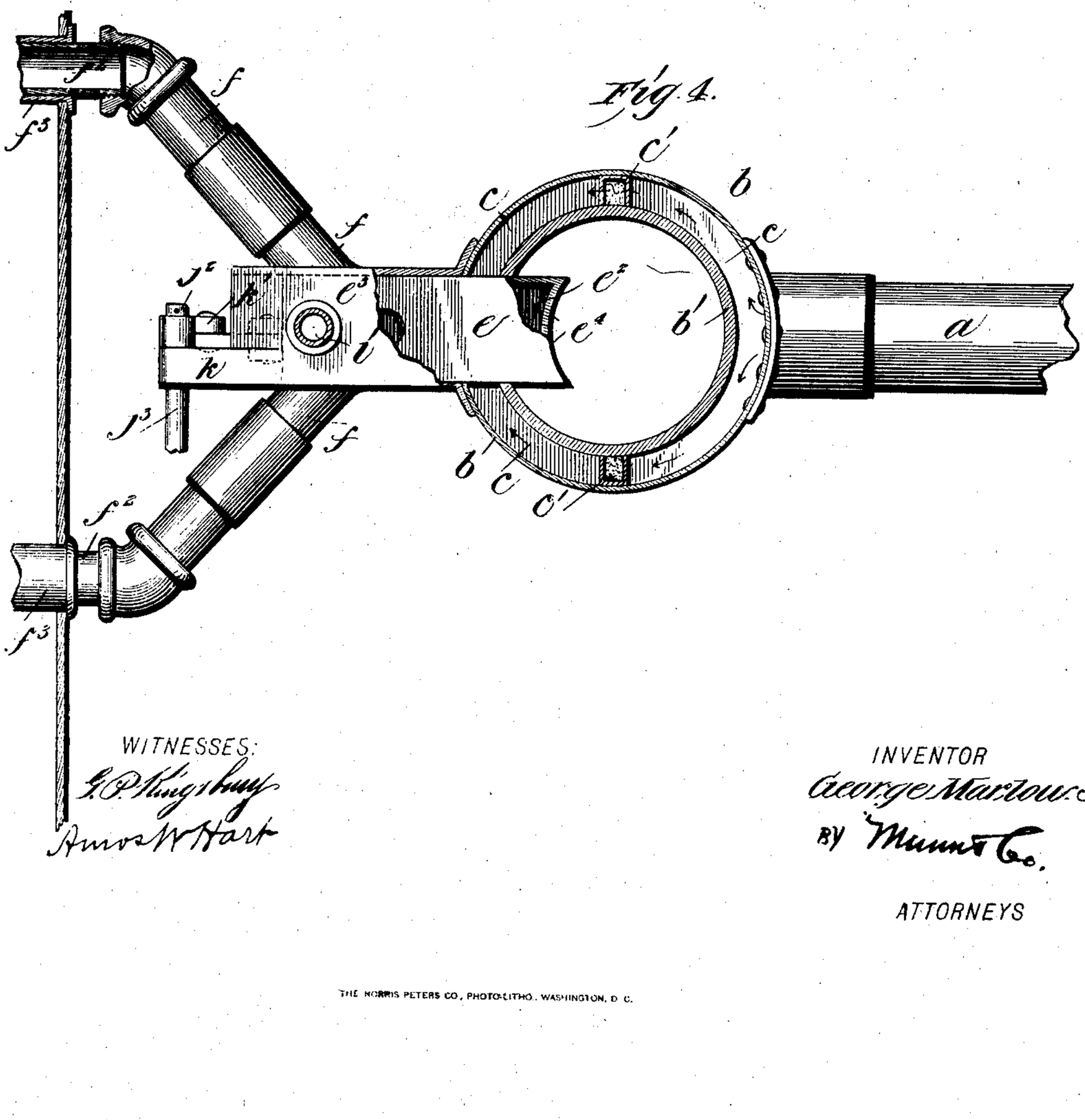

Fig. 4.

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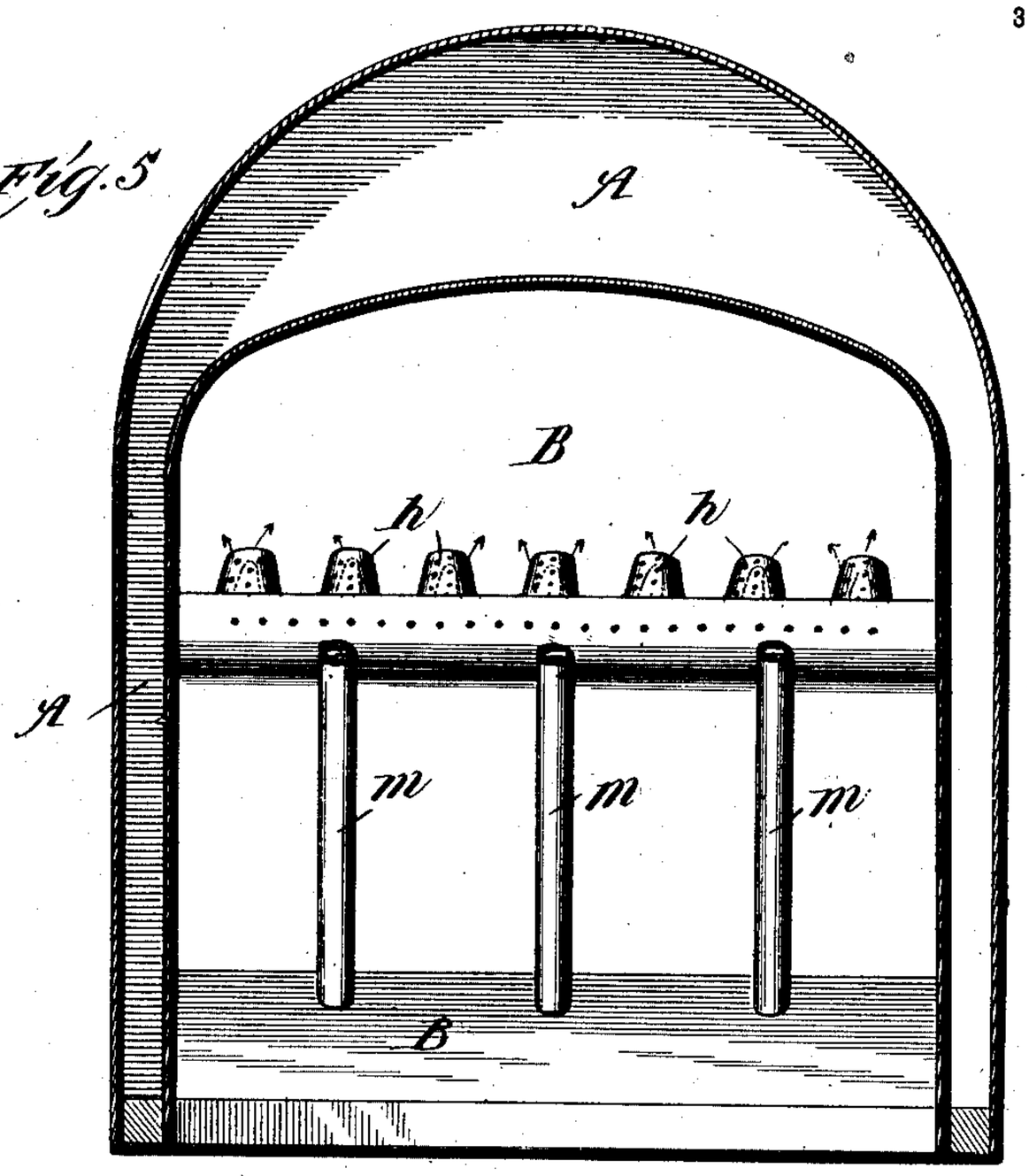
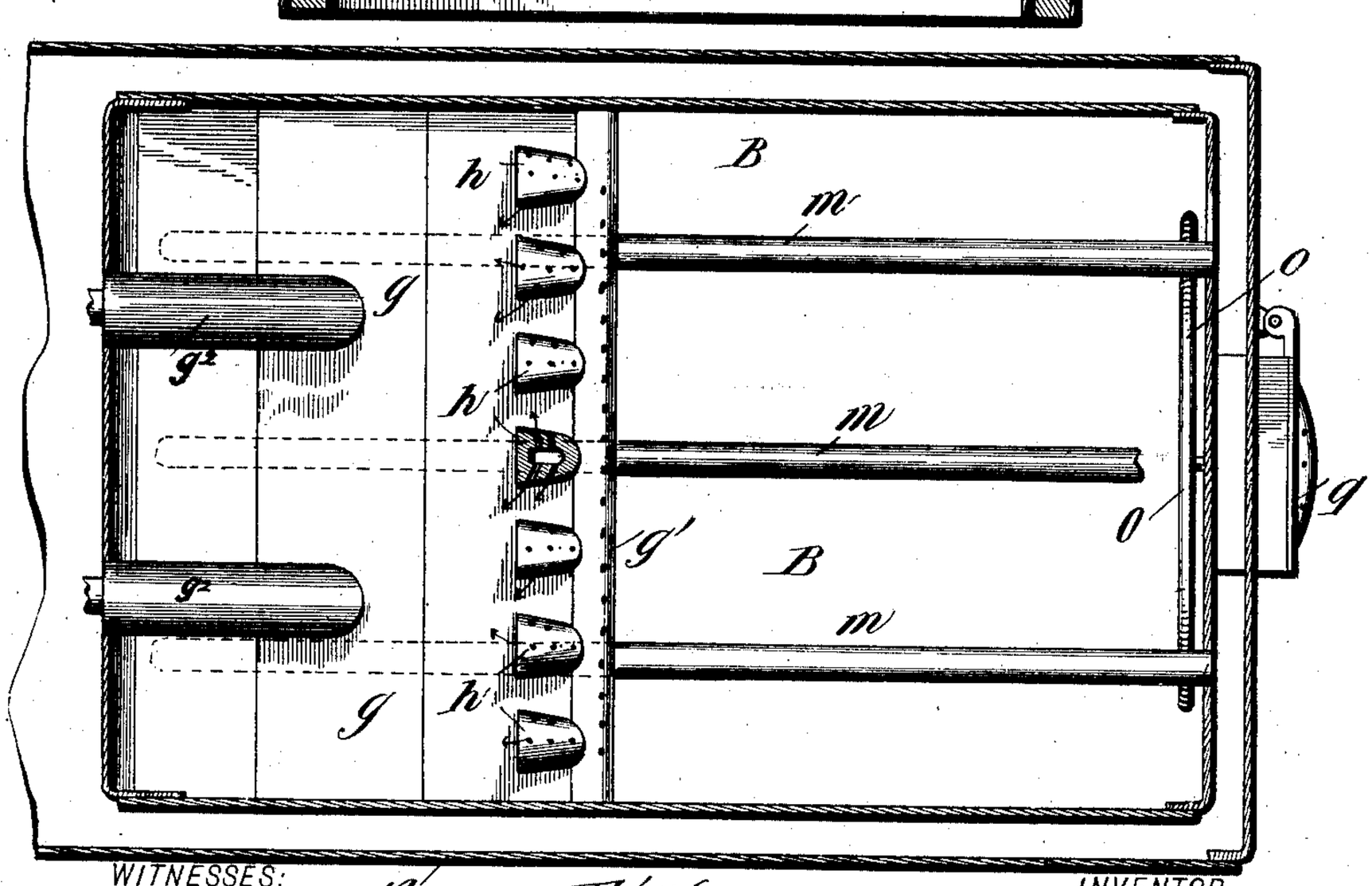
NO MODEL. 3 SHEETS—SHEET 3.

Fig. 5





A

Fig. 6.

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No. 736,857. Patented August 18, 1903.

UNITED STATES PATENT OFFICE.

GEORGE MARLOW, SR., OF SPOKANE, WASHINGTON.

AIR AND STEAM FEEDING ATTACHMENT FOR BOILER-FURNACES.

SPECIFICATION forming part of Letters Patent No. 736,857, dated August 18, 1903.

Application filed November 11, 1902. Serial No. 130,876. (No model.)

To all whom it may concern:

Be it known that I, GEORGE MARLOW, Sr., a citizen of the United States, and a resident of Spokane, in the county of Spokane and State of Washington, have made certain new and useful Improvements in Air and Steam Feeding Attachments for Boiler-Furnaces, of which the following is a specification.

The object of my invention is to prevent escape of smoke and effect a great economy in the combustion of fuel in furnaces.

The invention is embodied in an improved apparatus whereby mingled air and steam are introduced into the fire-box of the boiler or other furnace to effect a more perfect combustion, and especially to consume the carbon particles and such gaseous products of combustion as ordinarily escape into the air and are lost.

In practice I utilize the heat of exhaust-steam for heating air, which is then mingled with exhaust-steam, the mixture being introduced into the fire-box.

The apparatus is adapted for application to stationary and marine boiler-furnaces as well as locomotives, and it may be easily and cheaply applied to furnaces already constructed.

Details of construction, arrangement, and operation of parts are as hereinafter described, reference being had to the accompanying drawings, (three sheets,) in which—

Figure 1 is mainly a longitudinal vertical section of a locomotive-boiler and fire-box. Fig. 2 is a view of a water-distributing pipe arranged within the fire-box and forming part of my improved apparatus. Fig. 3 is an enlarged vertical central section of that portion of the apparatus which is connected with or applied to the exhaust-nozzle or stack. Fig. 4 is mainly a horizontal section of the parts shown in Fig. 3. Fig. 5 is a transverse vertical section of the boiler and fire-box. Fig. 6 is a longitudinal horizontal section of the boiler and fire-box.

Referring in the first instance to Fig. 1, A indicates a locomotive-boiler, B the fire-box thereof, and A′ the usual smoke-box, in which the steam-exhaust nozzle b' is arranged directly under the smoke-stack b^2. This nozzle b' is surrounded by a jacket b, and atmospheric air is admitted into the annular space c between the parts b and b' through the pipe a, which leads to the front of the smoke-box A′, where it is provided with a suitable screen a' for excluding dust or other foreign substances. The air which thus enters the annular chamber c of the exhaust-nozzle passes thence into the branching or lateral pipes f, by which it is conducted by pipes f^2 into tubes f^3, that lead into a discharge in the fire-box B, as will be further explained. In order that the air may be caused to take a circuitous passage through the heating-chamber c, and thus become more highly heated, I arrange vertical ribs or partitions c' in such chamber. (See Figs. 3 and 4.) As there indicated, the said partitions extend part way up the exhaust-nozzle, and thus the air is caused to pass up and over them on its way from the pipe A to pipes f. In practice these partitions c' may be formed of asbestos tightly packed in a suitable holder. The air traversing the chamber c does not pass directly into the pipes f, but first into a valve-chamber e. (See Figs. 1, 3, and 4.) The valve is elongated and hollow and adapted to slide horizontally in a casing e^3, which projects laterally from the exhaust-nozzle b' and communicates with the jacket b at e', as indicated in Fig. 3. The valve e is also provided with an opening in its lower side, which is in constant communication with the annular chamber c through the medium of the self-same opening e'. The valve has lateral openings near its front end, which communicate with the pipes f, as shown. It is further provided with an opening in the upper side, which communicates with the pipe i, (see also Fig. 1,) whose functions will be hereinafter stated.

The valve e may be so adjusted as to project into the exhaust-nozzle b', as shown in Fig. 4, in which case steam may pass from the latter into the valve-chamber at e^2. In other words, when the valve is thus adjusted both steam and heated air pass into the valve and are there mingled and escape together into the pipes f, by which and the tubes f^3 the mixture is conducted into the fire-box. It is apparent that the valve may be so adjusted as to hold or partly cut off the inlet of steam from the nozzle b'. This adjustment of the valve is effected by means of a rod j, which in practice will extend into the loco-

motive-cab, and crank-arms j' and j^2, which are rigidly attached to a rotary shaft j^3, having its bearings in a rigid arm k. The lower end of the arm j^2 is pivoted to a link k', which is in turn pivoted to a lug k^2, (see Fig. 4,) forming an attachment of the valve e. The mixture of heated air and exhaust-steam conveyed by the tubes f^3 enters a shallow space or chamber g, (see Fig. 1,) formed in the fire-arch g', which is supported upon the usual water-circulating pipes m, arranged diagonally in the fire-box B. From such space or chamber g the air and steam escape through twyers h and also through apertures h', formed in the upper portion of the fire-arch. (See Figs. 5 and 6.) As is well known, when steam is brought in contact with heated carbon a mixture of hydrogen and carbon monoxid is obtained—

$$C + H_2O = CO + H_2.$$

In other words, a water-gas is formed which effects instant ignition of the carbon particles, which would otherwise escape in the form of smoke, and also ignites certain gaseous products, so that the heat energy of the fuel is completely utilized, the escape of smoke and cinder effectually prevented, and heat in the fire-box is intensified. A further advantage is obtained in that the suction-draft generally required may be lessened to a considerable extent. In the case of a locomotive when the same is at rest, and hence no exhaust-steam is available from the cylinders, the necessary supply of steam may be obtained from the exhaust of the air-brake, which is at all times operative. Such exhaust is conducted to the valve e by means of the pipe i before mentioned and which is shown in Fig. 1 extending through the side of the boiler, whence in practice it will pass to the brake mechanism.

The fire-arch g' is preferably made of fire-clay, as are also the sleeves g^2, which connect the same with the tubes f^3. It will be understood that the distributing space or chamber g' extends practically the entire width of the fire-box B and that the twyers h will be of such size and number and provided with such perforations as will amply provide for due escape of steam and air therefrom.

The apparatus thus far described promotes combustion in the upper portion of the fire-box. To effect the same result in the lower and front portion of said fire-box, I provide the fire-door q (see Figs 1 and 6) with perforations through which air is admitted, and surrounding such door on the inner side is a pipe o, which is supported by a pipe o', that connects with a flexible pipe o^2, leading to the water-cistern (not shown) of the locomotive. The oval pipe o is provided with minute perforations in its inner side for passage of water, the same escaping in drops, which are quickly converted into steam that mingles with the air admitted through the fire-door q and forms a water-gas, whereby intense combustion is produced in the front portion of the fire-box B and beneath the circulating-tubes m. The door q is provided on the inner side with a baffle-plate q', whose edges are spaced from the door-jamb r. The air is heated in passing through this space and forms with the steam and carbon in the fire-box a water-gas which unites with the gas arising from the coking-coal at x and thus produces perfect combustion. In practice the coal x is dumped close to the door q in order that it may be coked where its gases will unite with the water-gas, as stated. I employ a peculiarly-constructed coal carrier or cart for discharging coal at the point x, and the same is adapted to prevent the inlet of a large volume of cold air when the door q is opened.

As shown in Fig. 3, an asbestos packing is provided between the jacket b and the exhaust-nozzle b' for the purpose of closing the top of the annular air-heating chamber c. Such packing l is confined by a conical flange l' and a collar l^2.

What I claim is—

1. The combination, with a boiler, fire-box, and steam-exhaust nozzle, of an air-conducting pipe leading to the front of the boiler, a jacket surrounding the exhaust-nozzle and arranged to provide an air-heating chamber between them, a valve-casing, and partitions arranged in connection with the jacket and nozzle as described, a hollow valve adapted to slide in the casing and to take air and steam from the said chamber and nozzle respectively, means for adjusting the said valve, pipes connecting with the valve-casing and extending into the fire-box, and a distributing-chamber arranged in the latter and provided with discharge-openings, substantially as shown and described.

2. In an air and steam feeding attachment, the combination, with the exhaust-nozzle and a jacket therefor forming an air-heating chamber as described, of a valve attachment comprising a lateral casing which communicates with both said nozzle and chamber, and devices leading to the fire-box, a hollow valve having bottom and lateral openings whereby it is adapted to communicate with the nozzle, the air-chamber, and the aforesaid pipes, and means for adjusting said valve for regulating the admission and discharge of air and exhaust-steam, substantially as shown and described.

3. In an air and steam feed attachment, the combination, with a steam-conducting pipe and an air-heating chamber adjacent thereto, of a hollow slidable valve and a valve-casing therefor which extends through the side walls of the aforesaid pipe and chamber and is provided with an opening which communicates with the chamber, the valve having an opening in its lower side which, when the valve is properly adjusted, communicates with both the pipe and chamber, and also provided with a discharge-opening near its outer end, means for adjusting the said valve, and pipes for

conducting mingled air and steam from the valve-casing, substantially as shown and described.

4. The combination, with a boiler, fire-box and steam-exhaust nozzle, of a valve-casing connected with said nozzle, a hollow apertured valve, air and steam pipes connected with the nozzle and valve-casing, and a supplemental steam-pipe connected with the valve-casing and extending to the brake mechanism, and means for operating the said valve, substantially as shown and described.

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Witnesses:
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