

(No Model.)

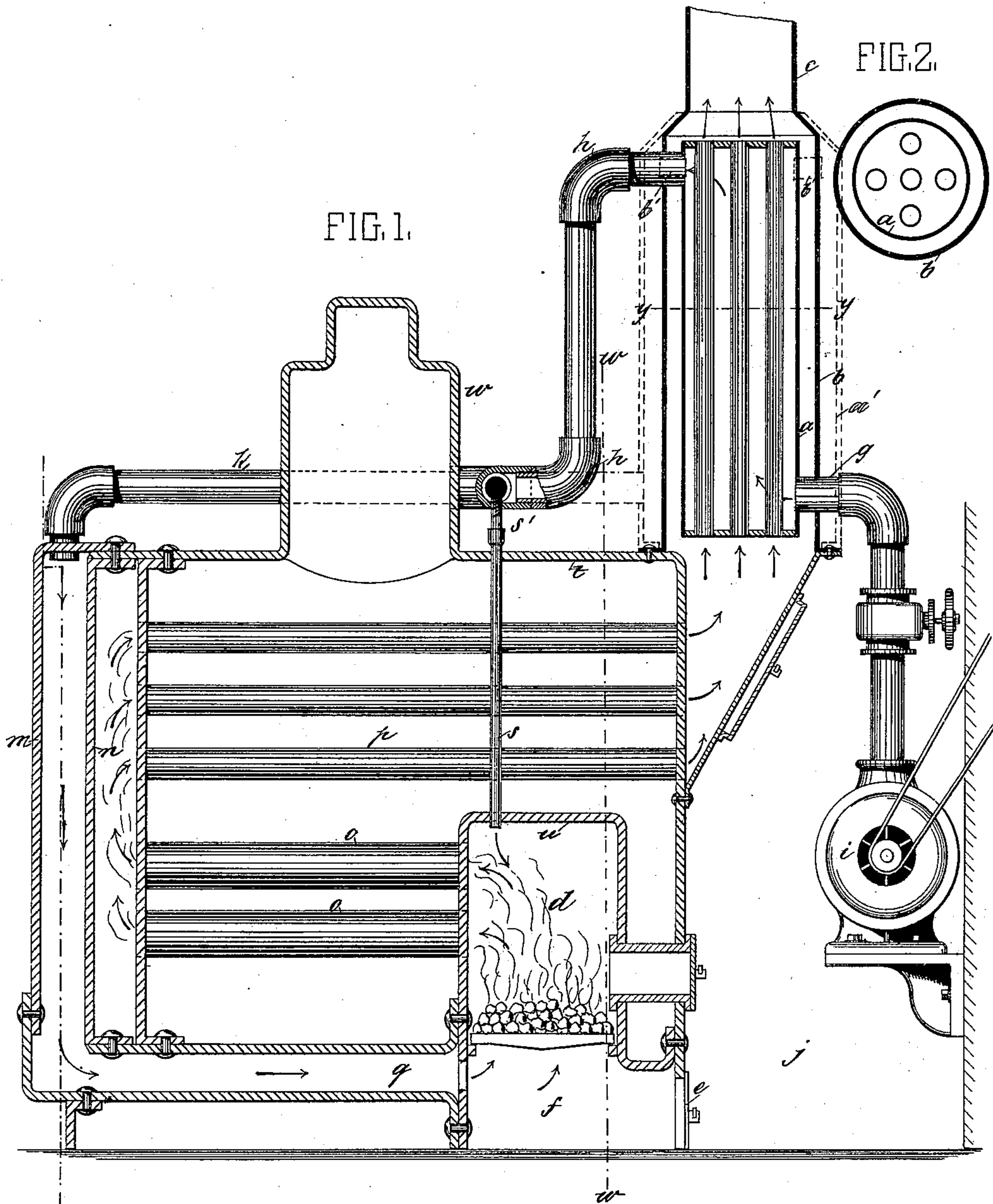
3 Sheets—Sheet 1.

J. S. PESSENGER.

AIR SUPPLY APPARATUS IN STEAM BOILERS.

No. 332,941.

Patented Dec. 22, 1885.



WITNESSES:

*Henry H. Cox*  
*W. J. Morgan*

INVENTOR:

*John S. Passenger*  
*By A. P. Thayer*  
*att'y.*

(No Model.)

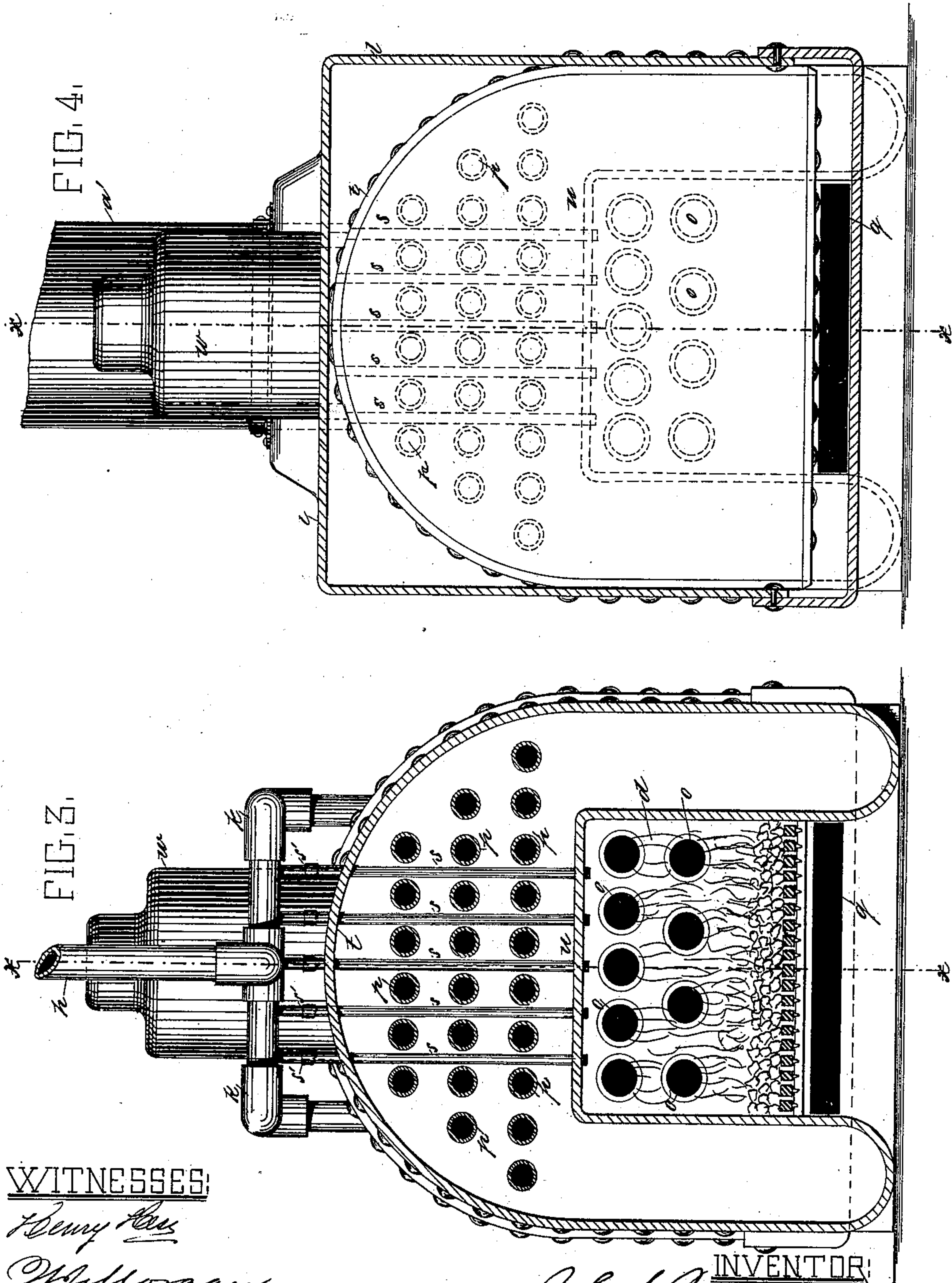
3 Sheets—Sheet 2.

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WITNESSES:

*Henry A. ...*  
*W. J. Morgan.*

INVENTOR:

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3 Sheets—Sheet 3.

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FIG. 6.

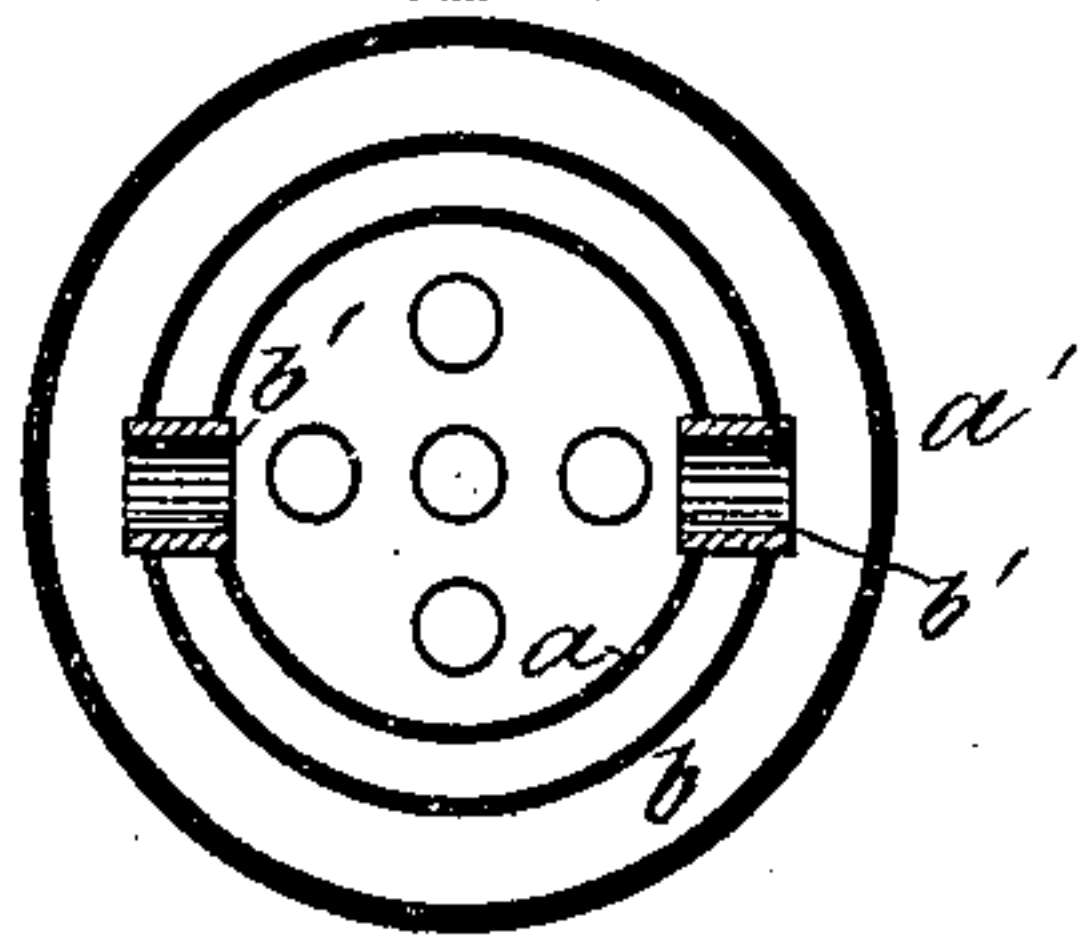
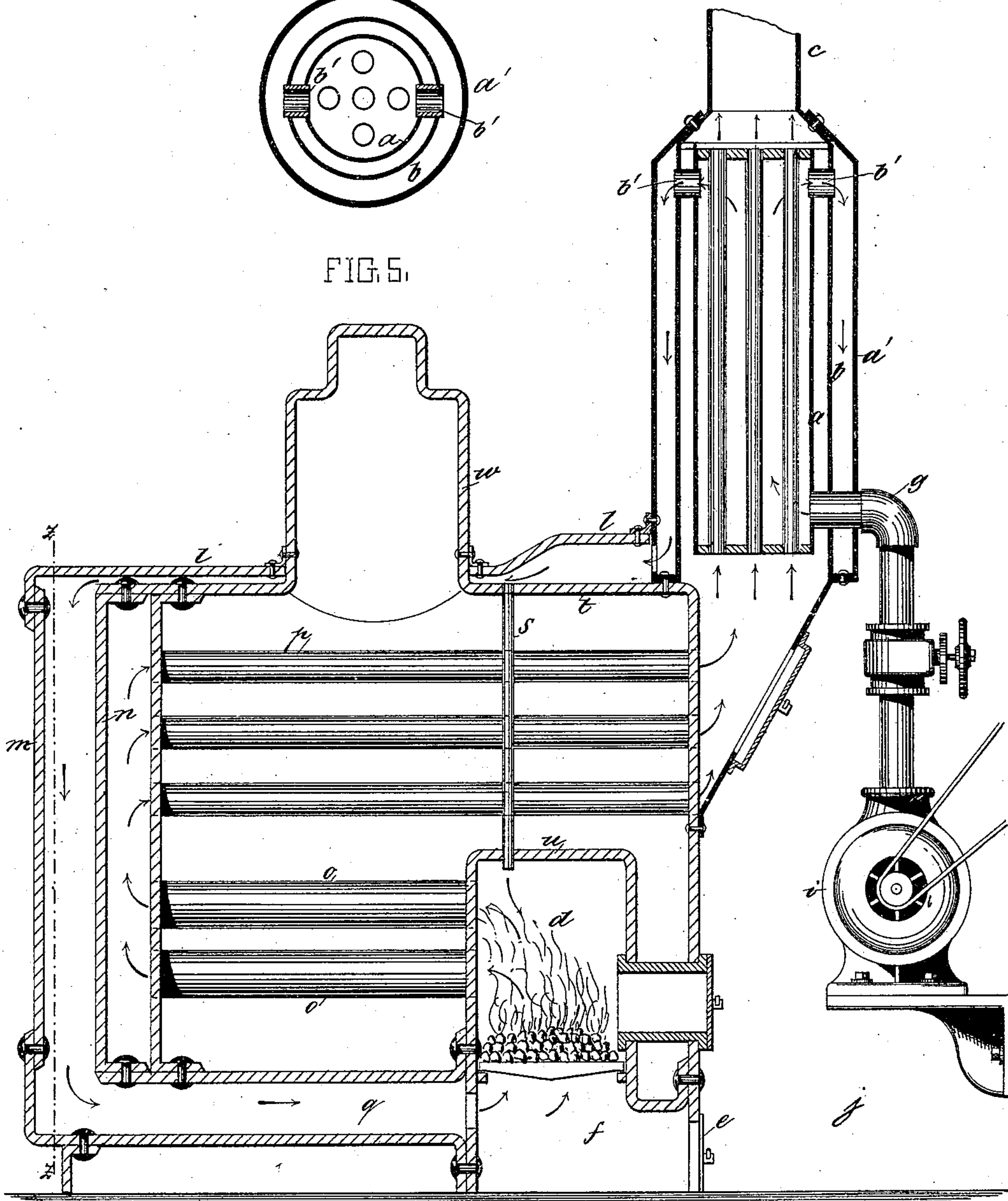


FIG. 5.



WITNESSES:

*Henry Hess*  
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INVENTOR

*John S. Pesenger.*  
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# UNITED STATES PATENT OFFICE.

JOHN S. PESSENGER, OF BROOKLYN, NEW YORK.

## AIR-SUPPLY APPARATUS FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 332,941, dated December 22, 1885.

Application filed July 24, 1885. Serial No. 172,580. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN S. PESSENGER, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in Air-Supply Apparatus for Steam-Boilers, of which the following is a specification.

My invention consists of improved contrivances of apparatus for the supply of the air for combustion in a manner to economize in fuel, both by utilizing waste heat for heating the air and by supplying heated air to the furnace; and it also consists of a novel contrivance for supplying a measure of fresh hot air above the coal-bed, for the better combustion of the gases failing to obtain sufficient oxygen from below the fire-bed, all as hereinafter fully described, reference being made to the accompanying drawings, in which—

Figure 1 is a longitudinal sectional elevation of a marine boiler contrived according to my invention with a modification indicated in dotted lines, the section being taken on the line *x x* of Figs. 3 and 4. Fig. 2 is a detail, in horizontal section, of Fig. 1 on line *y y*. Fig. 3 is a transverse section on line *w w*, Fig. 1. Fig. 4 is a transverse section on line *z z* of Fig. 5. Fig. 5 is a longitudinal section showing a modified form of the air-supply apparatus. Fig. 6 is a transverse section of Fig. 5 on line *y' y'*.

My invention is designed more particularly for marine boilers, and for the use of an artificial or forced draft; but it is applicable to other boilers, and may be used with a natural draft. I arrange a tubular or other air-heater, *a*, of approved form, in the uptake *b*, through which the waste products of combustion pass from the boiler to the smoke-pipe *c*. In some cases I also arrange an exterior jacket, *a'*, to the same, both of which may be extended along the smoke-pipe *c*, above, if desired, suitably for heating the air to be supplied to the furnace *d* by causing it to pass through the heater and the jacket before entering the furnace, the usual opening at *e* into the ash-pit *f* being closed, and said heater being provided with an inlet-pipe, *g*, and a delivery-pipe, *h*, when used alone; but when jacket *a'* is used it will have the delivery-pipe *h* connected to it, the heater and jacket being then connected by passages

*b'* at their upper ends through the uptake. I prefer to use a blower, *i*, for forcing the draft, and to locate the same in the stoke-room *j*, to draw the air therefrom for ventilation; but the air may enter the heater by natural draft.

The delivery-pipe *h* may connect directly with the ash-pit *f*; but for still further utilizing the waste heat I connect it with the cap *m*, by two branches, *k*, or substitute a jacket, *l*, for it, extending along the top of the boiler to said cap *m*, which is attached to the hood *n*, in which the heat products issue from the lower tubes, *o*, and pass into the return-tubes *p* at the back end of the boiler, for taking up the heat escaping through the hood, and from this cap I provide the conduit *q*, leading into the ash-pit from the back of the same, where the air issues in a high state of temperature gathered from heat that would otherwise be wasted, in which condition the combustion is more effective than when the air is cold.

Besides the merit of this contrivance as an economizer of waste heat by the supply of hot air below the fire-grate, it is also advantageous in the facility it affords of introducing air above the fire-bed by tapping the branch pipes *k* or the jacket *l* over the fire-box and inserting numerous small branch connections, *s*, through the shell *t* and the crown-sheet *u*, and between the return-tubes *p*, thus providing a distributed supply, which is the most effective, and introducing the air at the very hottest part of the furnace, and where the greatest portion of the gases will be intercepted, and also where, by the mixing of the oxygen with the gases directly in front of the tubes *o*, combustion will ensue along in the tubes, and higher temperature will be produced therein with corresponding increase of steaming power. The contrivance is also one enabling the fresh air to be introduced into this part of the furnace in such manner that the conducting-tubes *s* are effectually protected by water from injury by the heat, and these tubes *s* also serve for stay-bolts to the crown-sheet. The tubes will be expanded in the shell *t* and the crown-sheet *u* in the usual manner, and when pipes *k* are employed above the top of the boiler for conducting the air from the heater *a* to the cap *m*, the upper ends of the tubes *s*, which terminate at the shell *t*, will be connected to the pipes by nipples *s'*, which may connect with



them by entering the expanded ends, and be sealed therein with cement as a simple means of making the connection; but other joints may be used as desired.

- 5 The air-cap *m* may be used with advantage independently of the heater *a*′, said heater being connected to the furnace independently of the cap, and the cap receiving air directly into it from the surrounding atmosphere or  
10 from a blower. The jacket *a*′ may of course be dispensed with, if preferred, the heater *a* only being used in connection with the uptake, in which case the delivery-pipe *h* will connect with the top of the heater, as in Fig. 1, and  
15 said pipe will in such case connect with jacket *l*, when it is substituted for the branch pipes *k*; but when the said jacket *a*′ is used with the branch pipes *k* delivery-pipe *h* may connect with jacket *a*′, as dotted in Fig. 1.  
20 Besides the advantage of these contrivances for utilizing the waste heat, the jacket *l* and the conduit *q* add materially to the heating-surface by the hot air therein acting on the boiler-plates. They may be extended later-  
25 ally over considerable area of the boiler, as found practicable and advantageous. The tubes *s*, passing through the water and steam, also increase the heating power of the boiler to some extent. Some of the pipes may, if  
30 desired, be extended down the sides and back of the fire-box and connected thereat.

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

- 35 1. The combination, with a steam-boiler, of the air-heater *a*, located in the waste-heat passage above the boiler, and having an inlet-pipe and a delivery-pipe, also the air-cap *m* over the hood *n* of the return-flue, said air-cap  
40 having an inlet-passage connected with the heater and a delivery-passage connected with the furnace, for conducting the air for com-

bustion through the heater and the air-cap, substantially as described.

2. The combination, with a steam-boiler, of 45 the air-heater adapted to be heated by the waste-heat passage above the boiler and having inlet and connecting passages, also the air-jacket *l*, connected with the said heater and extending along the top of the boiler, and 50 also the air-cap *m*, located over the hood *n* of the return-flue and connected with the jacket *l*, and also having a delivery-passage connected with the furnace for conducting air for combustion through the heater-jackets and 55 cap.

3. The combination, with a steam-boiler, of the air-heater *a*, located in the waste-heat passage above the boiler, the inlet-pipe thereto, delivery-pipe arranged for conducting air for 60 combustion into the furnace below the grate, and a series of branch tubes, *s*, connected with the furnace through the crown-sheet, substantially as described.

4. The combination, with a steam-boiler, 65 of the air-heater adapted to be heated by the waste-heat passage above the boiler and having an inlet-pipe and a delivery-pipe, also the air-jacket *l*, extending along the top of the boiler, also the air-cap *m*, over the hood *n* of 70 the return-flue and having a delivery-passage connected with the furnace below the fire-bed, and also the tube *s*, connected with the jacket *l* through the top of the boiler and with the furnace through the crown-sheet, substantially 75 as described.

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

JOHN S. PESSENGER.

Witnesses:

W. J. MORGAN,  
L. H. MORGAN.