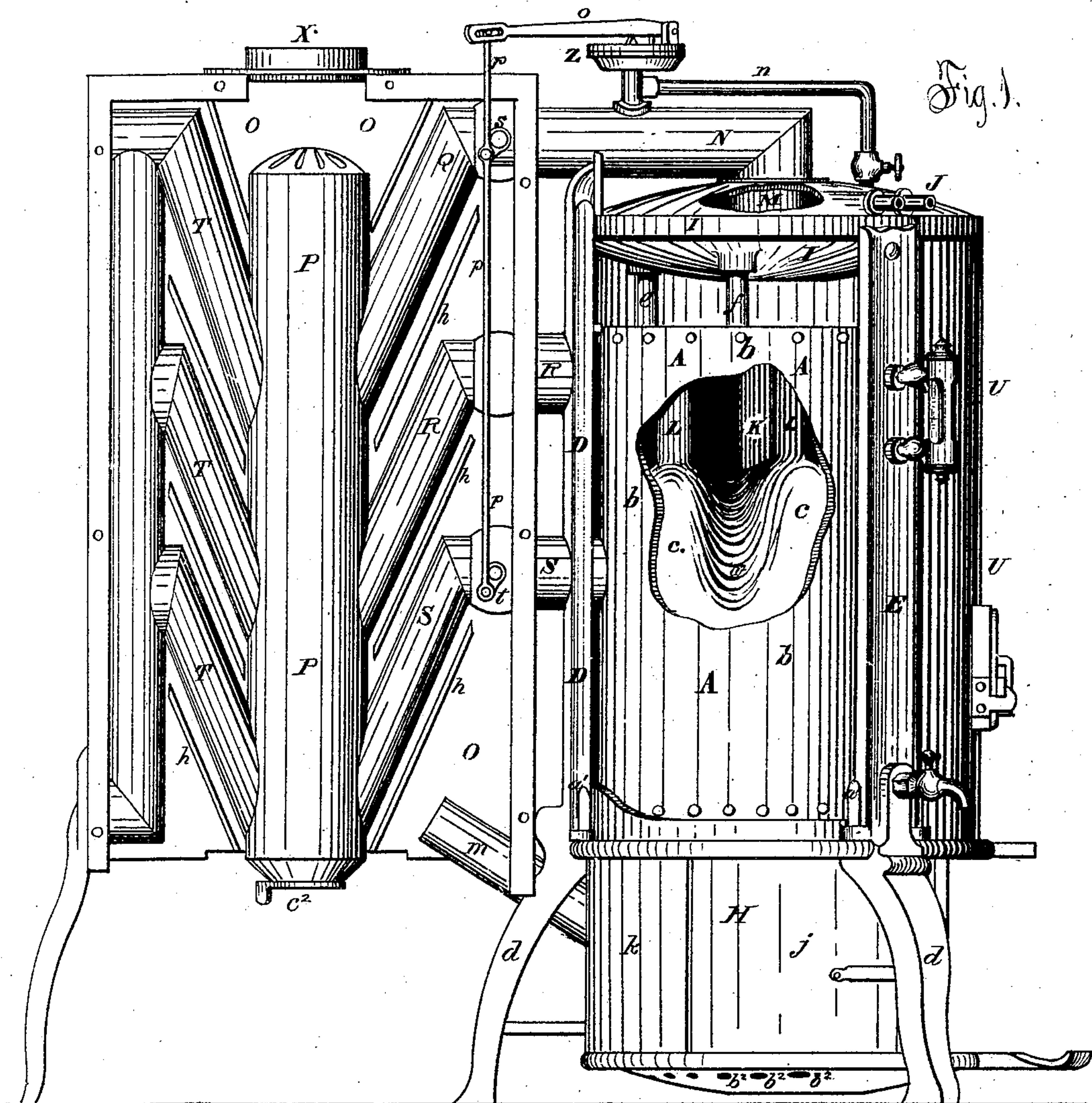


**A. B. WILSON.**  
**Steam-Boiler and Air-Furnaces.**

No. 153,211.

Patented July 21, 1874.



Witnesses  
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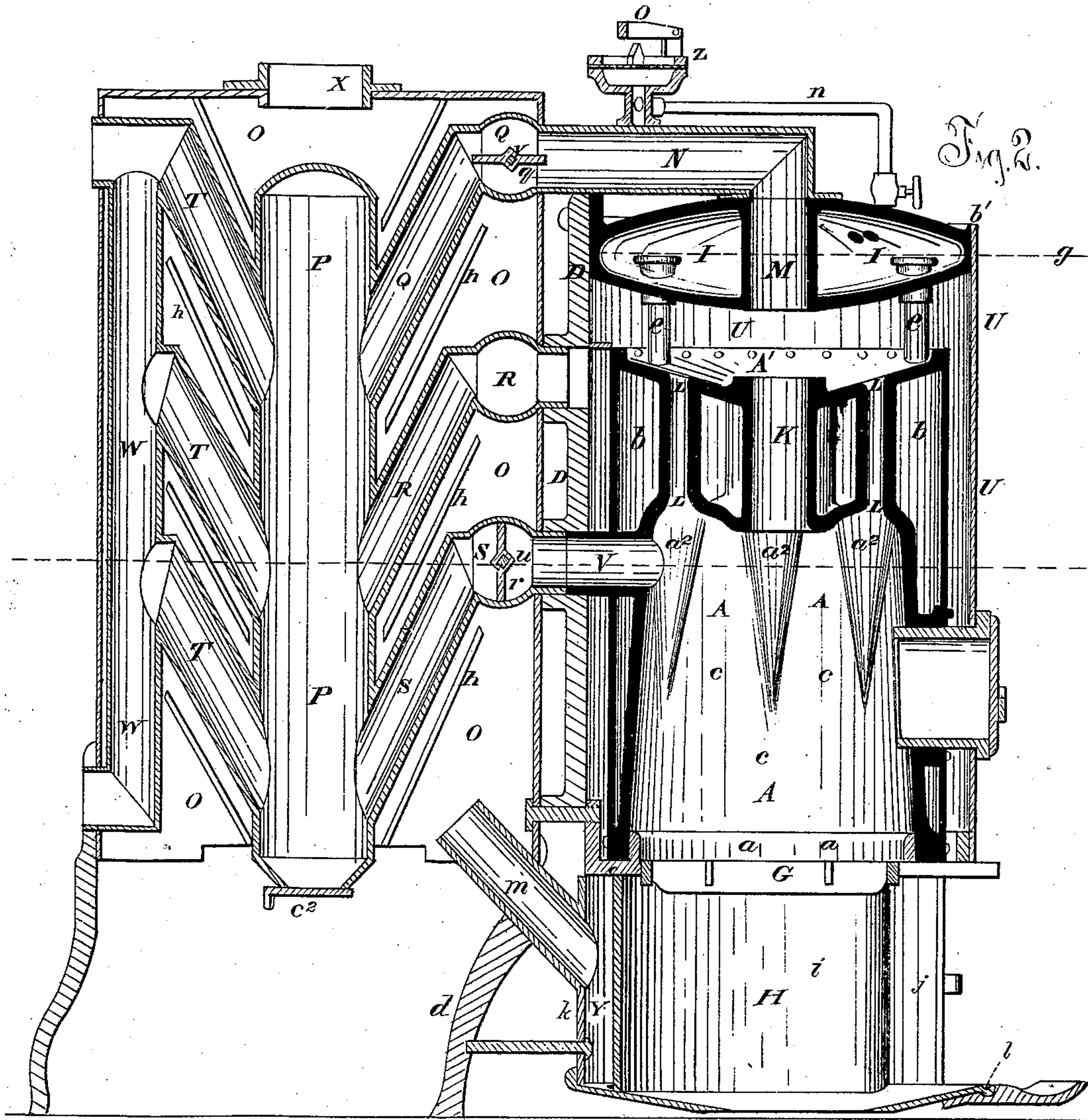
Inventor  
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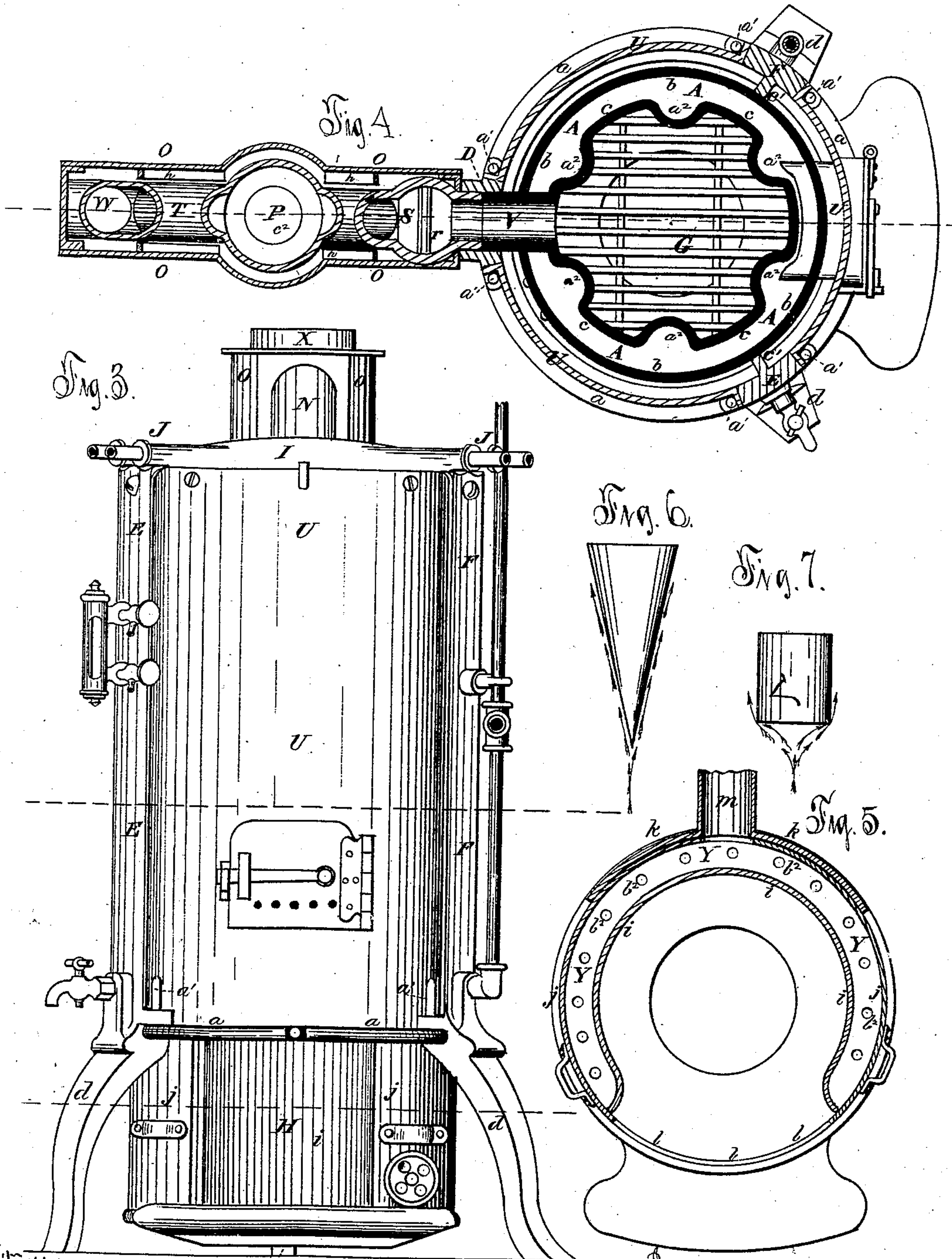
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*E. H. Johnson.*  
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# UNITED STATES PATENT OFFICE.

ALLEN B. WILSON, OF WATERBURY, CONNECTICUT.

## IMPROVEMENT IN STEAM-BOILERS AND AIR-FURNACES.

Specification forming part of Letters Patent No. **153,211**, dated July 21, 1874; application filed May 21, 1874.

*To all whom it may concern:*

Be it known that I, ALLEN B. WILSON, of Waterbury, in the county of New Haven and State of Connecticut, have invented certain Improvements in Steam-Boiler and Air-Furnace, of which the following is a specification:

My invention relates to steam-boilers, principally such as are used for warming purposes, and consists in a novel construction, combination, and arrangement of parts; and has for its objects to increase the evaporative power of the boiler; economize fuel; prevent superheating of the steam; afford ready access to the boiler and flues for purposes of cleaning and repairing; to utilize the heat passing through and away from the boiler for the purpose of warming air which is passed through registers to the apartments to be warmed; and, lastly, to furnish a supply of warm air for heating purposes after the steam has run so low as to be insufficient to maintain the desired temperature in the apartments, as will be fully hereafter set forth.

Figure 1 is a side elevation. Fig. 2 is a vertical longitudinal section. Fig. 3 is a front elevation. Fig. 4 is a horizontal section through *x x*, Fig. 3. Fig. 5 is a horizontal section through *y y*, Fig. 3. Figs. 6 and 7 illustrate the principle of construction of the internal heating-surface of the boiler.

The first object of my invention is accomplished by a peculiar configuration of the internal heating-surface or fire-box of the boiler, whereby a greater heating-surface is presented to the action of the fire, and all square corners to intercept the flame or heat are obviated, and the heat or flame is unobstructed in its ascent. The second object of my invention is effected by combining with the main boiler an auxiliary boiler, into which the condensed steam from the radiators flows back, and is retained at a certain height for the purpose of wetting the steam and preventing its superheating, thus obviating the danger of fire resulting from the use of dry steam. The third object is effected by inclosing the boiler in an external casing constructed in sections, so as to be readily removable. The fourth object of my invention is accomplished by combining with the boiler an air-warming chamber, into which the heat passing through and away from

the boiler is made to warm a quantity of air which ascends to the register of the apartments to be warmed. The fifth object of my invention is accomplished by combining with the boiler an air-warming chamber, into which the heat, after it has become insufficient to maintain the requisite pressure of steam, is deflected by means of flues and dampers actuated by a pressure-diaphragm.

A is the boiler, composed of an outer shell or cylinder, *b*, and an inner shell or fire-box, *c*. It is supported by the ring *a*, secured to the uprights D E F, the lower extremities of which are formed into legs *d e f*. G is the fire-grate, and H the ash-box. Secured at the upper ends of the uprights D E F, and immediately above the boiler A, is an auxiliary boiler, I, which is connected with the steam-room of the boiler A by the pipes *e f*, which extend up into the boiler to the line *g*, Fig. 2. This auxiliary boiler is, in transverse section, the shape of an ellipse or a double convex lens, which shape is conducive to strength. J J are steam-supply pipes, and are also the ones by which the condensed steam is returned to the boiler I. K is a central flue passing vertically through the boiler A. L L are smaller tubes situated around the one K, and which also pass through the boiler A. M is a flue of the same diameter as the one K, passing through the auxiliary boiler I. N is a continuation of the flue M, and leads into a chamber, O. This chamber is composed of a flat box, in which is arranged a series of flues, consisting of a central chamber or flue, P, and inclined flues Q R S T T T branching upward from either side of it. The uppermost branch tube Q is connected with the flue N, the middle one, R, with the space between the outer casing U and the boiler A, and the lowest one, S, with a flue, V, leading directly from the fire-box *c*. The flues T T T, on the other side of the main one, P, all enter the vertical flue W, which has an outlet at both ends, either one of which may be connected with the chimney for the escape of smoke. The inner surface of the sides of the box O is provided with ribs *h*, situated between the tubes, so as to deflect the current of air and make it impinge against the tubes. The lower extremity of the box O is open for the



admission of air, and a register-box, X, is provided at its top from which the heated air issues. The ash-box H is constructed with a hollow wall or casing, Y, composed of the inner plate *i*, and the outer plates *j j k*, two of which, *j j*, constitute sliding doors, and run in the grooves *l l* cut in the base-ring of the boiler and the bottom of the ash-box. From the back plate *k* a tube, *m*, proceeds into the warm-air box O. The bottom of the ash-box, between the plates *i j k*, is perforated, for the admission of air between the plates. *z* is a diaphragm connected with the boiler by the pipe *n*. *o* is an arm pivoted to the flange of the diaphragm. *p* is a rod operated by the arm *o*, and *q r* are dampers situated in the flues Q S. The rod *p* is connected to the arms *s t* on the damper-spindles *u v*. The rod *p* may be constructed so as to be readily disconnected with the diaphragm-arm *o*, and the dampers thus adjusted by hand.

All the attachments, such as gage-cocks, water-glass, blow-off cocks, feed-pipes, &c., are situated in the posts E F, so as not to interfere with the removal of the plates of the external casing U U. The flues Q R S pass through the rear post D, and thence into the central chamber or flue P. The external casing U is applied in sections between the posts D E F, and is held at the bottom against the flange of the ring *a a* by pins *a' a'* projecting upward, and at the top against the edge of the auxiliary boiler I by means of screws or by hooks hooking over the ledge *b'* of this boiler. A rib, *c'*, is formed on the inside of the front posts or uprights E F, to within a short distance from their lower end, and one is also formed on the inside of the two side sections of the casing U, so as to divide the space between the external casing and the boiler into flues, which form a circuitous route for the heated air, to keep it in longer contact with the boiler.

In Figs. 6 and 7 are seen two vessels containing equal quantities of water to be heated. In Fig. 6 the vessel is cone-shaped, and its apex being presented to the flame the heat ascends, keeping in contact with or hugging the concave surface of the cone. The vessel, Fig. 7, is cylindrical, and the flame turns its angular corners leaving the bottom of the vessel without heat, as shown by the arrows. The internal shell *c* of the boiler A, which constitutes the principal heating-surface, is constructed on the principle illustrated by the cone-shaped vessel, its upper portion being formed into inverted cone-shaped corrugations, the apexes or points of the corrugations projecting downward. The flues L L are situated between the bases of the corrugations *a' a'*, and pass through the head A' of the boiler A, so that the heat rises up in contact with the sides of the cones, and on arriving at their bases at the top of the shell *c*, passes through the flues into the space between the boiler A and the auxiliary boiler I.

The parts, being constructed and combined as above described, will operate as follows: The

boiler being supplied with water and a fire started in the fire-box, the flames and heat will rise against the cone-shaped corrugations *a' a'*, and thence through the central flue K, and smaller flues L L L, rapidly heating the water, which, by the configuration of the boiler, will circulate freely. The current of heat will then pass through the flue M in the auxiliary boiler I, and also down between the boiler A and outer casing U, and through the middle flue R. From the flues Q R it will enter the large central flue P, and pass up through the tubes T T to the tube W, and thence to the chimney. In Fig. 2 is shown the position of the dampers when steam is up. The uppermost damper is seen open, but it may be arranged so as to be closed when steam is up, thus turning all the heat around the boiler A and through the central flue R. As soon as the pressure is so far diminished as not to supply the sufficient quantity of heat to the radiator the diaphragm collapses and operates the dampers, closing the upper one and opening the lower, thus turning the heat of the furnace into the flue S, and passing it down to the lower extremity of the flue P, and as it ascends it branches off into the other flues, T T T, heating them all, and presenting a large heating-surface to the air entering at the bottom of the box. The water of condensation will flow back from the heat-radiators and steam-pipes into the auxiliary boiler I through the pipes J, and, having filled it half-way, (up to the line,) it will overflow into the boiler A, through the pipes *f f*, and be reconverted into steam. The under surface of the boiler I being situated immediately over the flues L L L of the boiler A, and the flue M passing through it, converts it into an evaporative as well as a steam-wetting chamber. The air contained in the hollow wall of the ash-box will be heated by the heat radiated downward from the fire, and will rise through the flue *m* into the warm-air box O, cold air entering by the perforations *b' b' b'* to take its place, and be warmed.

When it is desired to cleanse the boiler of soot, &c., the plates forming the external casing are removed, which leaves the outer shell and top of the boiler exposed and easy of access. To clean the flues T T R S Q the lid *c'*, at the bottom of the large flue P, may be slid aside, and a brush or scraper introduced for the purpose.

I claim—

1. The boiler A, with the fire-box shell *c*, constructed with conical corrugations *a' a'*, substantially in the manner and for the purpose set forth and specified.

2. The combination, with the boiler A, of the posts D E F, through which all pipes, flues, &c., from the boiler pass, and segment-casing plates U U U, which can readily be detached for cleaning or repairing the boiler and flues, and replaced, constructed substantially in the manner described and specified.

3. The combination, with the boiler A and



casing U, of the auxiliary boiler I and tubes *e* connecting it with the boiler A, constructed and operating substantially in the manner described and specified.

4. The combination, with the boiler A and warm-air chamber O, of the flue V, forming a direct connection between the furnace and chamber P, constructed and operating substantially as described and specified.

5. The combination, with the warming-chamber O and radiator-flues P Q R S T, of the deflecting-plates *p p*, constructed and operating substantially as described and specified.

6. The combination, with the boiler A and

heating-chamber O, of the radiator, consisting of a main flue or chamber, P, inclined branch tubes Q R S T, and upright flue W, constructed and operating substantially in the manner described and specified.

7. The combination, with the boiler A, air-warming chamber O, and radiator-flues P Q R S T, of the dampers *q r* and pressure-diaphragm *z*, constructed and operating substantially in the manner described and specified.

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Witnesses:

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