(No Model.)

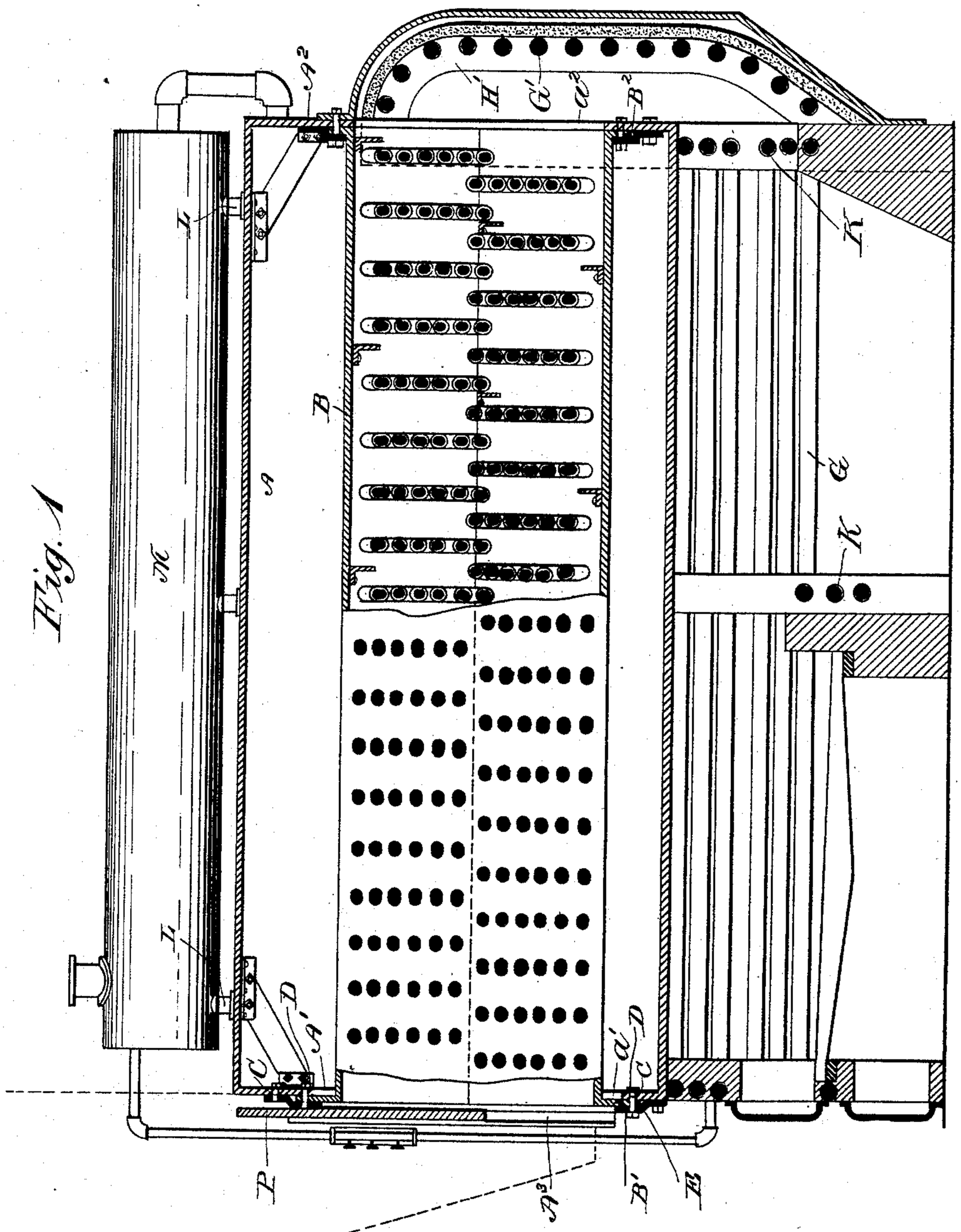
2 Sheets—Sheet 1.

D. AHERN.

STEAM BOILER.

No. 522,871. Patented July 10, 1894.

Fig. 1.



Witnesses:
N. S. Harris
M. F. Boyle

Inventor:
Denis Ahern
by his attorney
Thomas Dyer Stetson
Attorney.

(No Model.) 2 Sheets—Sheet 2.

D. AHERN.

STEAM BOILER.

No. 522,871. Patented July 10, 1894.

Fig. 2

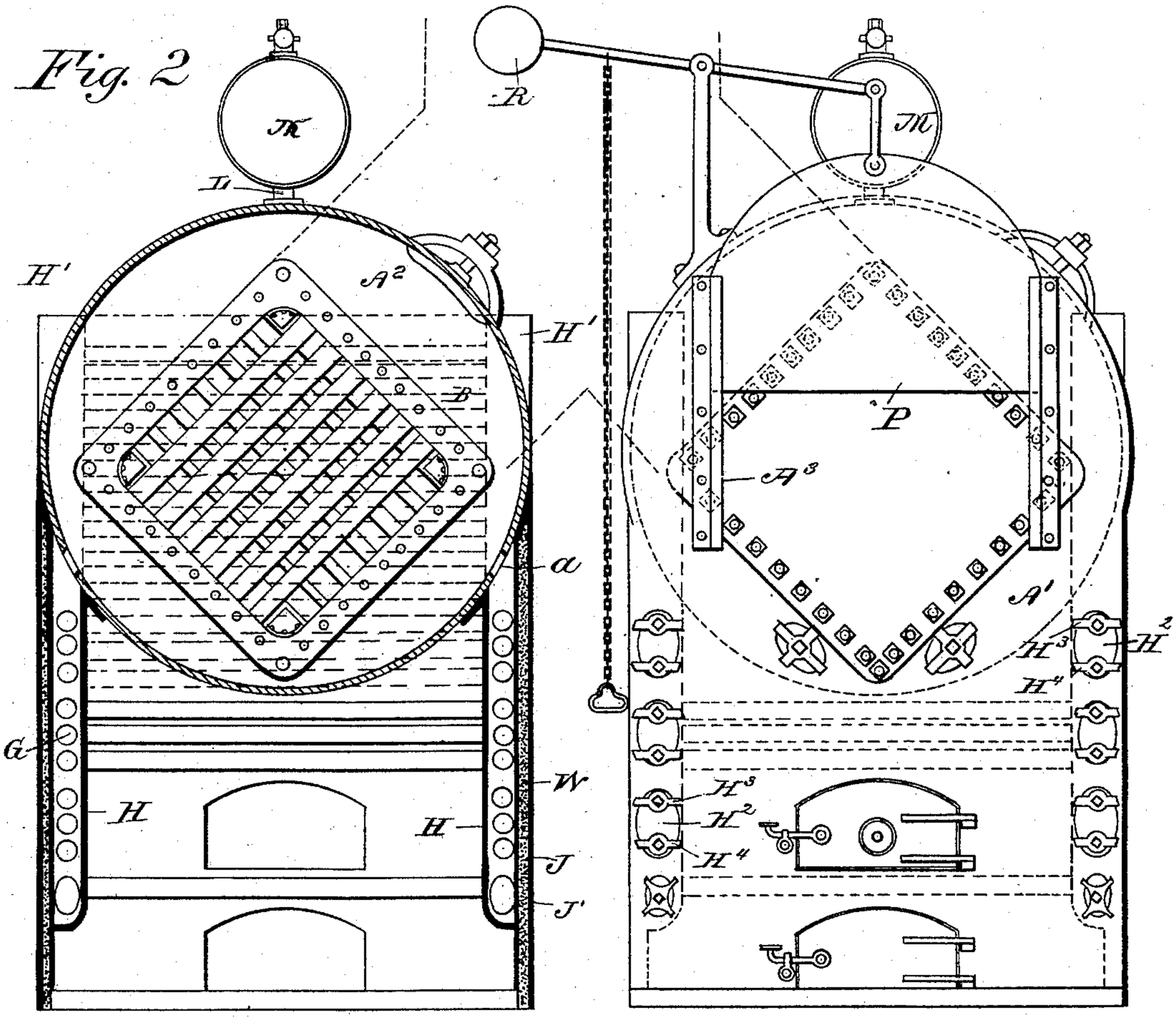


Fig. 6

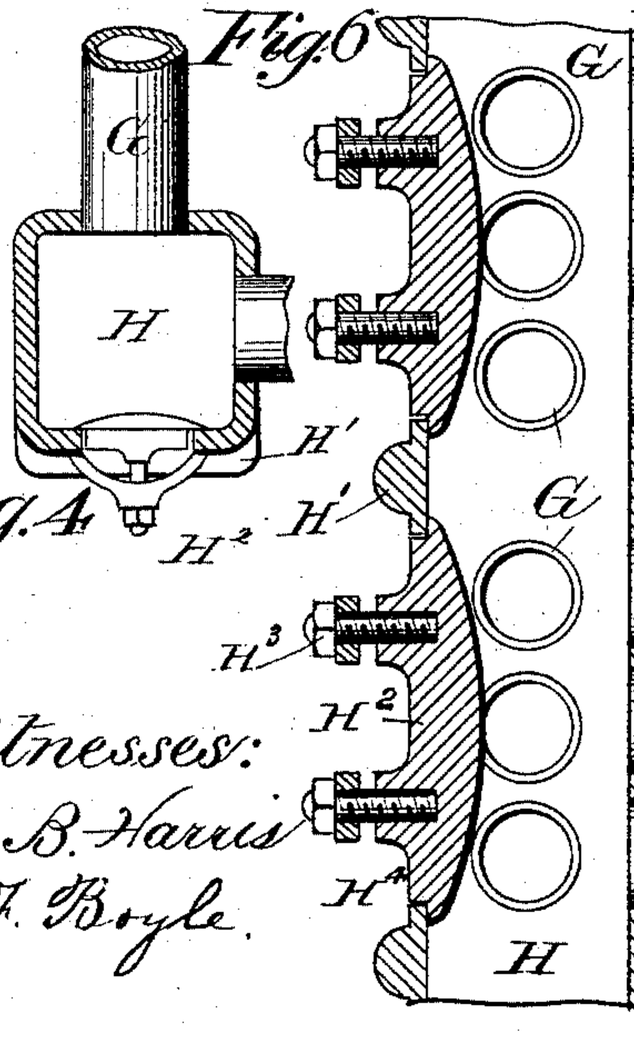


Fig. 4

Fig. 3

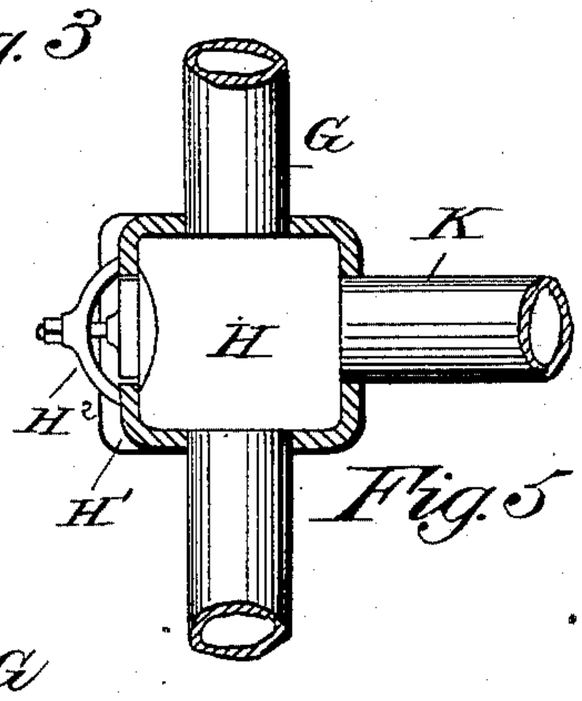


Fig. 5

Witnesses:
M. B. Harris
M. F. Boyle.

Inventor:
Denis Ahern
by his attorney
Thomas Drew Staton
Attorney.

UNITED STATES PATENT OFFICE.

DENIS AHERN, OF NEW YORK, N. Y.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 522,871, dated July 10, 1894.

Application filed March 29, 1894. Serial No. 505,523. (No model.)

To all whom it may concern:

Be it known that I, DENIS AHERN, a citizen of the United States, residing in the city and county of New York, in the State of New York, have invented a certain new and useful Improvement in Steam-Boilers, of which the following is a specification.

In my improved boiler I employ a cylindrical shell with a furnace under it, arranged to have the hot products of combustion move rearward the entire length of the boiler, then rise up at the rear end and return through the interior of the boiler, and thence rise into the stack. The novelty lies in the construction of the interior parts through which the gases move forward, and the provisions for examining and repairing the same, when necessary.

I provide a flue or passage of approximately rectangular cross-section but with rounded corners. This is set diamondwise, with one of its angles upward and the several faces equally inclined. This flue extends from the front to rear, of uniform size from one end to the other. It is crossed by a great number of small tubes which are set in the plane sides, the uniformity of dimensions throughout allowing each to be set properly by ordinary tools. They provide for a free movement of the water through them, the water coming in at the bottom and flowing out partly transformed into steam at the top. I make provisions for disconnecting and moving the whole of the rectangular shell with its tubes bodily endwise so as to take it partly or entirely out of the cylindrical shell whenever repairs become necessary. I have devised a construction which makes it relatively easy to do this at the long intervals at which such repairs are likely to be necessary. I arrange a sliding damper which checks the flow of the heated gases and holds them longer in the upper part of the rectangular shell, and have modified other details to contribute to the useful effect.

The accompanying drawings form a part of this specification and represent what I consider the best means of carrying out the invention.

Figure 1 is a central longitudinal vertical section. Fig. 2 is a front elevation showing the main parts of two of my boilers delivering gases into a single stack by means of the ordinary breeching, the latter shown in dotted lines. The boiler on the left side is in section on the line 2—2 in Fig. 1. The remaining figures are on a larger scale, and represent portions of a header and the adjacent ends of tubes forming the sides of the furnace or water leg. Fig. 3 is a vertical section. Fig. 4 is a horizontal section through one of the front headers forming a corner. Fig. 5 is a corresponding section of one of the mid-length headers. Fig. 6 is a central vertical section through the front of one of the front headers.

Similar letters of reference indicate corresponding parts in all the figures where they appear.

A is the cylindrical shell or main exterior of the boiler, A′ is the front head and A^2 the back head. These parts may be flanged together or riveted in the ordinary and long-approved manner. Each head is formed with a square opening, such opening a' in the front head A′ being larger than the corresponding aperture a^2 in the rear head A^2.

B is the rectangular shell or flue which traverses the whole distance between the heads A′, A^2. It is of uniform dimensions throughout, and is provided with a wide external flange B′ at the front end and with a narrower corresponding flange B^2 at the back end. These flanges may be made of flange iron, and strongly riveted to the rectangular flue in the obvious manner.

The aperture a' in the front head A′ is sufficiently large to allow the passage of the narrow flange B^2 at the rear end of the rectangular shell B. I effect a strong and tight union of the flanges with the respective heads by means of removable bolts C and nuts D. The line of bolts at the rear end of the boiler extends around close to the edge of the rectangular shell or flue B. The corresponding line of bolts which extend around in the front head are set farther outward, such arrangement being necessitated by the larger aperture a' in this end of the boiler. I strengthen the front head by a metal strip or gusset E, properly shaped to apply closely upon the exterior. It is held by the same bolts which confine the flange B′ to the head A′. Care being taken in the formation of the parts and in the applying of them together,

I can make the joint tight either by matching the metal of the several parts together with absolute tightness, or by matching more roughly the finished parts together with a yielding material between, which will serve as a packing and endure the conditions.

P is a plane sheet of boiler iron or other suitable material arranged to be moved up and down in guide ways A^3. A weight R partially counterbalances the damper. When down it retards the escape of flame, holding it in the upper portion of the casing B in contact with the tubes until it has imparted heat thereto.

Any ordinary or suitable form of grate may be used. I construct the vertical sides of the furnace of a series of horizontal tubes G set in suitable upright headers H, with provision for causing the water to circulate actively through these tubes. All these series of tubes G and headers H, which may be referred to collectively as water-legs, may be protected by thin fire-brick I up to the level of the bed of fuel, or somewhat higher. The exterior may be cased in sheet metal J.

The upright castings H which serve as headers are strengthened at short intervals by transverse ribs H′. The tubes G are set a little farther apart at these points to allow room for these ribs which serve to strengthen and stiffen the headers. There are three tubes set in each of the intervals between the ribs. Hand-holes, sufficiently long and of suitable width, are provided on the opposite sides of the headers to allow the tubes to be set, and in case of need to be calked and renewed. The hand-hole covers H^2 which secure these holes are each provided with two holding bolts H^3 and cross-pieces H^4. The headers communicate with the main interior of the boiler through liberal apertures *a*. The feed-water is introduced at or near the bottom of the water-legs.

There are transverse tubes K extending across the furnace at the rear, directly over the ordinary bridge-wall which forms the back boundary of the furnace. The hot gases in flowing rearward move both over and between these tubes.

The rearmost headers are cast in duplicate, one portion straight and another curved to correspond to the outline of the back connection, as indicated by H′. A series of tubes G′, extend across and form a water-wall at that part.

In what I esteem the most complete form of the invention I provide a drum M above the shell A, with sufficiently liberal connections L through which the steam rises, and is dried in the drum and is taken away by any ordinary or suitable arrangement of steam-pipes, safety-valves, &c.

It will be understood that the cylindrical shell A and the drum M, and the connections L, are all incased in masonry or other good non-conducting material to preserve the heat. The hot gaseous products of combustion may be circulated in contact with these parts in any ordinary or suitable manner, not shown.

There may be brick work covering the exterior of the water legs at the sides and the water wall at the back and at other points in my boiler, if desired, but I propose to dispense with such. I apply a thick coating of asbestus W outside of the sheet metal J between it and an external plate J′, and it constitutes a tight wall and effectually restrains the escape of heat. Nearly the same construction is shown at the back of the water wall.

Modifications may be made without departing from the principle or sacrificing the advantages of the invention. Parts may be used without the whole.

I can dispense with the provisions for moving the damper P, and keep it always set in about the position represented in Fig. 2.

I claim as my invention—

1. In a steam boiler a cylindrical shell having substantially rectangular apertures in its heads, the aperture in one head being larger than that in the other in combination with an internal casing of rectangular section of uniform dimensions throughout and flanged at each end, the flange at one end being larger than that at the other, and with holding bolts and nuts securing the flange to the heads respectively, as shown, adapted to allow the internal parts to be removed from the cylindrical shell to allow of repairs, all substantially as herein specified.

2. In a steam boiler a cylindrical shell having substantially rectangular apertures in its heads, the aperture in one head being larger than that in the other, in combination with an internal casing of rectangular section of uniform dimensions throughout and flanged at each end, the flange at one end being larger than that at the other, and with holding bolts and nuts securing the flanges to the heads respectively as shown, and with a gusset E applied on the head having the largest aperture, and aiding to strengthen and stiffen the connection, all substantially as herein specified.

3. In a steam boiler a rectangular casing flanged and having tubes extending across, in combination with a cylindrical shell within which it is inclosed and with bolts and nuts or equivalent attaching means adapted to allow the insertion and removal of the casing and its tubes, and with a damper and provisions as slides for moving such damper to arrest more or less the escape of the hot gases from the upper portion of such casing, all arranged for joint operation substantially as herein specified.

4. In a steam boiler, a rectangular casing flanged and having tubes extending across, in combination with a cylindrical shell within which it is inclosed, and with bolts and nuts or equivalent attaching means adapted to allow the insertion and removal of the casing and its tubes, and with a damper and provisions as slides for moving such damper and arrest-

ing more or less the escape of the hot gases from the upper portion of such casing, and with side tubes G and headers H having ribs H′, and with the top connections L and drum M, all arranged for joint operation substantially as herein specified.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

DENIS AHERN.

Witnesses:
M. B. HARRIS,
M. F. BOYLE.