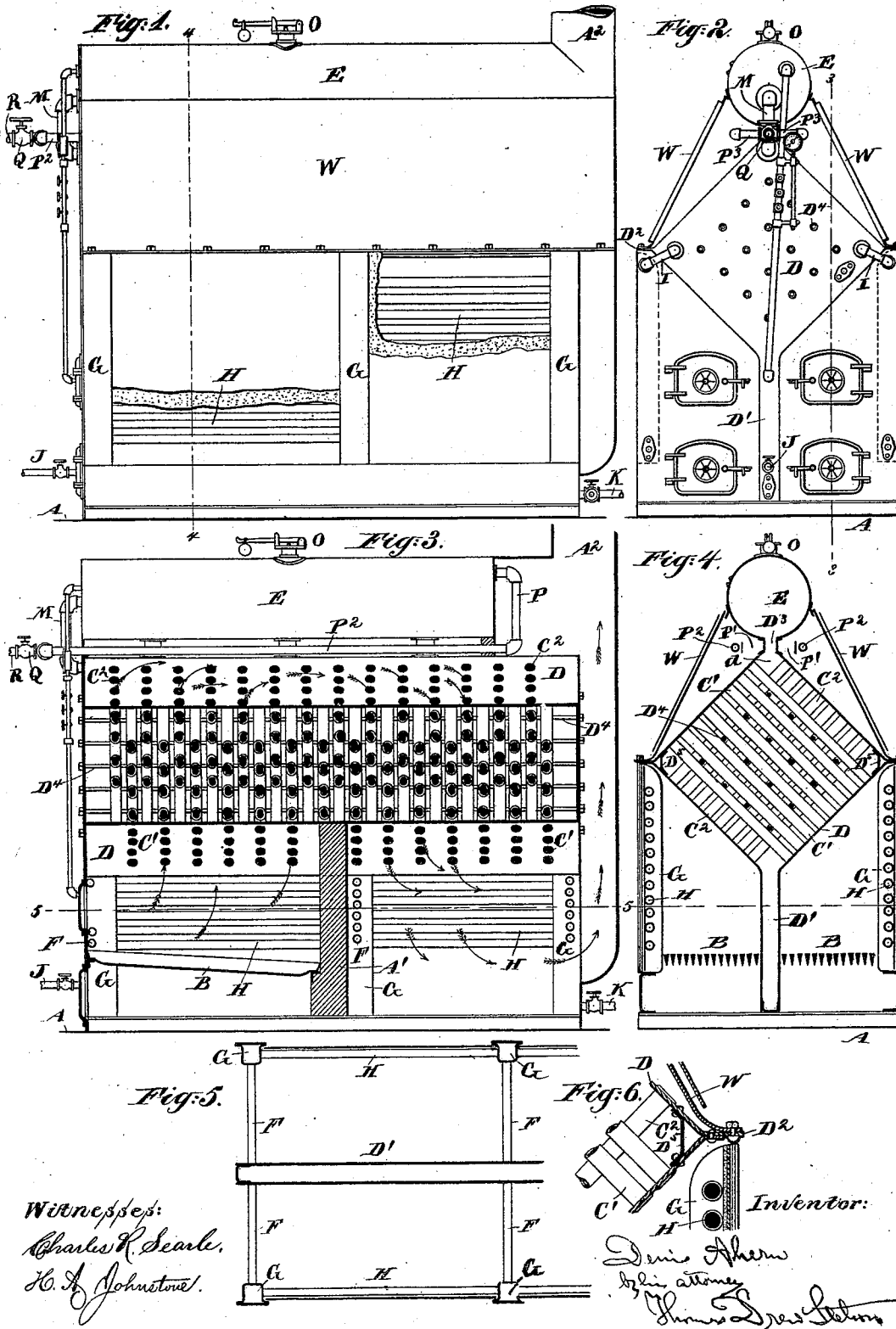


(No Model.)

D. AHERN.
STEAM BOILER.

No. 521,532.

Patented June 19, 1894.



Witnesses:
Charles K. Searle,
H. A. Johnston.

Inventor:
Dennis Ahern
by his attorney
James S. Searle

UNITED STATES PATENT OFFICE.

DENIS AHERN, OF NEW YORK, N. Y.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 521,532, dated June 19, 1894.

Application filed September 26, 1893. Serial No. 486,502. (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.

My improved boiler is of that class in which a large quantity of water is contained in a rectangular chamber arranged diamond-wise, or with one of its angles downward, over the furnace, and filled with tubes arranged to cross each other so that the gaseous products of combustion rising from the furnace flow obliquely upward through the several tubes into mixing spaces over the rectangular chamber. In the extension of the chamber rearward beyond the furnace, the tubes serve to conduct the gases downward into a common mixing chamber below, from whence they flow horizontally rearward and then upward into the stack. A single central water-leg or mid-feather extends downward from the lower angle of the chamber. At the angle on each side along the mid-height of the rectangular chamber I extend or flange the boiler iron horizontally and hold up the chamber by means of such flanges. I provide removable coverings in sections extending up from such flanges to the separating drum, and thus inclose the upper mixing chambers. I provide peculiarly constructed sides composed of nearly horizontal tubes and upright headers, with a suitable cover, in which pipes and headers the water is caused to circulate. I extend along the top a nearly horizontal cylindrical drum of boiler iron. I connect this with the rectangular chamber by sufficient liberal passages. I connect the steam-pipes from the upper portion of such drum at one end, lead it downward a little, branch it horizontally, and extend a pipe longitudinally each side through the mixing space above the chamber. These pipes unite at the front and the flow of steam through them is controlled by a single screw-valve, as will be readily understood.

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 side elevation, with certain portions broken away. Fig. 2 is a correspond-

ing end view. Fig. 3 is a vertical section on the line 3—3 in Fig. 2. Fig. 4 is a vertical cross-section on the line 4—4 in Fig. 1. Fig. 5 shows portions of a horizontal section on the line 5—5 in Figs. 3 and 4. Fig. 6 is a vertical cross-section of a portion on a larger scale.

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

A is the foundation, A' a substantial masonry wall and B a nearly horizontal grate.

D is a chamber of rectangular section, held in a horizontal position, extending forward and back, arranged diamond-wise; that is to say, with one angle presented downward. Tubes C', C², traverse it diagonally, as shown.

D' is a mid-feather or water-leg formed by an extension of the same boiler-iron which forms the lower portion of the chamber D, and in free communication with such chamber. This water-leg extends below the grate and forms an important feature of the construction. I provide an excess of the boiler-iron of which the upper part of the rectangular chamber D is formed, and extend its lower edges horizontally outward beyond the angle on each side, as indicated by D², D². In the upper angle of the chamber D are liberal apertures d, each communicating through a short and sufficiently large pipe D³ with a horizontal steam-drum E which extends nearly the whole length of the structure.

W are removable covers or panels of sheet metal, made in sections, each extending from the flanges D² up to the sides of the steam-drum. They inclose mixing chambers in which the gaseous products of combustion rise through the tubes C', C², over the furnace and flow rearward and descend through other tubes C', C², into the space in rear of the wall A'. From this space they rise into the stack A².

D⁴ are stays extending longitudinally through the spaces at the crossings of the tubes C', C², and armed at each end with crows'-feet which are bolted or riveted to the interiors of the heads or ends of the chamber D.

D⁵ are gussets riveted across the angle on each side of the boiler.

The sides of the furnace are formed with

upright headers G, G, connected together and with the water-leg D' by means of horizontal pipes F. Such pipes extend across at the rear end and at the mid-length. A small number
 5 also extend across the front above and below the fire-door, as shown in Fig. 3. The front and rear header on each side are connected together by a series of horizontal pipes H, H, arranged one over another, extending front
 10 and rear, and form nearly continuous water sides for the furnace. The upper portions of the headers are connected with the adjacent portion of the ends of the chamber D by pipes I. The feed-water is forced in through a
 15 pipe J which connects with the water-leg D' near the bottom. The bottom of the water-leg below the connection of the feed-pipe serves as a mud-drum.

K is a blow-off pipe.

20 L is a hand-hole cover held by bolts in the ordinary manner, by removing which access is obtained to introduce a hose for washing out the mud.

M is a connection between the chamber D
 25 and the steam-drum E at the front. This indirect connection may serve as an additional passage for the movement of the steam upward. If water by any chance is thrown up through the direct passages D³ into the steam-drum, this passage M is favorably situated
 30 for its easy return, as it does not in this passage encounter any strong upward current of steam.

O is a safety-valve of any ordinary or suitable construction.

P is the steam-pipe. It is connected to the drum near the top and leads thence downward at the rear end to about the level of the bottom of the drum. There it connects with
 40 the pipe P' extending a sufficient distance across horizontally. The ends of this pipe connect by elbows with horizontal pipes P², P², extending forward through the hot gases in the spaces under the panels W. Their
 45 front ends connect by elbows to horizontal pipes P³, P³, which lead to a screw-valve Q from which the steam is led away through a single pipe R to be used. The arrangement insures dry steam with a slight degree of super-heating. The exteriors of the sides and
 50 the outer faces of the sectional covers W are formed with two or more thicknesses of metal, held at a little distance apart, forming efficient non-conductors of heat.

55 I attach importance to the water-leg D' because it gives a great accession to the heating surface without in any degree interfering with the arrangement and effect of the tubes C' C², and because the steam generated in
 60 this water-leg promotes the activity of the circulation of water and steam upward through the spaces in the mass of tubes C' C² into the drum E near the front of the boiler and downward through the rearmost

short tube D³ and thence again through the
 65 spaces into the water leg near the rear end of the boiler where it is cooler, insuring that the steam shall be well separated and contributing to the durability of the boiler.

I attach importance to the flanged edges of
 70 the plates at the mid-height angles of the chamber D and to the gussets D⁵ adjacent thereto because they give unusual strength and lightness, afford a continuous bearing upon the sides and supply means for the efficient engagement of the panels W.

I attach importance to the headers G and pipes H and the transverse pipes F as combined with the chamber D and its cross tubes C', C², and with the short connecting pipes I
 80 because the active movement of the water through the pipes F and the great surface presented by the pipes H in a strong form gives much steam, and the pipes I I pour it into the chamber at the end where there are
 85 no pipes C' C² giving great uniformity of action throughout the whole apparatus.

I attach importance to the pipes M arranged a little out of the line between the steam generating surfaces below and the separating drum D adapted to allow the water
 90 to descend in addition to the liberal spaces provided by the rearmost and coolest of the pipes D³. The connection between the water-leg D' and the interior of the rectangular casing D, is open the whole length except for the stays and thimbles always employed in such constructions.

I claim as my invention—

1. In a boiler the rectangular chamber D,
 100 and diagonal tubes C', C², traversing it, arranged diamond-wise, as shown, in combination with the continuous water leg D', extending downward from its lower angle, the series of pipes G, headers H and connecting
 105 pipes I, serving as water legs at the sides, with the connections D³ to the upper angle of the chamber and separating drum E, all arranged for joint operation as herein specified.

2. In a boiler, the rectangular chamber D,
 110 having diagonal tubes C', C², traversing it obliquely in opposite directions, the flanged lips or edges of the plates of which it is composed extended outward horizontally, and adapted to serve as supports the gussets D⁵
 115 reinforcing the joint and the panels W connected by detachable bolts to said flanged lips, all combined and arranged to serve as herein specified.

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

DENIS AHERN.

Witnesses:

M. F. BOYLE,

H. A. JOHNSTONE.