3 Sheets--Sheet 1.

I. BARTON.

Flue and Tubular Steam-Boilers.

No. 167,054. Patented Aug. 24, 1875.

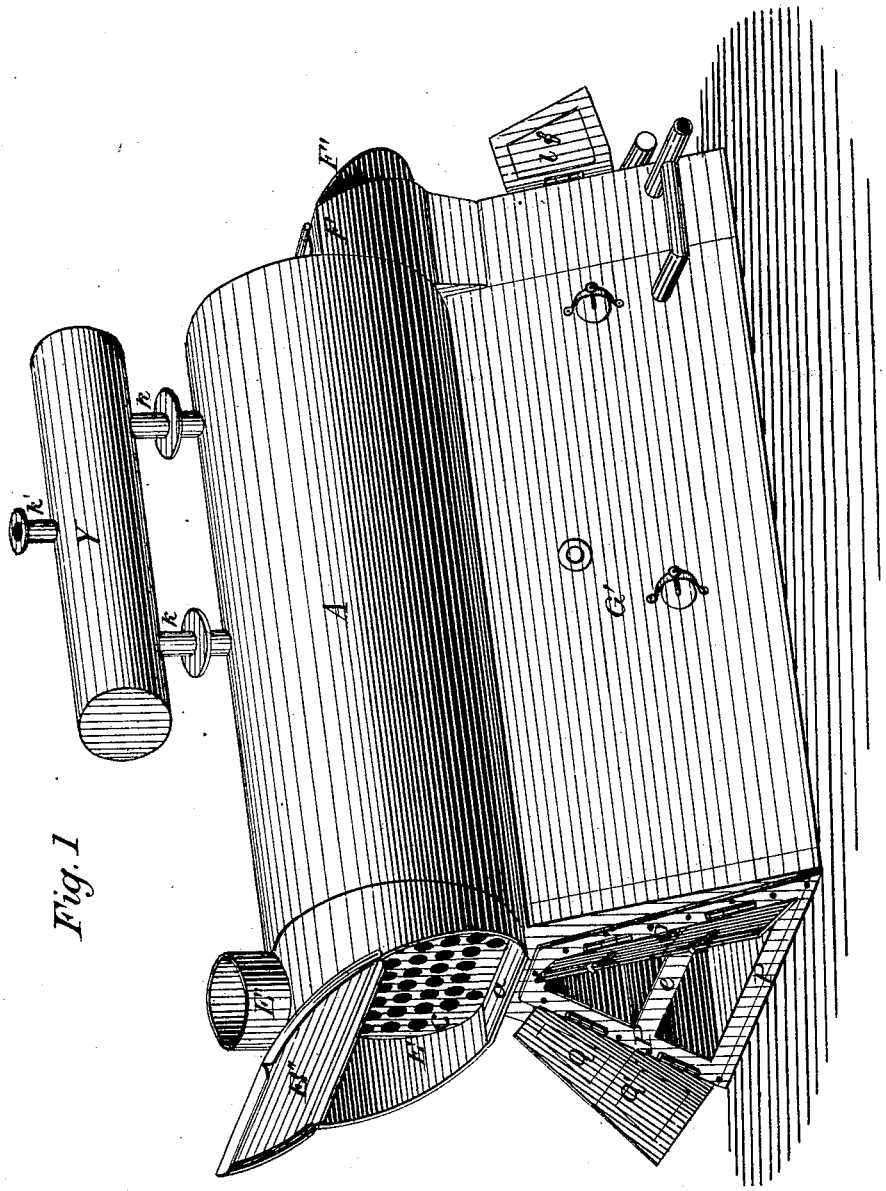

Fig. 1

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Fig. 2.

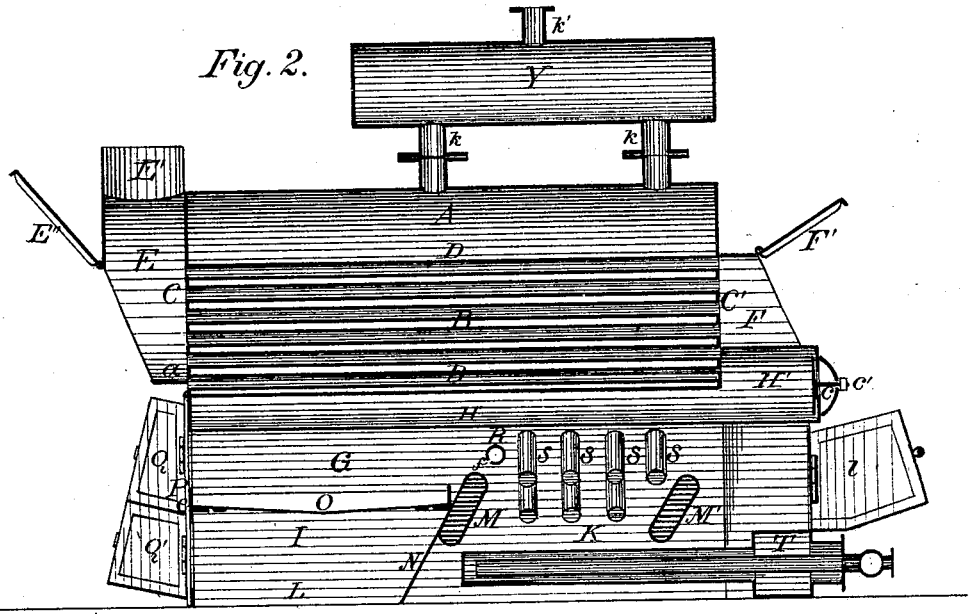
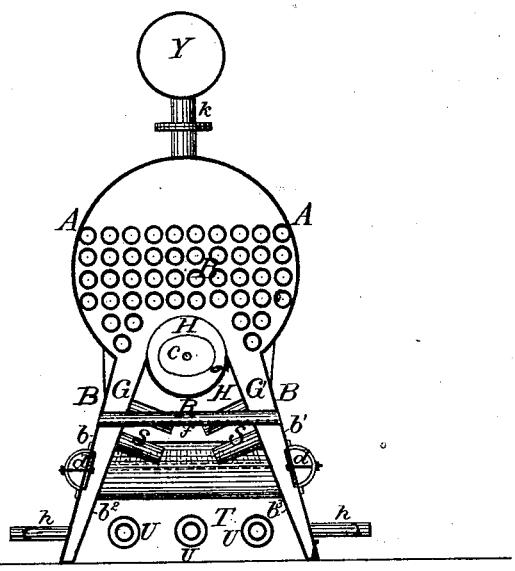


Fig. 3.



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I. BARTON.

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Fig. 4.

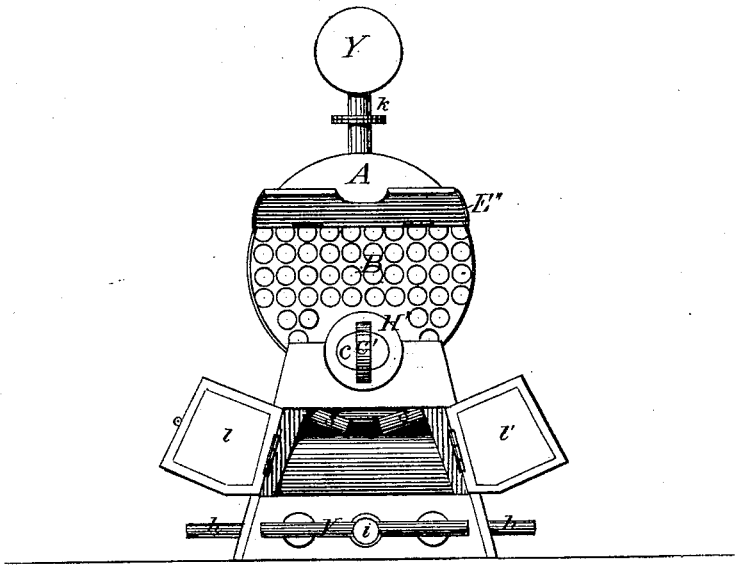
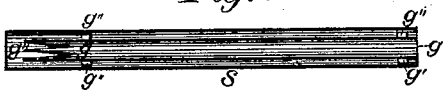


Fig. 5.



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UNITED STATES PATENT OFFICE.

ISAAC BARTON, OF WILLIAMSPORT, PENNSYLVANIA.

IMPROVEMENT IN FLUE AND TUBULAR STEAM-BOILERS.

Specification forming part of Letters Patent No. **167,054**, dated August 24, 1875; application filed July 14, 1875.

To all whom it may concern:

Be it known that I, ISAAC BARTON, of Williamsport, in the county of Lycoming and State of Pennsylvania, have invented a new and useful Improvement in Steam-Boilers; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings and to the letters of reference marked thereon.

The object of my invention is the production of a horizontal tubular boiler which shall have means for gaining easy access to the inside of the boiler, for repairing and cleaning the scale from the side and crown sheets, so that this class of boilers can be used economically and effectively with hard waters; and, further, a boiler which shall have great facility for cleaning the flues, be cheap in construction, and utilize to the fullest extent the fuel in the heating of the water; and my invention therein consists, first, in the peculiar supporting water-legs; second, the combination therewith of the circular crown-sheet; third, in extending the circular crown-sheet; fourth, in the peculiar sediment-collectors, all as more fully hereinafter explained.

To enable others skilled in the art to make and use my invention, I now proceed to describe the same in connection with the drawings, in which—

Figure 1 is a perspective view; Fig. 2, a central longitudinal section; Fig. 3, a section on the line *x x* in Fig. 2; Fig. 4, an elevation from the rear, with the shell removed; Fig. 5, a section of one of the circulating drop-pipes, showing their construction.

Similar letters denote corresponding parts in each figure.

A represents the shell of the boiler; B, the water-space; C C′, the front and rear flue-sheets, placed a short distance from either end of the shell. D represents the flues. E is a smoke-box placed in front of the flue-sheet C, and covering the flues D, opening at its top into the smoke-flue E^1, leading to the smoke-stack. The front part of the smoke-box is closed by a door, E^2, so as to give free access to that end of the flues. The lower end of this smoke-box terminates in a flat shelf, *a*, a short distance below the flues, upon which the soot and dirt from the said flues are scraped and easily removed. The rear ends of the flues are covered by a smoke-box, F, rising from the rear of the combustion-chamber, to be hereinafter described, which smoke-box is provided with a large door, F′. The flues communicate directly with the smoke-boxes E and F. Thus a scraper can be passed all the way through the flues from the rear to the front, depositing the dirt on the shelf *a* of the smoke-box E, from which it can be easily removed. By this method of passing the cleaner entirely through the flues they are cleaned more thoroughly than where the dirt is scraped out from one end.

The boiler is supported by two water-legs, G G′, the outer surfaces of which are a continuation of the shell A. These outer surfaces *b* b^1 may spread outwardly, if desired, or they may drop in a straight line from the upper part of the boiler. The inner surfaces b^2 b^3 of these water-legs diverge from the crown-sheet H to their feet. These water-legs run the whole length of the boiler from the front to the rear flue-sheets.

The crown-sheet H to this boiler is circular in form, so as to not need supporting-braces. This crown-sheet is nearly semi-cylindrical from the front to the rear flue-sheets, but from there to the rear sheet of boiler is a cylinder, H′. Its end is a man-hole, *c*, covered by a head, *c′*, through which entrance is given to the water-space below the flues, and thus this boiler can be easily entered for cleaning or repairs.

Besides serving as an entrance to the boiler, the extension H′ is brought in contact with the products of combustion as they pass into the smoke-box F.

I is the fire-box; K, the combustion-chamber, and L the ash-pit, the sides of which are the diverging water-legs. M is a hollow bridge-wall, extending between the inner surfaces b^2 b^3 of the water-legs G G′. This hollow bridge-wall also serves the purpose of a sediment-collector, and is cleaned out through hand-holes *d*, placed in the outer surfaces *b* b^1 of the water-legs, opposite the ends of the hollow bridge-wall. One or more other sediment-collectors, M′, similar in shape to the hollow bridge-wall, are placed in the combustion-chamber, between the said bridge-wall and the rear of the said

combustion-chamber. These sediment-collectors are cleaned through hand-holes *d'*. N is a cast or wrought iron plate, placed immediately in front of the bridge-wall, forming the rear of the ash-pit, and closing the space below the said bridge-wall. This plate supports the rear end of the grate O. P is a cast-iron frame, bolted to the front part of the boiler, upon which the fire-doors Q and ash-pit doors Q' are hung. This frame has also cast with it the rest *e* for the front end of the grate. Back of the bridge-wall a pipe, R, is passed entirely through the water-legs and combustion-chamber, and has its ends open to the surrounding air. In the combustion-chamber this pipe is perforated, as shown by *f*, and admits air from the outside into the said combustion-chamber, to secure a complete combustion of the gases.

This pipe, instead of having open ends, may have one end closed and the other connected by a pipe, having a regulating-valve, if desired, with the steam-drum, in which case the steam acts to secure a perfect combustion in place of air; but I prefer the first method as being simpler and less expensive. Any number of these pipes can be used.

S represents any number of drop-flues, which project from the inner surfaces b^2 b^3 of the water-legs into the combustion-chamber at right angles to the said surfaces of the water-legs. These drop-flues are pipes having their lower ends closed, screwed into the side sheets of the combustion-chamber. Each of these pipes has a pipe, *g*, of less diameter dropped into it, the construction of which is shown in Fig. 6. This pipe *g* has its lower end split, as shown by g^1, and has projections, g^2, on its sides, so as to support it clear from the inner surface of the pipes S. The water in the boiler standing in these pipes would be heated on the outside first, and would consequently be forced up by the pressure of the colder water in the pipes *g*. As the heat of the water increases the circulation increases. T is a box placed across the rear of the combustion-chamber, and connected to the water-space by pipes *h* and branch pipes *h'*. U represents three or more flues, which extend from the box T inwardly nearly to the bridge-wall, with their inner ends closed. V is a pipe extending parallel to the box T, and has a joint, *i*, for connecting through a pipe with the pump. W represents pipes of the same number as the flues U, which are connected, by one end, to the pipe V, and extend through the box T inside the flues U nearly to the ends of the said flues. The inner and upper sides of the box T and the whole surface of the flues U are always subjected to the heat of the combustion-chamber. The water entering the pipe V has to run through the pipes W to their ends before it can return to the box T, and from thence to the water-space B. The water, as it passes through the ends of the pipes W, and commences its return in the flues U, is exposed to the heat of the furnace in a thin column, thus very effectually heating the same. The pipes *h* have their ends open and provided with a suitable valve to act as a blow-off.

Y is the steam-drum, made in the form of a cylinder, and placed longitudinally upon the boiler. It is connected by suitable branches, *k*, with the steam-space. *k'* is the steam-pipe. *l l'* are doors opening into the rear of the combustion-chamber for repairs and cleaning.

The spreading water-legs, besides supporting the boiler more steadily than straight ones, and giving a larger extent of water-surface, also admit of the grate-space being enlarged or contracted by putting in a larger or smaller grate and grate-rests, and lowering or raising the same.

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

1. In a horizontal tubular boiler, the supporting water-legs, forming the sides of the fire-box, ash-pit, and combustion-chamber, and extending the entire length of the boiler, diverging downwardly from the crown-sheet in a straight line, substantially as described and shown, for the purposes set forth.

2. In a horizontal tubular boiler, the combination of the supporting water-legs, forming the sides of the fire-box, ash-pit, and combustion-chamber, and extending the entire length of the boiler, diverging downwardly from the crown-sheet in a straight line, and the circular crown-sheet, substantially as described and shown.

3. In a horizontal tubular boiler having a circular crown-sheet, the crown-sheet extended to the rear into a cylinder which passes through the back sheet of the boiler, and is provided with a proper opening, so as to give entrance into the water and steam space of the boiler, substantially as described and shown.

4. In a horizontal tubular boiler, two or more sediment-collectors, M M', placed in the combustion-chamber and connecting the inner sheets of the water-legs, the said water-legs being provided with hand-holes in their outer sheets opposite to the ends of the said collectors, when the several parts are constructed and arranged substantially as described and shown.

This specification signed and witnessed this 10th day of July, 1875.

ISAAC BARTON.

Witnesses:

J. EUTERMARKS,

JNO. SCHWER, Jr.