

(No Model.)

2 Sheets—Sheet 1.

W. A. LLOYD.
WATER TUBE BOILER.

No. 604,993.

Patented May 31, 1898.

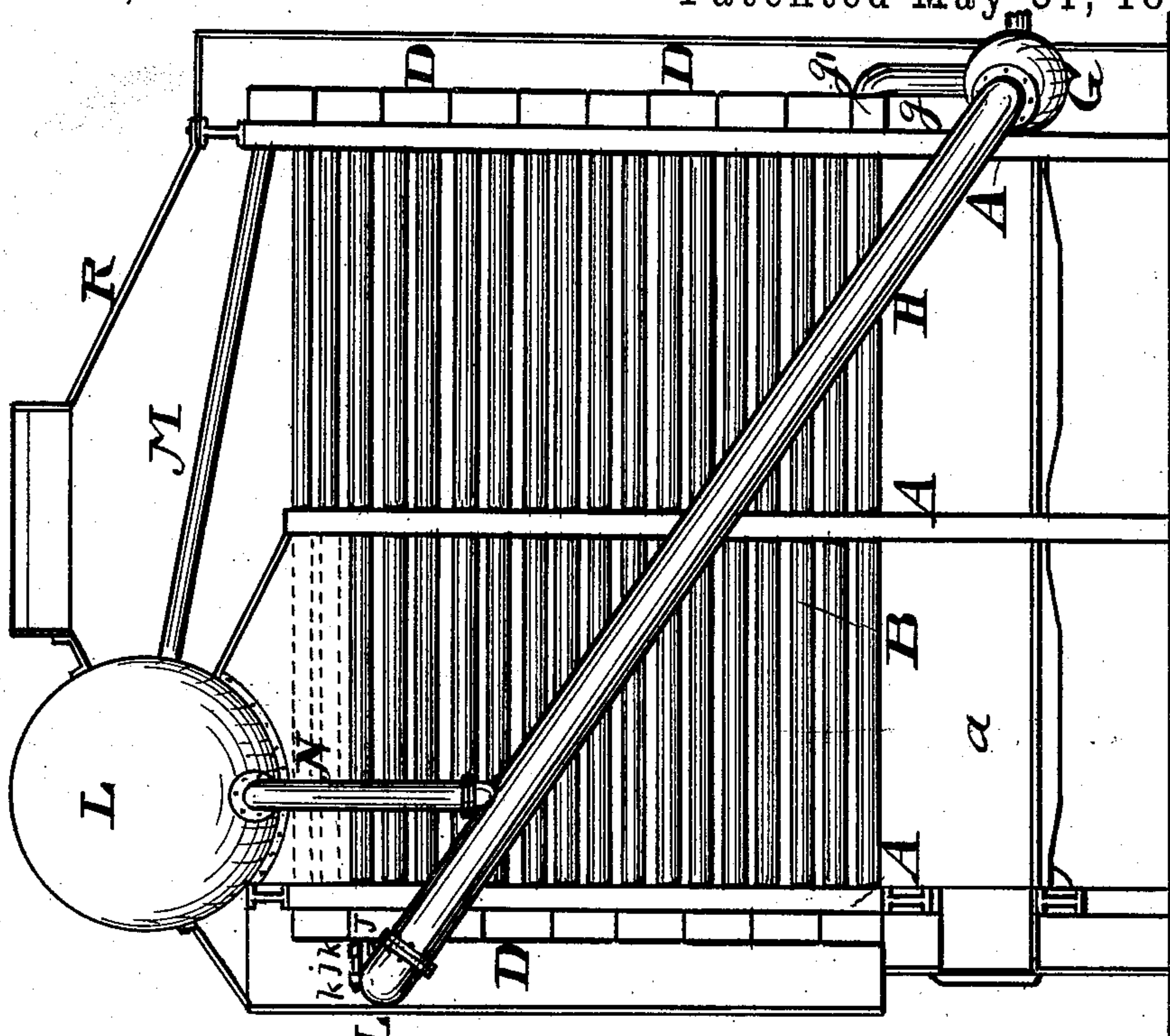


Fig. 2.

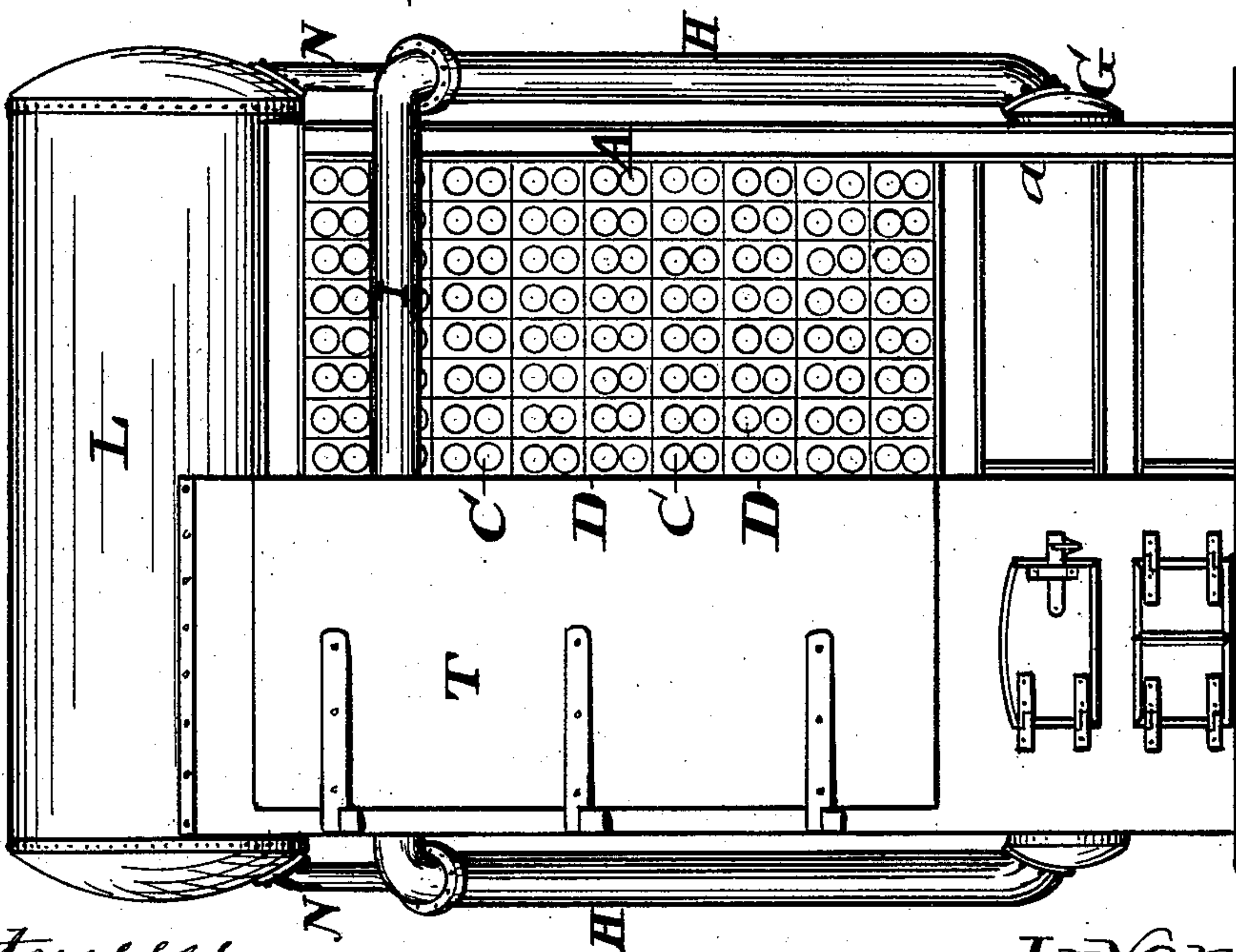


Fig. 1.

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William A. Lloyd
By Geo. W. Tibbitts Attorney

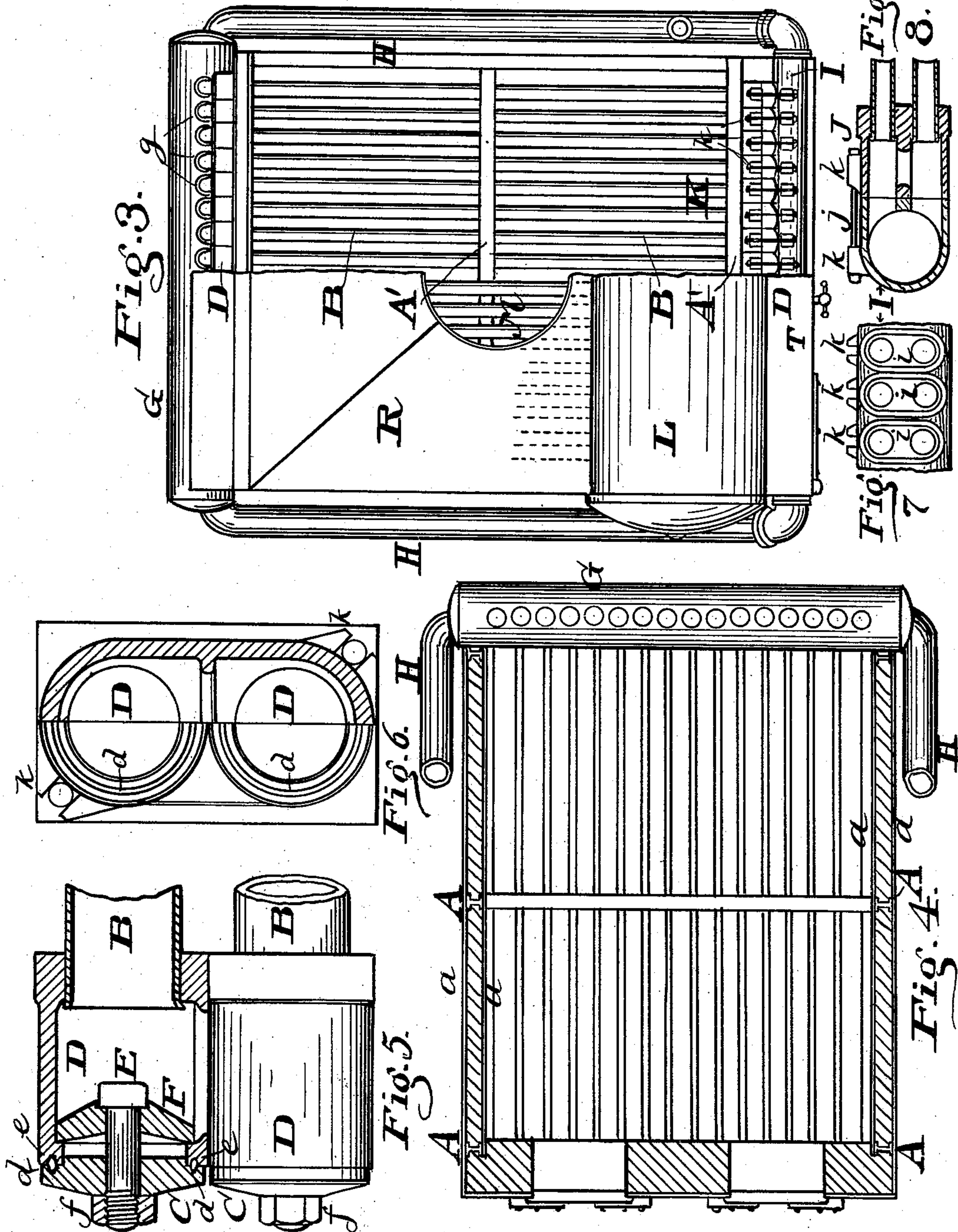
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UNITED STATES PATENT OFFICE.

WILLIAM A. LLOYD, OF ASHTABULA, OHIO.

WATER-TUBE BOILER.

SPECIFICATION forming part of Letters Patent No. 604,993, dated May 31, 1898.

Application filed January 10, 1898. Serial No. 666,249. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. LLOYD, a citizen of the United States, residing at Ashtabula, in the county of Ashtabula and State of Ohio, have invented certain new and useful Improvements in Water-Tube Boilers, of which the following is a specification.

This invention relates to steam-boilers, and particularly to that class known as "water-tube" boilers; and it consists in the new and novel constructions and combinations whereby simplicity and cheapness of construction, ease and readiness of repair, and a perfectly natural circulation are the results, substantially as hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a front elevation with one-half of the front removed for showing interior construction. Fig. 2 is a side elevation with side wall removed for showing interior construction. Fig. 3 is a top view with half of the top covering removed, also for showing interior construction. Fig. 4 is a horizontal section on line 4 4 on Fig. 2, showing grate-surface and construction of furnace side walls. Fig. 5 is an enlarged detail view, partly in section, of one of the headers which join the ends of tubes for coupling tubes at front and rear. Fig. 6 is a transverse front view of the same. Fig. 7 is a face view of a portion of the upper cross-tube, showing the apertures which join it onto an upper row of headers. Fig. 8 is a transverse section of the same, showing its connection with a header.

A A represent side posts, preferably made of I-beams or channel-iron, comprising part of a framework for supporting the boiler mechanism. A' are cross bars or beams which join the said posts at the top and at certain portions of the said framework. To the sides of the framework which contains the furnace are attached sheet-metal plates *a a* up to a level with the lower rows of water-tubes, and the space between said plates *a a* is filled with asbestos or other suitable material. The front and back of the furnace may have brick-work or similar lining; but otherwise no brick-work is to be used. The grate-bars are of the usual kind and supported in the usual manner.

B B is a series of water-tubes horizontally

disposed from front to rear and to any required height for a given capacity. These tubes are connected at the front and rear by means of new and peculiar coupler-headers, by means of which an upward and alternating course is provided for the circulation of water. As seen in Figs. 5 and 6, these headers consist of double tubular rectangular blocks, which when in place in the front and rear frames completely fill the space in said frames, as seen in Figs. 1 and 3. The front openings in said blocks are closed with caps C, held firmly in place by bolts E and inside cross-pieces F, through which the bolts are put, with the heads of the bolts on the inside and the nuts *f* on the outside of the caps. In the caps and in the ends of the tubes D of the headers are made taper-sided annular grooves *d*, into which are placed double taper-rings *e* of copper or other suitable material for the purpose of making a perfectly steam-tight joint. The ends of the tubes B are secured in their seats in the said blocks by expanding or beveling their ends, as seen in Fig. 5.

G is a mud-drum placed at the back of the furnace and considerably below the lower line of water-tubes and is connected by a series of branch pipes *g* with the single headers *g'* on the rear ends of the lower row of water-tubes B.

H H are side pipes connected with the ends of the mud-drum G and extend upward in a diagonal line outside of the casing inclosing the boiler and have their upper ends connected with front cross-pipe I. This pipe is connected with the front ends of the third and fourth rows of tubes B from the top by means of joints K K. (Seen in detail in Figs. 7 and 8.) The headers J are open at the front and are joined to the openings *i* in the pipe I by bolts *j*, held in the lugs *k* on the sides of the headers and pipe.

L is a steam-drum located on the top and front part of the framework and over the front ends of the water-tubes. The rear side of said drum is connected with the top row of rear headers by slightly-inclined tubes M. The ends of said steam-drum are connected on the outside of the casing by vertical pipes N with the diagonal pipes H H.

The top of the boiler is covered with a slanting roof R.

The front and rear ends of the casing above the furnace are provided with large doors T, by means of which the front and rear may be opened for exposure of the entire front and rear headers, thus enabling ample and free access to the interior for cleaning and repairs.

From the foregoing it will be seen that a natural and ready circulation of water takes place back and forth upwardly from the mud-drum, where the feed-water is admitted, through the tubes B, thence through the upper cross-pipe I and back again down the outside diagonal pipes II II. The steam will be superheated in the top rows of tubes and enter the steam-drum in a dry state.

The flames from the furnace pass upward between the tubes B in a direct line, as seen in the drawings; but the headers instead of being square-cornered may be made with diagonal sides, whereby the tubes instead of being directly over one another will be in alternate lines, whereby the flames will be obstructed and must pass in zigzag lines and thus enhance the heating effects on the tubes.

Having described my invention, what I claim is—

1. In a water-tube boiler, the combination with the tubes B of the headers D, having double tubular chambers, caps C for closing said chambers, annular beveled grooves *d* in said caps and in the ends of said chambers, tapering packing-rings *e* in said grooves, and the bolts E, nuts *f* and cross-pieces F, substantially as described.

2. In a water-tube boiler, the combination with the tubes B, headers D connecting said tubes at the front and rear, and the mud-drum G, connected with the rear end of lower row of water-tubes, the outside diagonal pipes II II, attached to the ends of mud-drum, and the upper cross-pipe I connected with the upper tubes B, substantially as described, of the steam-drum L connected at its rear side by pipes M with the upper rear headers D, and its ends connected by branch pipes N with the diagonal pipes II II, substantially as described and for the purpose set forth.

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Witnesses:

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H. A. MACK.