

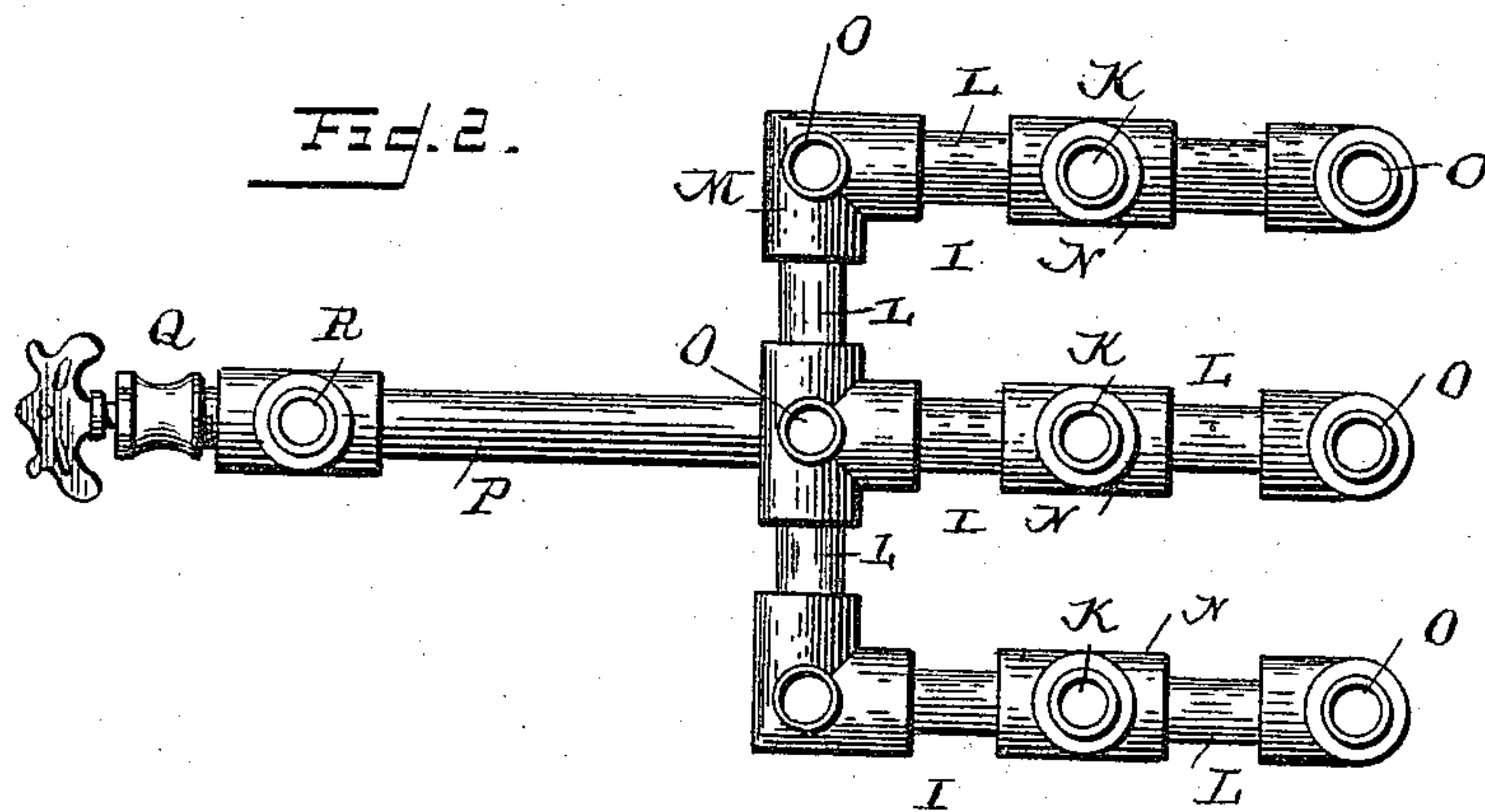
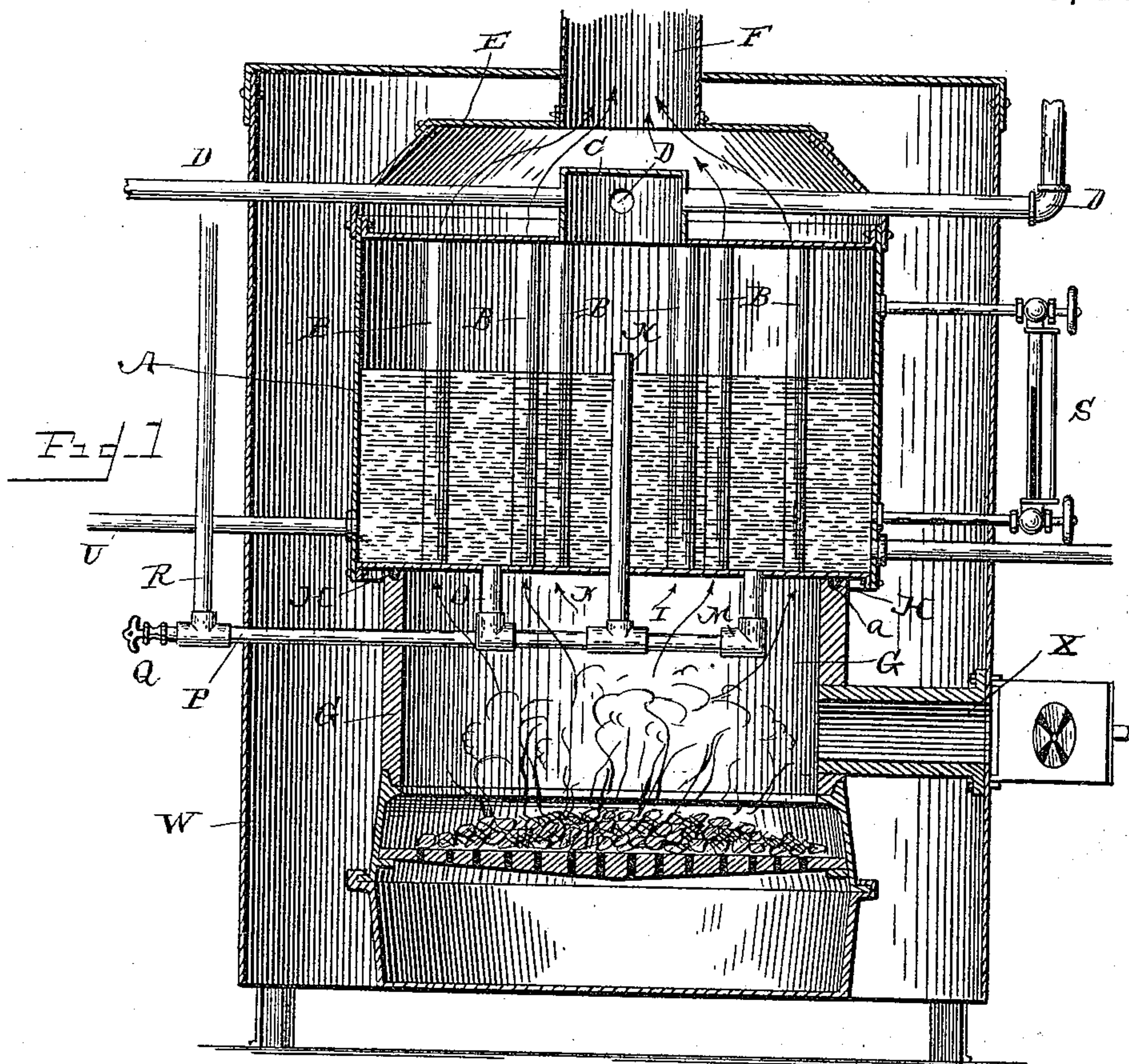
(No Model.)

2 Sheets—Sheet 1.

M. CARMAN.  
UPRIGHT TUBULAR STEAM BOILER.

No. 441,280.

Patented Nov. 25, 1890.



Witnesses  
Isa R. Steward.  
Alfred T. Gage.

Inventor  
M. Carman  
By his Attorney  
H. B. Henderson.

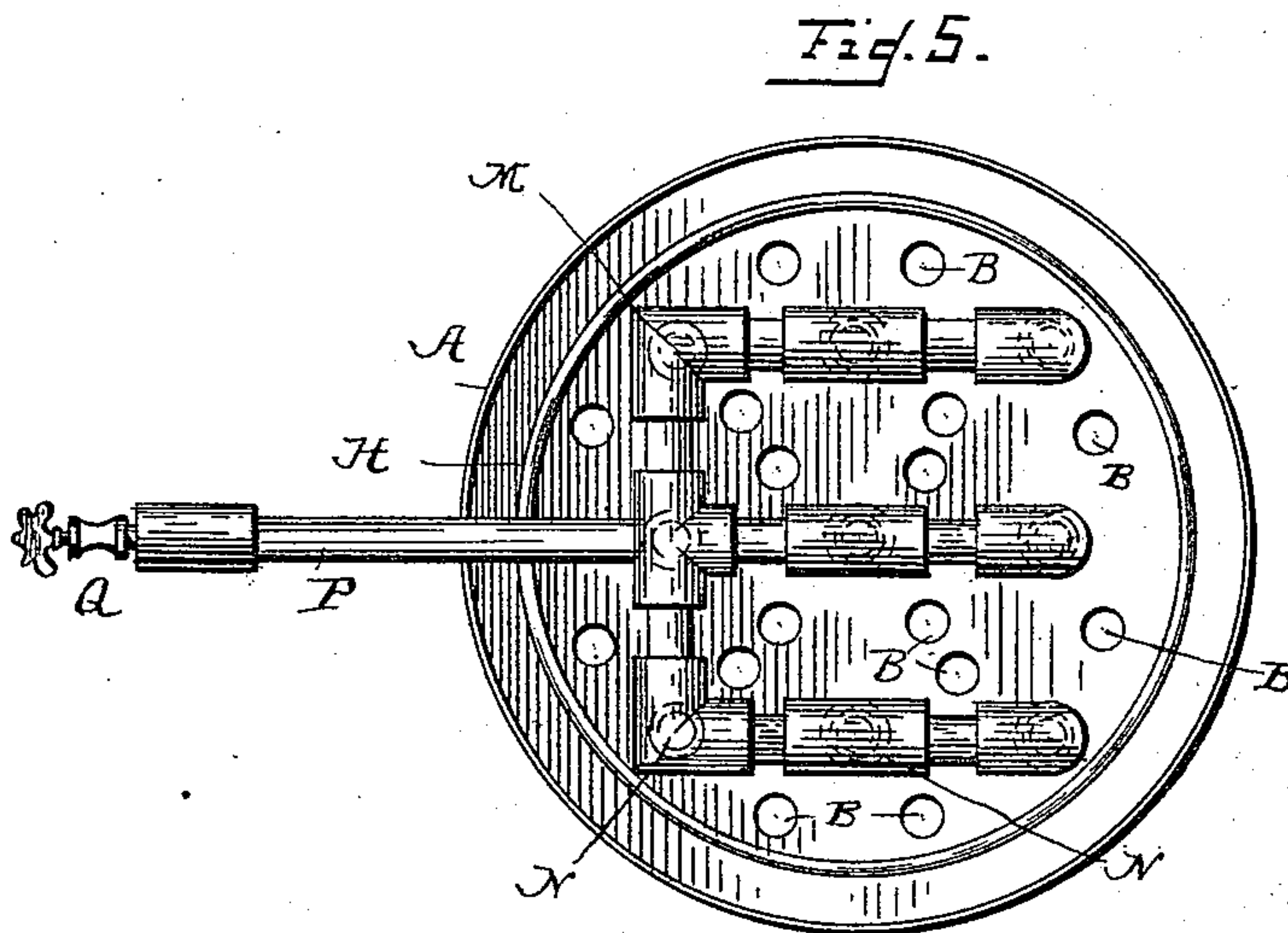
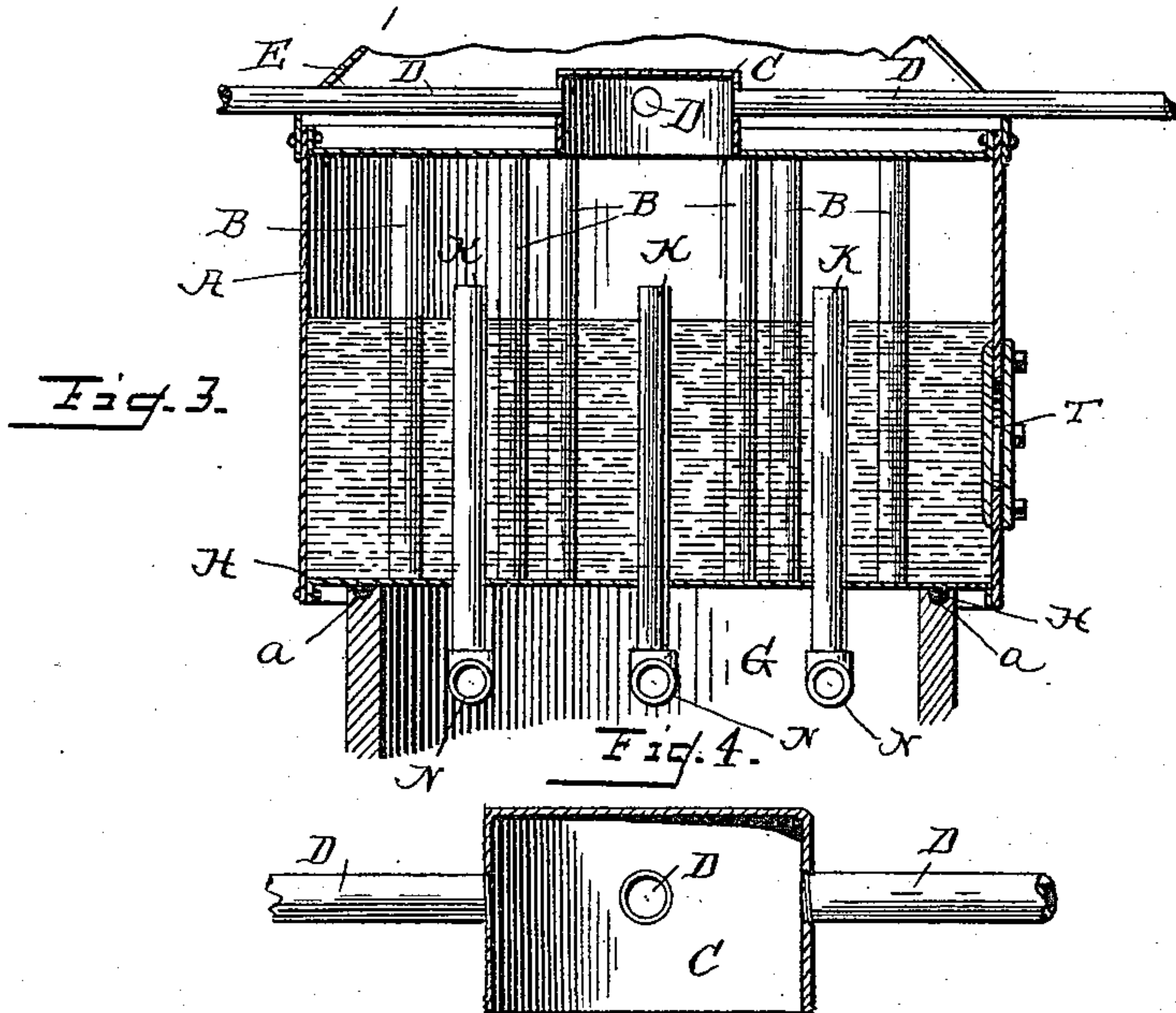
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H. B. Hudson



# UNITED STATES PATENT OFFICE.

MAHLON CARMAN, OF TOWANDA, PENNSYLVANIA.

## UPRIGHT TUBULAR STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 441,280, dated November 25, 1890.

Application filed December 23, 1889. Serial No. 334,713. (No model.)

*To all whom it may concern:*

Be it known that I, MAHLON CARMAN, a citizen of the United States, residing at Towanda, in the county of Bradford and State of Pennsylvania, have invented certain new and useful Improvements in Upright Tubular Steam-Boilers; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to tubular boilers, and has for its object to provide the boiler with a "drop-square" of a construction that will materially increase the heating-surface and generate the steam quicker than under other constructions, and thus economize fuel.

It also has for its object to so combine the drop-square with the boiler and the circulating-tubes with the drop-square that a more thorough circulation is obtained, and the steam generated in the drop-square is caused to pass up through the water in the boiler, thus adding to the heating of the water and quickening the generation of steam.

It also has for its object to provide a simple and efficient steam-dome to receive steam from the boiler and have the same still further heated by the waste productions of combustion before the steam passes through the supply-pipes to the radiators.

It also has for its object to provide an expansion-pipe connecting with the drop-square, so as to relieve the pressure thereon, and thereby contribute to securing a better circulation of the steam and water.

It has for its further objects to generally improve the construction and increase the efficiency of such boilers.

The construction well adapts the boiler to be applied to hot-air furnaces of various constructions already in use, and in the drawings it is illustrated as applied to one form of such a boiler.

To the accomplishment of the foregoing and such other objects as may hereinafter appear, the invention consists in the construction and combination of parts, hereinafter particularly described and claimed, reference being had

to the accompanying drawings, forming a part hereof, and in which—

Figure 1 is a vertical section through a hot-air heater having the boiler applied thereto. Fig. 2 is a plan view of the drop-square detached from the boiler and looking down onto the top of the square. Fig. 3 is a vertical section through the boiler and drop-square at right angles to Fig. 1, with parts broken away. Fig. 4 is a vertical section through the steam-dome detached from the boiler and having the steam-supply pipes radiating therefrom. Fig. 5 is a bottom view of the boiler, showing the drop-square attached thereto and the packing-ring, which will fit into the top of the fire-box so as to increase the diameter of the boiler.

In the drawings, the letter A designates the boiler provided with the combustion-flues B and having a steam-dome C, composed, preferably, of a four-and-one-half-inch pipe or nipple four inches high, capped and secured in the top of the boiler by screw-threads, and from which radiate the steam-supply pipes D, which run to the radiators. The top of the boiler is provided with the chamber E, into which the products of combustion from the combustion-flues are discharged before their escape through the escape-flue F, so that the heat therefrom may be utilized to further heat the steam in the dome C. By locating the steam-dome in the chamber E, as shown, and having the radiator steam-supply pipes D pass from the dome through the chamber E heating-surface is obtained sufficient to very largely increase the heat of the steam.

In order that the capacity of the boiler may be increased and that a close joint may be made between it and the fire-box G, I form a bead or packing-ring H on the bottom of the boiler, so that the same may set into a groove *a*, formed in the top of the fire-box wall, and will be so positioned on the bottom of the boiler as to make the boiler about two inches larger in diameter than the fire-box.

For the purpose of increasing the circulation in the boiler and the generation of steam, I provide a drop-square having three parallel arms or branches I, connected together at one end by a transverse arm or pipe J and communicating with the interior of the boiler at opposite ends, and at an intermediate point



with circulating - tubes K, extending up through the boiler to a point above the water-level therein. I prefer to construct the three parallel branches and the end transverse pipe  
 5 of sections of two-inch heavy steam-pipe L, connected at the ends or corners of the square to L's (designated by the letters M) and at intermediate points by the T's. (Designated by the letters N.) The square at opposite  
 10 ends will connect with the interior of the lower part of the boiler through the drop-flues O, there being six in all, as illustrated, three at each opposite end of the square, and at points between its ends it will communicate with the  
 15 interior of the boiler through the circulating-tubes K, there being three shown and illustrated as connected at their lower ends to the T's of the square, and which will extend up above the water-level in the boiler. These  
 20 several parts may be of any desired dimensions, and as a mere illustration I may mention that the drop-square and its fittings may be of two-inch steam-pipe, while the drop-flues may be of one-inch pipe, and the circulating-tubes also made of one-inch pipe, and  
 25 the square may be four inches below the bottom of the boiler.

With the drop-square constructed and connected to the boiler as described, a thorough  
 30 circulation is obtained, and steam is generated at a great saving in fuel and much quicker than otherwise.

I provide the drop-square with a draw-off or sediment pipe P, having a cock Q, so that  
 35 when necessary the pipes can be cleaned by opening the cock and letting the steam blow them out.

To prevent undue steam-pressure in the drop-square, I relieve the same by providing  
 40 an expansion-pipe R, which is illustrated as connecting with the draw-off or sediment pipe, and at the other end will communicate with any form of vessel adapted to receive the water that may rise in the expansion-pipe  
 45 from the pressure of steam in the square. By thus relieving the pressure on the square a freer circulation of the steam and water is obtained. The boiler is also provided with the water-gage S, a controlled opening T,  
 50 through which access can be had to the interior to clean it, and with return-pipes U from the radiators. It is also illustrated as inclosed by the casing W of a hot-air heater, which has an opening X, as usual, for the introduction of fuel.  
 55

I have illustrated and particularly described what I consider to be the best form and construction of parts and have given the proportions which some of the parts may  
 60 have; but I do not wish to be understood as restricting myself thereto when departures in such features can be made without departing from the spirit of my invention.

Having described my invention and set forth its merits, what I claim is—

1. The combination, with the boiler, of the drop-square composed of a series of parallel pipes connected together by a transverse pipe, drop-flues connecting said square with the interior of the boiler, and circulating-pipes  
 70 extending from said square up within the boiler above the water-level therein, substantially as and for the purposes set forth.

2. The combination, with the boiler, of the drop-square composed of the sections of  
 75 pipe having the L's at their ends and T's between their ends, the drop-flues connecting said square with the interior of the boiler, and the circulating-tubes extending up within the boiler and having their lower ends  
 80 connected with the T's of the drop-square, substantially as and for the purposes set forth.

3. The combination, with the boiler, of the drop-square connected with the interior of  
 85 the boiler by means of the drop-flues, the circulating-tubes extending up within the boiler and connecting with said square, and the sediment or draw-off pipe connected with said square, substantially as and for the purposes  
 90 set forth.

4. The combination, with the boiler, of the drop-square communicating therewith through drop-flues, the circulating-pipes extending up within the boiler and connecting  
 95 with said drop-square, and the expansion-pipe connecting with the drop-square to relieve pressure therein to insure a better circulation of steam and water, substantially as and for the purposes set forth.  
 100

5. The combination of the fire-box, the boiler having the bead or packing-ring formed on its under side at a point to leave a space between it and the outside wall of the boiler and fitting in a groove at the top of the fire-  
 105 box, and a drop-square suspended from the boiler and entering the fire-box, substantially as and for the purposes set forth.

6. The combination, with the boiler having combustion-flues extending through the same  
 110 and a chamber E at its top, of the steam-dome located in said chamber and communicating with the upper part of the boiler and having supply-pipes extending laterally from the same through said chamber and the drop-  
 115 square suspended from the lower part of the boiler, so as to communicate therewith, and having circulating-pipes extending from it up within the boiler, substantially as and for the purposes set forth.  
 120

In testimony whereof I affix my signature in presence of two witnesses.

MAHLON CARMAN.

Witnesses.

WILLIAM EDWARD LANE,  
 ULYSSES MERCUT.