

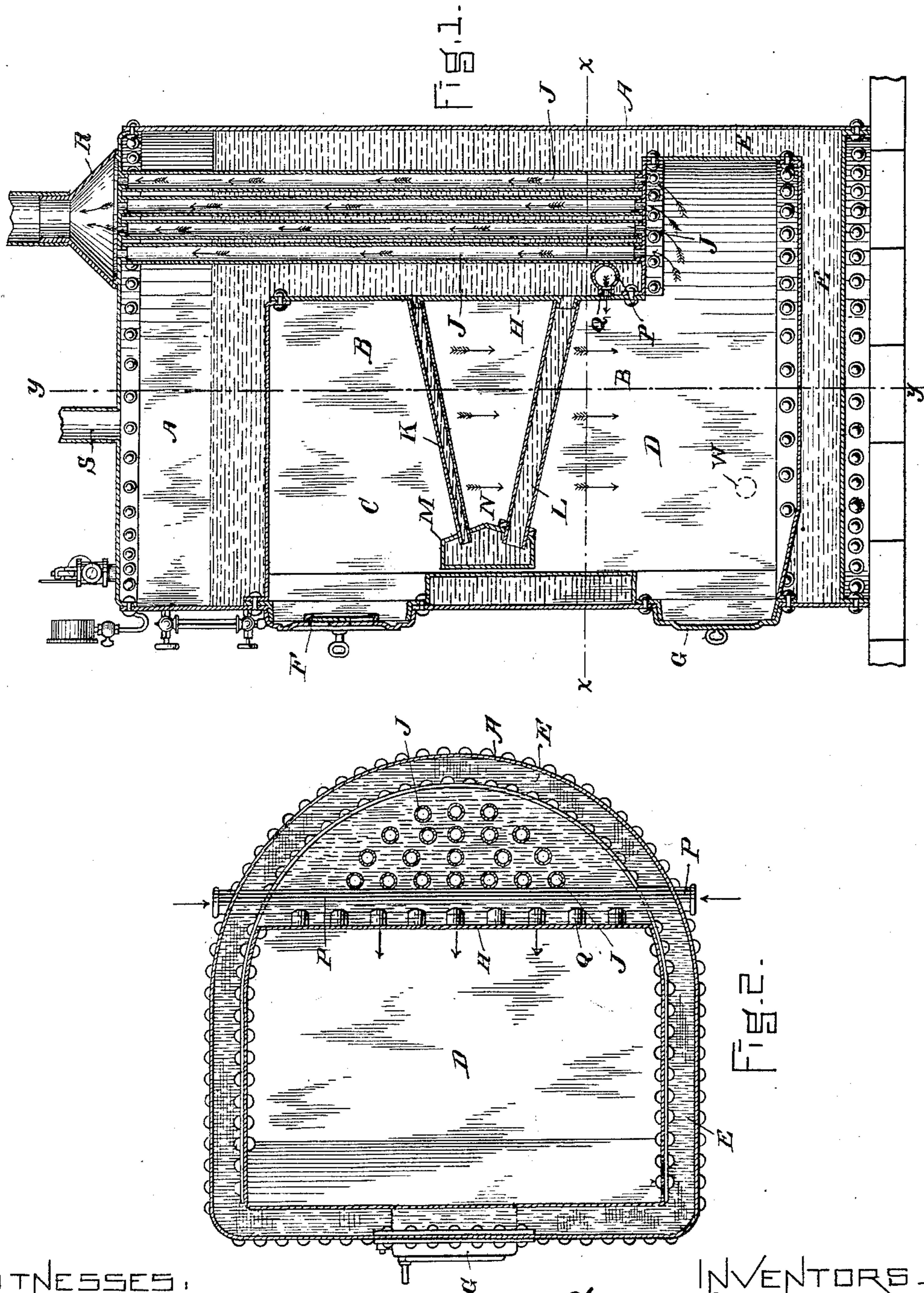
(No Model.)

3 Sheets—Sheet 1.

W. S. POST & H. DE W. SAWYER.
STEAM BOILER AND FURNACE.

No. 394,131.

Patented Dec. 4, 1888.



WITNESSES.

James C. Prince.
E. G. Alexander.

INVENTORS.

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Howard W. Sawyer.
by A. H. Jones, atty.

(No Model.)

3 Sheets—Sheet 2.

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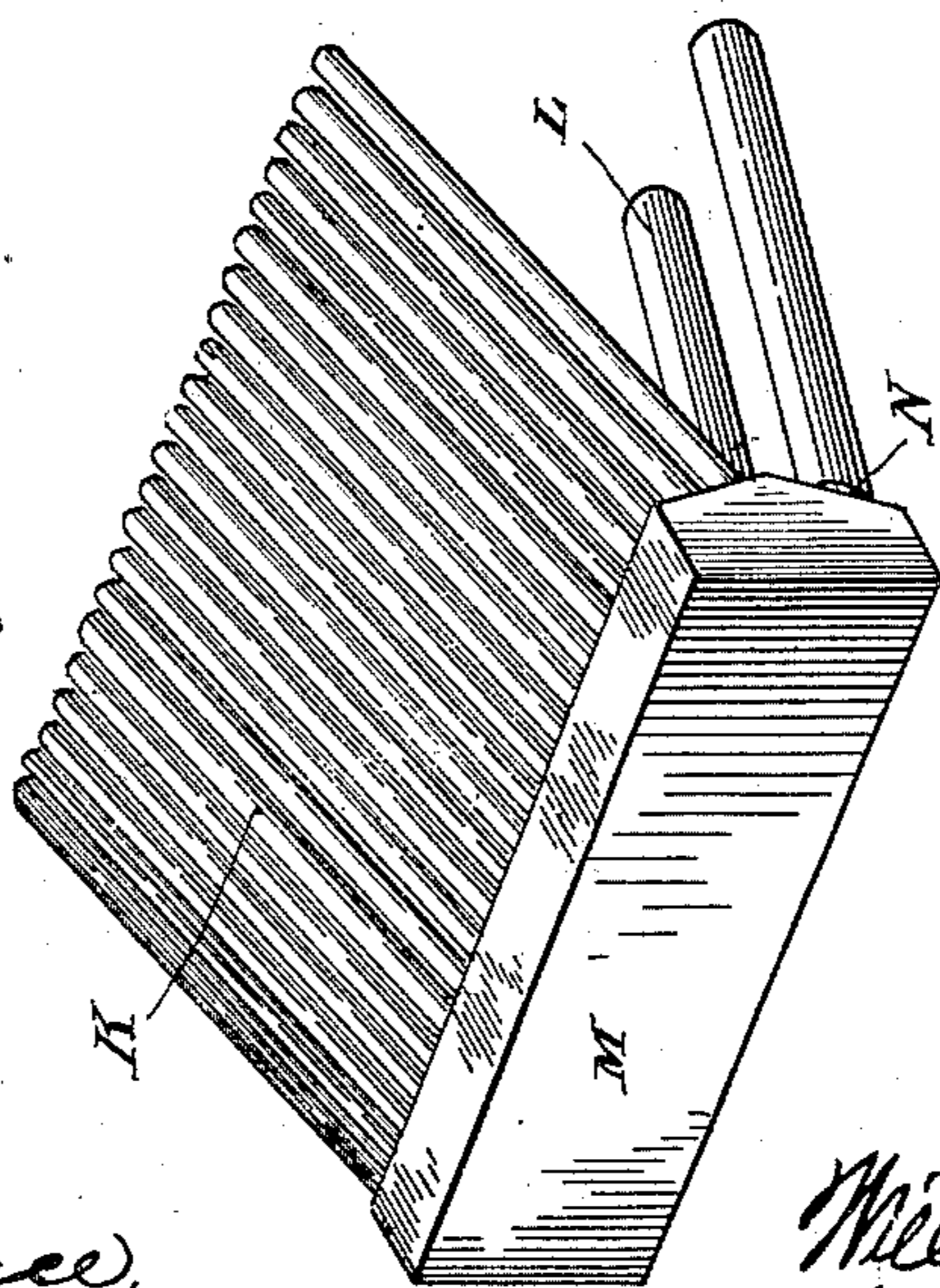
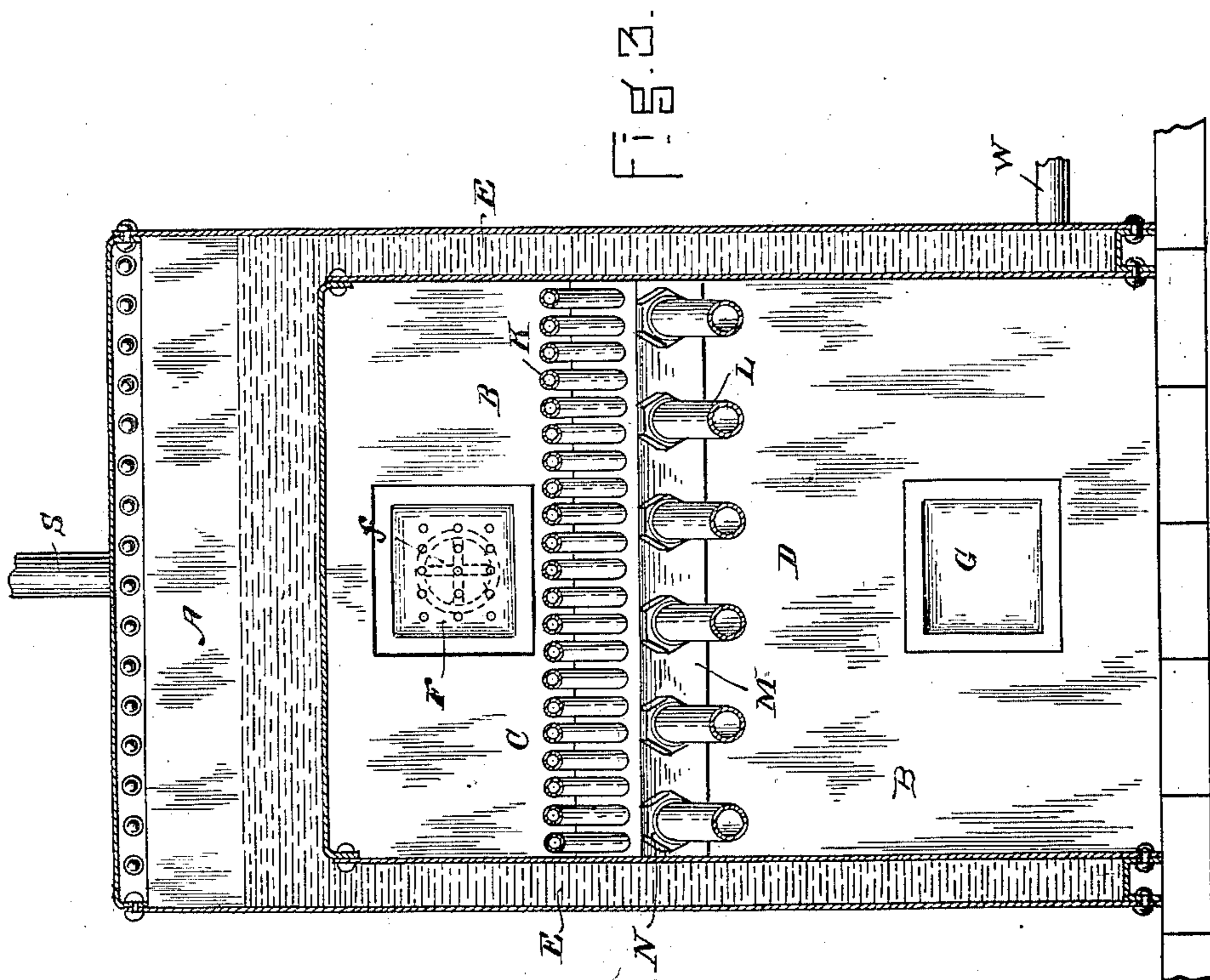


FIG. 4-

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(No Model.)

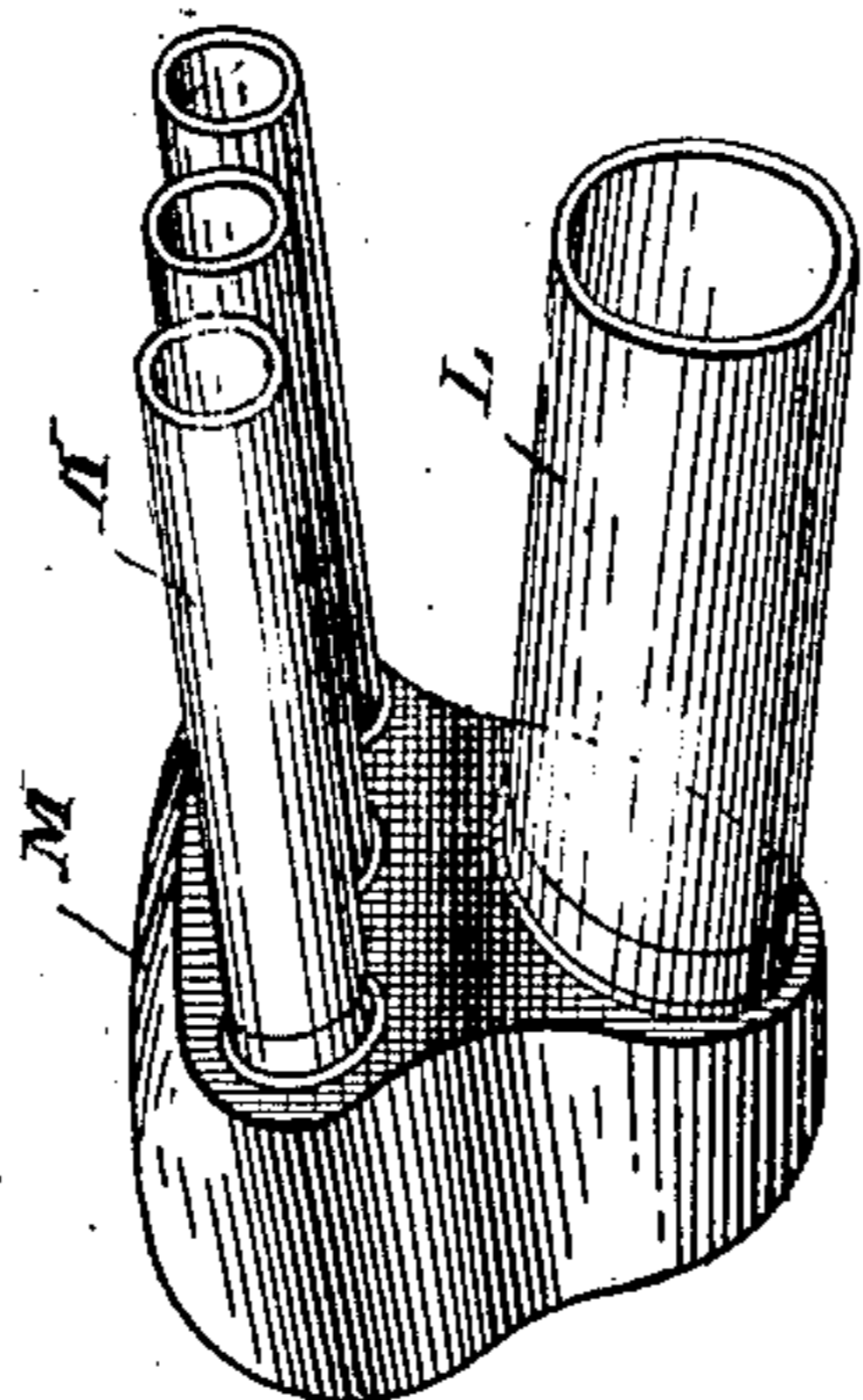
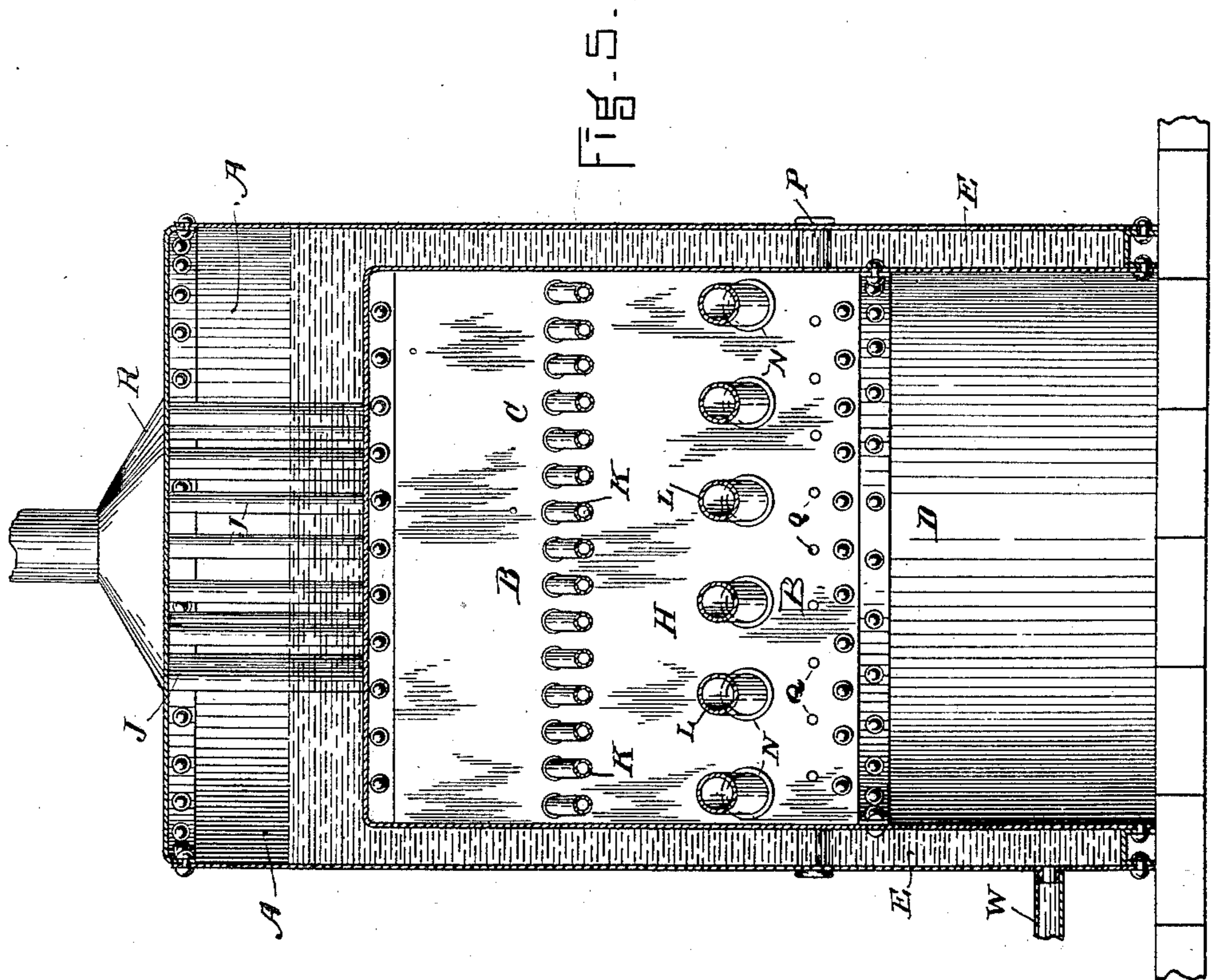
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UNITED STATES PATENT OFFICE.

WILLIAM S. POST, OF BOSTON, AND HOWARD DE W. SAWYER, OF REVERE,
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OF PORTLAND, MAINE, OF BOSTON, MASSACHUSETTS.

STEAM-BOILER AND FURNACE.

SPECIFICATION forming part of Letters Patent No. 394,131, dated December 4, 1888.

Application filed January 3, 1888. Serial No. 259,661. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM S. POST, of Boston, and HOWARD DE W. SAWYER, of Revere, both in the county of Suffolk and State of Massachusetts, have jointly invented certain new and useful Improvements in Steam-Boilers and Furnaces, of which the following, taken in connection with the accompanying drawings, is a specification.

This invention is in the nature of an improvement upon the apparatus shown in our several Letters Patent on steam-boilers and furnaces, No. 299,578, dated June 3, 1884, No. 351,338, dated October 19, 1886, and No. 351,652, dated October 26, 1886.

In each of our prior forms of apparatus a downward draft was maintained through an oblique water-grate, the caloric current being deflected and caused to pass downwardly below and behind a depending water-leg having an oblique portion about parallel with the grate, upon which the descending current impinged.

With our present improvements we employ the oblique water-grate and downward draft, substituting for the depending leg, with its oblique member, a plain vertical water-back, along which the caloric current is deflected to a point considerably below the grate, passing meanwhile between water-circulating tubes, said water-back having lengthwise through it a series of vertical flues, through which the caloric current passes upwardly to the funnel. The water-back of our present boiler forms a part of or is connected directly with the water-wall at the back and each side of the fire-box. The pipes of the water-grate run obliquely downward and water-circulating pipes below the grate run obliquely upward from the water-back to an independent water-box placed across the front of the boiler and disconnected from the water-wall thereof. This box may therefore yield with the expansion and contraction of said pipes, and all may be introduced together into place through the bottom of the boiler.

In the drawings, Figure 1 is a vertical section from front to rear of an upright boiler embodying our improvements. Fig. 2 is a

horizontal section on line *x x* of Fig. 1. Figs. 3 and 5 are vertical sections on line *y y* of Fig. 1, looking, respectively, to front and to rear thereof, but showing a boiler open at bottom. Figs. 4 and 6 show details of the water-box and its connected tubes, Fig. 6 representing a sectional box.

A is the outer shell of the boiler, preferably of the **D** form in cross-section shown in the drawings. The fire-box B is placed wholly within this shell, and is divided by the grate into two chambers C and D, the upper one, C, being the fuel-chamber and the lower one the combustion-chamber, in which the gases are consumed. The fire-box is entirely surrounded by water when in use, except at the bottom, the space between it and the outer shell forming water-walls E at each side and in front and rear of the fire-box, while the water-line is maintained constantly at a suitable height above the crown-sheet, as shown. The bottom of the boiler may also be a water-space, as shown in Fig. 1. A door, F, above the grate admits fuel, and a damper, *f*, therein constitutes a draft-opening for the downward air-current, while below it is another door, G, for removal of ashes. The bottom of the boiler may be left open for convenience in setting the tubes or for repairs, as in Figs. 3 and 5, and the structure rests on a fire-brick foundation.

In rear of the fire-box is water-back H, constituting a material enlargement of the water-wall, with which it is directly connected. Through the water-back vertically there is a series of flues, J, for the upward passage of the caloric current, which is first deflected downwardly by the front wall of the water-back and enters said flues through the bottom thereof, which is raised a foot or more above the bottom of the combustion-chamber for this purpose.

The grate K, upon which the fuel rests, consists of a series of metallic tubes, preferably about one inch in diameter and from one-half to three-fourths of an inch apart, set parallel to each other and at an inclination of about one inch per linear foot. Below the grate is another series of water-pipes, L,

shown as larger in diameter and less in number, inclined in the opposite direction, for the purpose of supplying water to and maintaining its circulation through the grate. All the tubes K and L extend from the water-back II forward to and into an independent pipe or water-box, M, placed horizontally across the front part of the fire-box, but detached therefrom, so that it may yield with the tubes under the varying temperatures. The supply-pipes L thus serve, also, as braces to support the free end of the grate and the fuel upon it. The water-box M may be made in sections, as in Fig. 6, a single pipe L supplying water for two or more grate-tubes, K.

There are other advantages of our combinations of the grate and supply-pipes with the water-box M. Said pipes are at first screwed sufficiently far into the box so that all may be introduced together through the open bottom of the boiler, and when in position the tubes may be successively unscrewed from the box far enough to enter at the other end through the front of the water-back and each be thus made fast. Countersunk set-nuts N, with fire-proof packing, are then employed to secure tight joints.

By making the box M in sections the tubes connected with any one section may be readily removed together for repairs, if required, without disturbing the remainder of the grate.

The downward draft causes the gases evolved to pass through the fire, carries the caloric current between the tubes of the grate K, impinging upon and passing between the inclined water-circulating pipes L, and produces in the combustion-chamber C a most intense heat, to which the water is continually exposed, thus utilizing the heat to the utmost and generating steam with great rapidity. For more complete combustion of the gases we arrange to deliver a limited and regulated amount of air in jets below the grate. An air-pipe, P, runs through the foot of the water-back and has short hollow nipples Q, connecting its interior with that of the combustion-chamber, as indicated in Figs. 1 and 5, and about as shown in our former patent, No. 351,652.

Above the flues J we provide a removable

cap or hood, R, so that ready access to said flues may be had for the purpose of cleaning them when required. A steam-pipe, S, and water-inlet W will be furnished with suitable gages, valves, &c. The boiler will be suitably supported by ordinary crown-bars and stay-bolts, so as to have abundant strength.

We claim as our joint invention—

1. In a downdraft steam-generator, the fuel-chamber C, closed tightly at top and provided with a feed-door and draft-inlet above the grate, and the combustion-chamber D below the grate, extending beneath the water-back, with the outlet for the caloric current through the flues J, in combination with the water-back II, traversed by said flues, and with the water-grate K, having a front water-connection and connected with said water-back, substantially as set forth.

2. In a steam-generator, the shell A, fire-pot B, and deflecting water-back II, having vertical flues J traversing it, in combination with an inclined water-grate, K, and a series of water-circulating pipes, L, below said grate, adapted to supply water thereto, for the purpose set forth.

3. In a steam-generator, the fire-pot B, having the oblique water-grate K, separating the fuel-chamber from the combustion-chamber, in combination with the independent water-box M and the water-circulating pipes L, through which water is supplied to said grate, substantially as set forth.

4. In a steam-generator, the combination of the water-back II and independent water-box M with the water-grate K and oblique circulating-pipes L, arranged to act as inclined supports for the water-box, said tubular grate and pipes both connecting with the water-back and water-box to complete a direct circulation, substantially as set forth.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses, on this 24th day of December, A. D. 1887.

WILLIAM S. POST.
HOWARD DE W. SAWYER.

Witnesses:
A. H. SPENCER,
FRANK T. BENNER.