

(No Model.)

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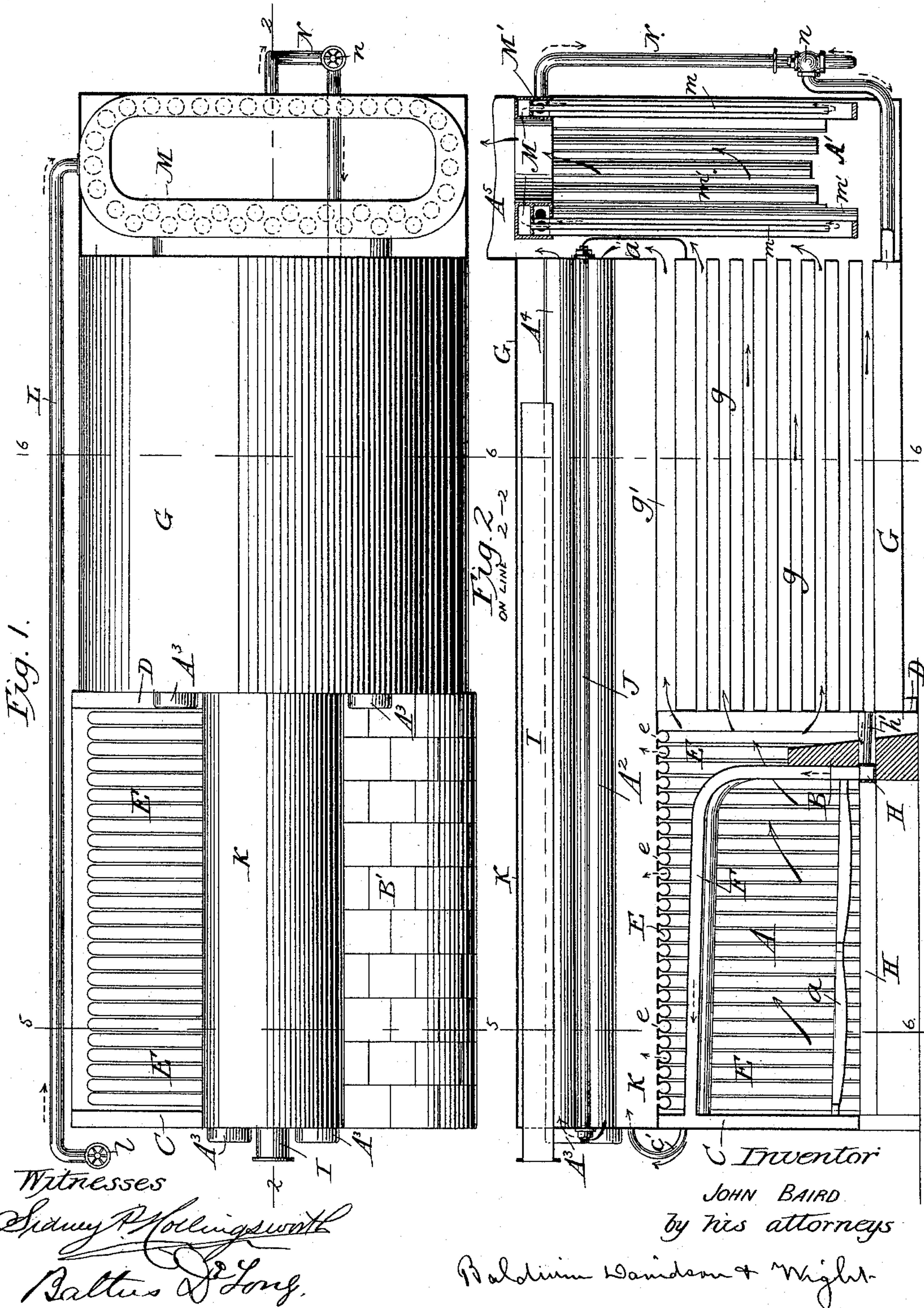
J. BAIRD, Dec'd.

J. S. & A. W. BAIRD & J. E. PARSONS, Executors.

STEAM BOILER.

No. 476,181.

Patented May 31, 1892.



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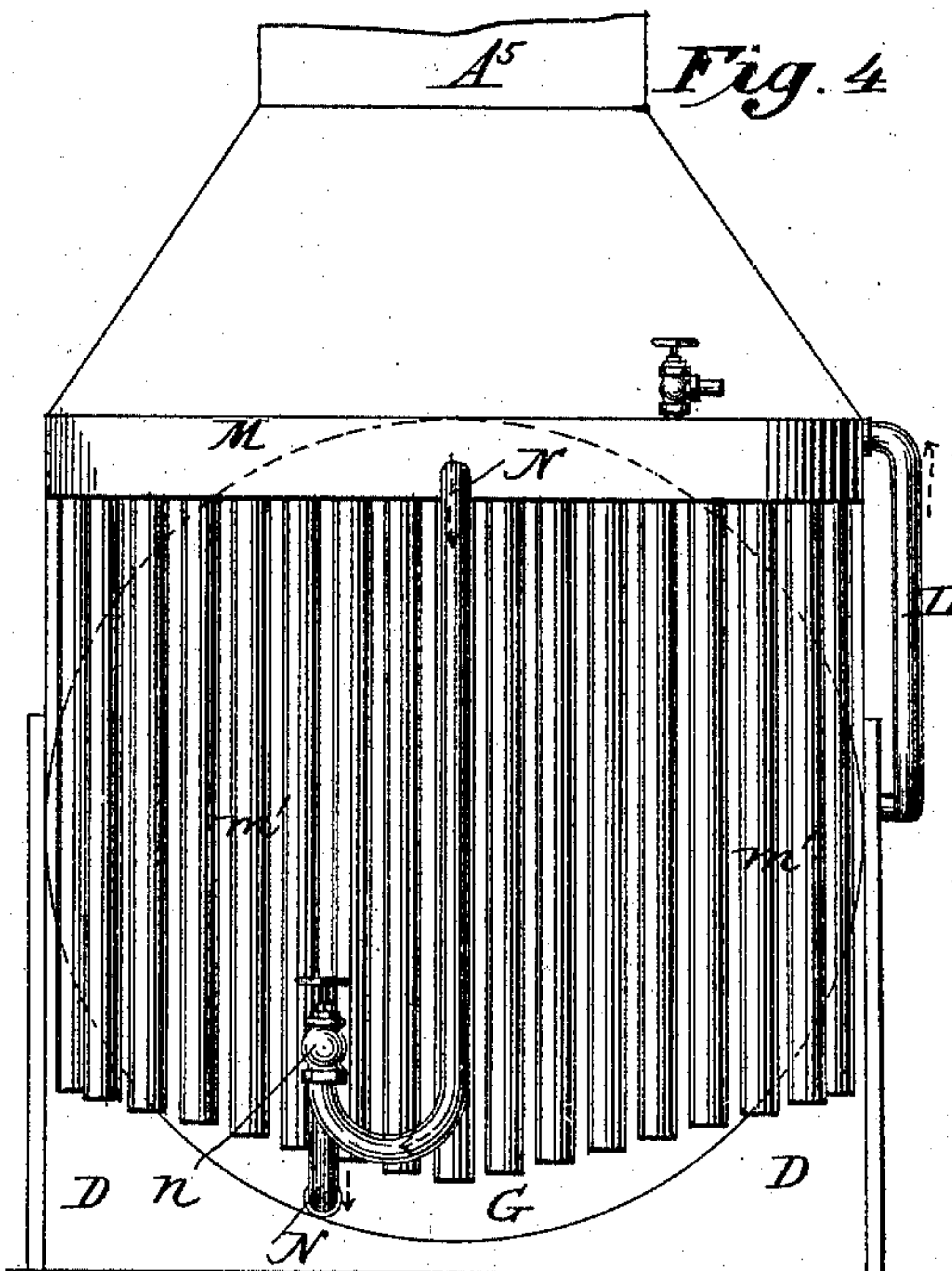
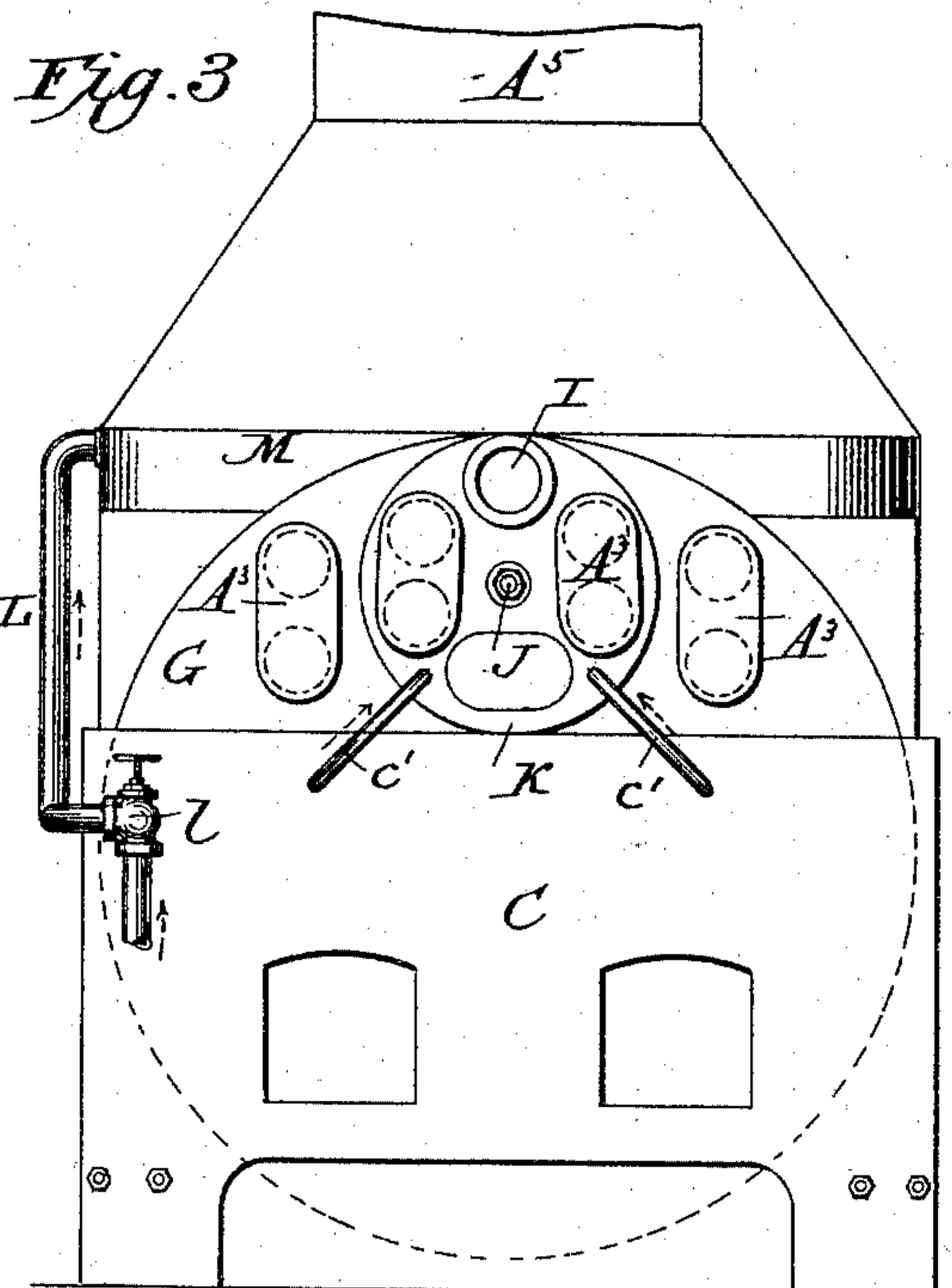
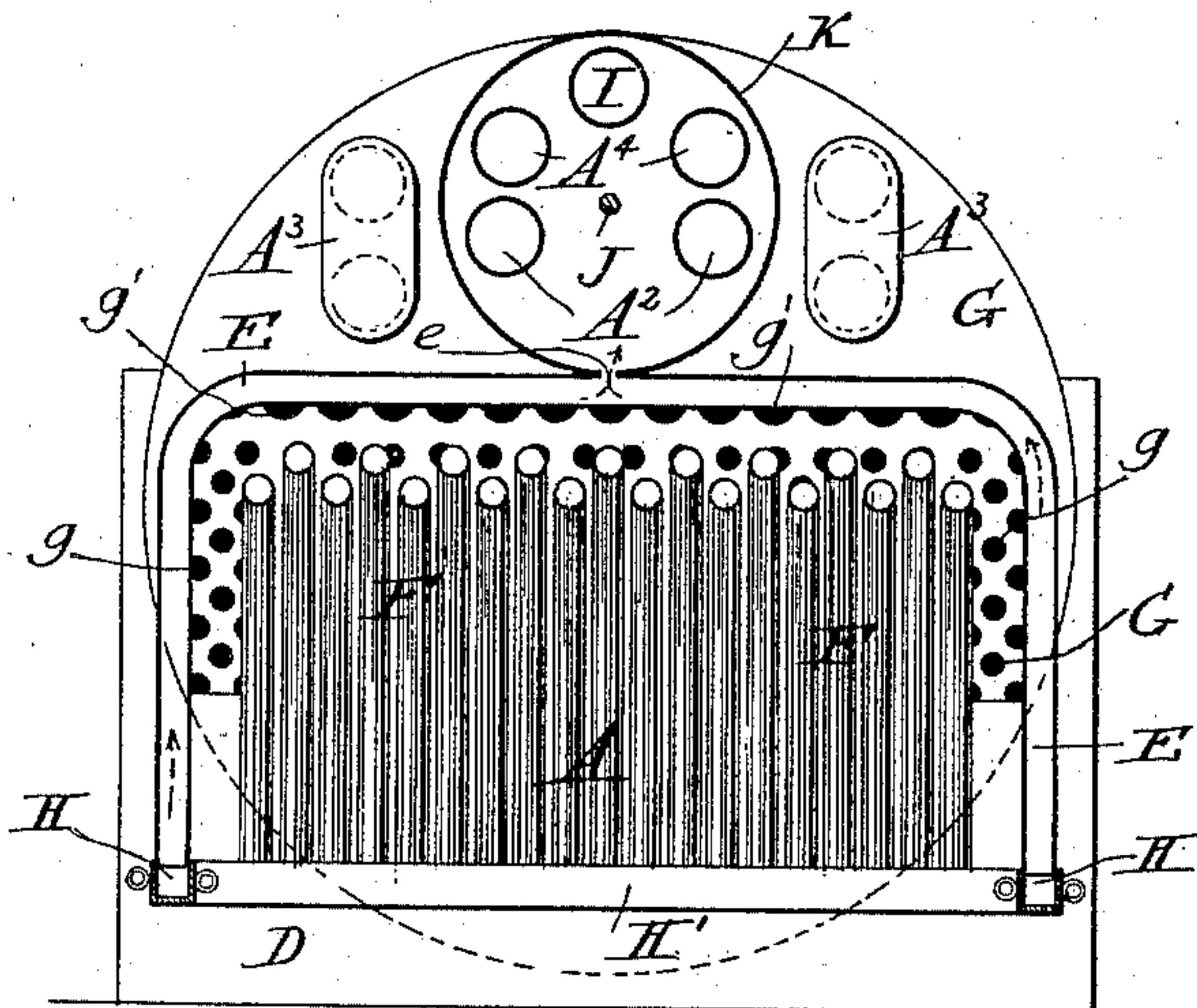


Fig. 5

ON LINE 5-5

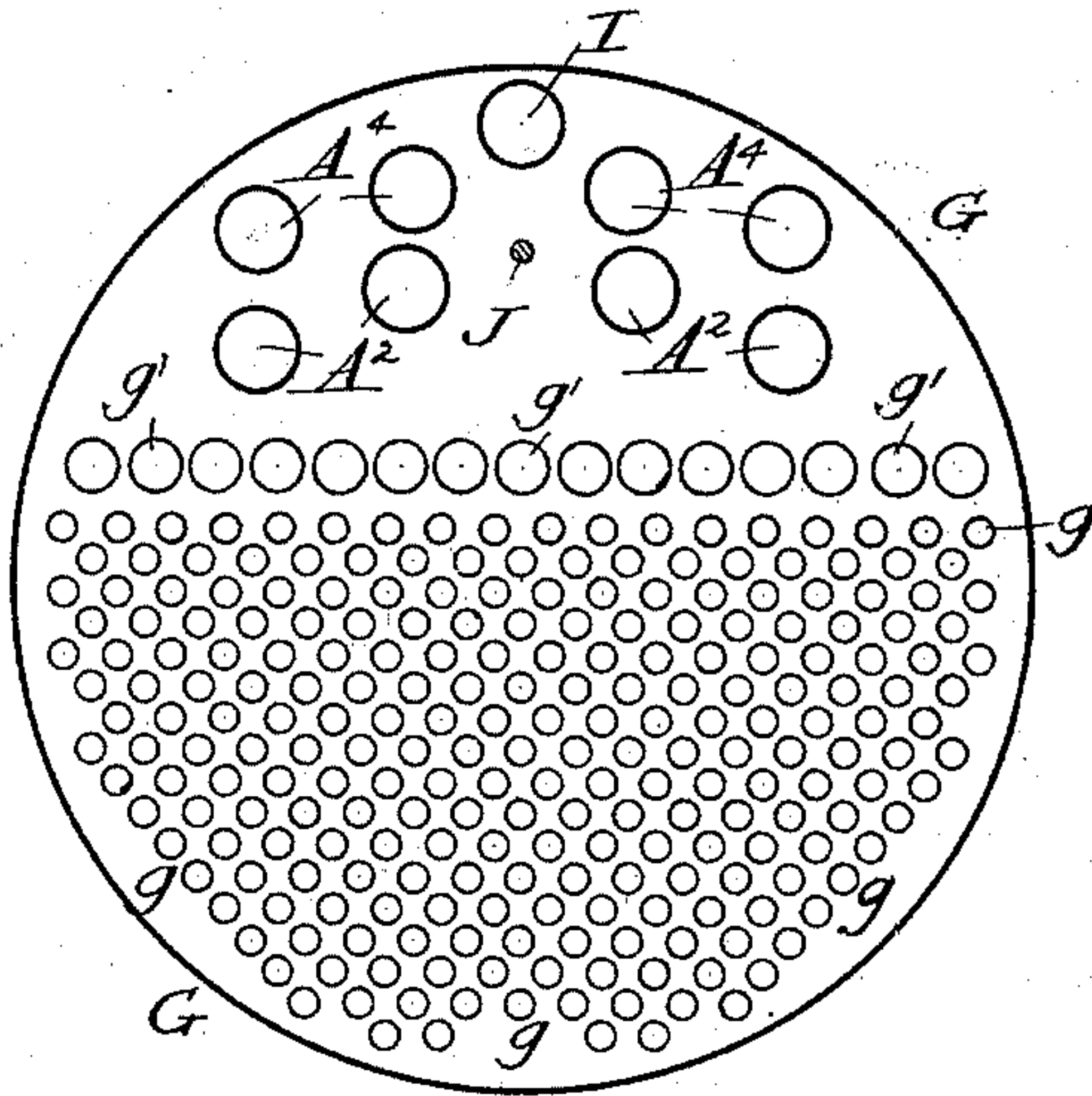


Witnesses

Sidney Hollingsworth
Balter De Long

Fig. 6

ON LINE 6-6



Inventor

JOHN BAIRD

by his attorneys

Baldwin Davidson & Wright

UNITED STATES PATENT OFFICE.

JOHN BAIRD, OF NEW YORK, N. Y.; JOHN S. BAIRD, ADDISON W. BAIRD, AND
JOHN E. PARSONS EXECUTORS OF SAID JOHN BAIRD, DECEASED.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 476,181, dated May 31, 1892.

Application filed May 4, 1891. Renewed May 7, 1892. Serial No. 432,138. (No model.)

To all whom it may concern:

Be it known that I, JOHN BAIRD, mechanical engineer, a citizen of the United States, residing at No. 324 Lexington avenue, in the city, county, and State of New York, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification.

My present invention more especially relates to steam-boilers of the locomotive type provided with upright arched tubes constituting or contained within the fire-box and substantially horizontal flues or tubes in the boiler-shell. Boilers of such a type are exemplified in United States Letters Patent granted to me as follows, viz: No. 402,127, dated April 30, 1889; No. 434,973, dated August 26, 1890, and No. 435,386, dated September 2, 1890; also in application, Serial No. 384,736, filed March 12, 1891, and Serial No. 388,656, filed April 13, 1891.

The object of my invention is to secure a compact and efficient boiler adapted to generate ample high-pressure steam in a comparatively small space, which end I attain by certain novel organizations of instrumentalities hereinafter specified.

The accompanying drawings show so much apparatus only as is necessary to illustrate the subject-matter claimed. Unless otherwise indicated the parts are of usual approved construction and ordinary operation. Short unfeathered darts indicate the direction in which the sections are shown, dotted arrows the course of the water-circulation, and solid arrows that of the products of combustion. The fire-box end of the boiler I term the "front" and the opposite the "back" or "rear" end. That side on the right of a person facing the fire-box I term the "right," the opposite side the "left."

Figure 1 is a plan with the smoke-stack and portions of the casing removed; Fig. 2, a vertical longitudinal central section on the line 2 2 of Fig. 1, looking to the left; Fig. 3, a front elevation; Fig. 4, a back elevation with a part of the casing removed. Fig. 5 is a vertical transverse section on the line 5 5 of Figs. 1 and 2, looking backward; and Fig. 6, a similar section on the correspondingly-numbered line.

A combustion-chamber or fire-box A, provided with grate-bars *a* and a bridge-wall B, lies between a front head C and a back head D, consisting of parallel plates with water-spaces between them. The sides and top of the fire-box consist of a series of transverse arched water-tubes E, placed close together side by side between the front and back head, their lower ends being united by longitudinal water-tubes H, connecting the front head with the lower shell G. A series of longitudinal water-tubes F are arranged centrally in the fire-box, their front ends being connected with the upper portion of the front head. These tubes extend backward through the upper portion of the fire-box to a point near its rear end, where they are bent downward and connected by a cross-pipe H' with the water-tubes H and by a series of small pipes *h'* with the back head or water-leg at the bottom of the tube-sheet of the lower shell G. This shell is constructed in the form of a flat-ended cylinder of comparatively large diameter in proportion to its length, about the lower two-thirds of which is filled with a large number of fire-tubes *g* of comparatively small diameter—say two and a half inches. The top row *g'* of these tubes, which comes just about the normal water-line of the boiler, is made of larger diameter—say five inches. The upper portion of the boiler-shell likewise contains still larger flues A² A⁴, connected by rear hoods *a'* and by front hoods A³. The diameter of the lower shell, it will be observed, is nearly as great as the width of the fire-box, and its entire steam-space or about one-third of its height extends above the level of the top of the fire-box.

An upper shell K of comparatively small diameter—say about one-third that of the main shell—extends forward from the upper front portion of that shell over the fire-box, and rests upon the front head with its bottom just about the normal water-line of the boiler. This shell contains return-flues A² and direct flues A⁴, connected by a front hood A³, and constituting continuations of the corresponding central flues of the main shell. The corresponding side flues of the main shell come outside of the upper shell, as shown in Fig. 3.

The front head is connected with the upper shell by a steam-pipe c' , and each of the arched fire-box tubes E is connected with the bottom of this shell by a short vertical pipe e . This upper shell, with the upper portion of the main shell, constitutes a steam-space, where the steam is dried and superheated. A perforated steam-exit pipe I extends longitudinally through the upper portion of both shells from a point near the back connection through the front head of the upper shell. The steam-pipe being thus so far above the water-line, the steam is thoroughly dried and superheated and the tendency to priming diminished. A bolt J , extending longitudinally through the heads of the shell, strengthens them against longitudinal strains.

The feed-water is shown as flowing through a pipe L on the left-hand side of the boiler provided with a suitable check-valve l and extending backward, preferably, inside the boiler-casing to a water-box M , extending across the rear end of the back connection about the level of the top of the boiler, and consequently some distance above its normal water-level. A series of pendent open-ended tubes m , arranged around this box in an annular or ovoid form, is connected with a similar box M' below it by means of larger tubes m' inclosing the others. The lower box M' is in turn connected with the bottom of the lower or main boiler-shell by a pipe N , provided with a check-valve n . These check-valves l n enable the flow of the feed-water to be regulated at either end of the boiler. The water-boxes, it will be seen, are of an ovoid or flattened ring shape, the side next the main shell being provided with a double row of tubes, while the front one has a single row only. The hot gases are thus enabled to pass both around and through the central opening in the water-boxes.

The products of combustion traverse two different paths from the combustion-chamber or fire-box. One portion goes through the lower fire-tubes g into the back connection A' , where it circulates around and among the pendent feed-water-circulating pipes and impinges against the lower water-box, around the sides of which and of the upper box it escapes through the chimney. Another portion passes through the large upper flues g' and back hoods a' and through the lower or return flues A^2 , both of the main and upper shells, to the front hoods A^3 , thence through the upper or direct flues A^4 of both shells to the back connection, where it impinges against the feed-water boxes, and thence passes up the chimney A^5 . The entire length of both shells is thus twice traversed by this portion of the hot gases, and the main shell is traversed by them three times, thus thoroughly drying and superheating the steam.

The top of the fire-box is shown as covered with brick-work B' , as well as its sides, and other necessary portions of the boiler are to

be jacketed or protected with asbestos or other heat-resisting material wherever required.

The boiler is of course to be supplied with the most approved appliances, including safety-valves, water, steam, and air passages, and valves for filling, emptying, or working the boiler, as well as the usual manholes and fire-doors.

Many of the details of my improved boiler are illustrated in the applications and patents above mentioned, and such details are accordingly of course not claimed herein.

Both the applications above mentioned show pendent tubes in the back connection, the organization, however, being different from that herein shown, and another application, Serial No. 391,735, filed May 6, 1891, shows horizontal feed-water heater-tubes also in the back connection, and I therefore limit my claims herein accordingly.

I claim herein as new and as of my own invention—

1. The combination, substantially as herebefore set forth, of a fire-box or combustion-chamber, a back connection, an interposed boiler-shell of large diameter extending above the fire-box, an upper shell extending over the fire-box, and a series of direct and return flues in both shells, through which hot gases pass to dry and superheat the steam.

2. The combination, substantially as herebefore set forth, of a front head, a back head, a fire-box or combustion-chamber, parallel upright transverse arched water-tubes inclosing its top and sides, a back connection, a main or lower shell of large diameter between the fire-box and back connection, pipes connecting the front head, back head, arched tubes, and main shell, an upper shell over the fire-box, and direct and return flues in the main shell and upper shell, through which a portion of the products of combustion pass.

3. The combination, substantially as herebefore set forth, of a front head, a back head, a fire-box or combustion-chamber, parallel upright transverse arched water-tubes inclosing its top and sides, a back connection, an interposed lower or main shell of a diameter equal to the width of the fire-box, but extending above it, an upper shell of smaller diameter overlying the fire-box in front of the main shell, steam-pipes connecting the front head and arched tubes with the upper shell, direct and return flues in both shells, and a steam-pipe extending from the back of the main shell forward through the upper shell to dry and superheat the steam.

In testimony whereof I have hereunto subscribed my name.

JOHN BAIRD.

Witnesses:

A. J. BAIRD,
ADDISON W. BAIRD.