

(No Model.)

J. J. HOGAN.
STEAM BOILER.

No. 578,747.

Patented Mar. 16, 1897.

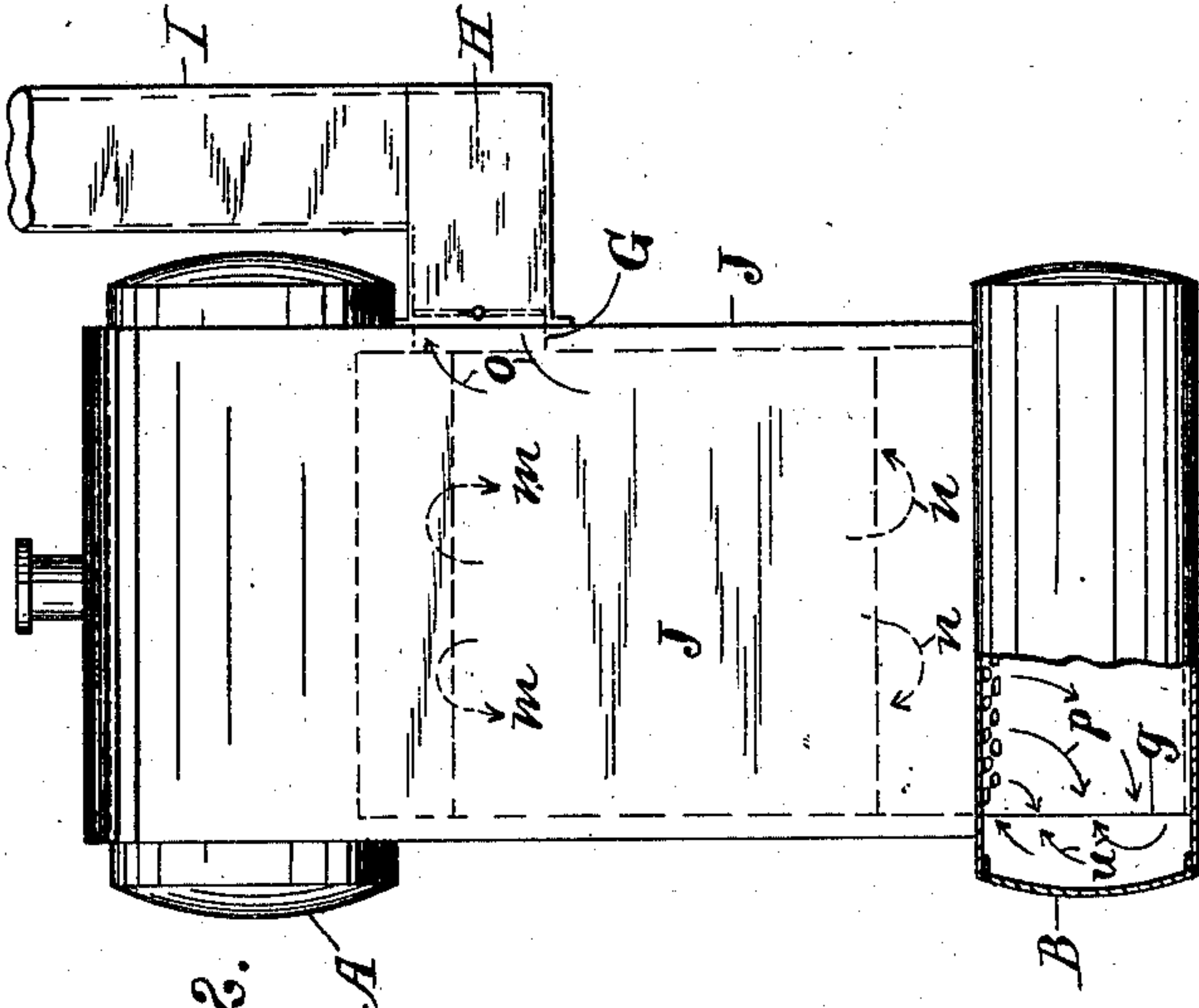


Fig. 2.

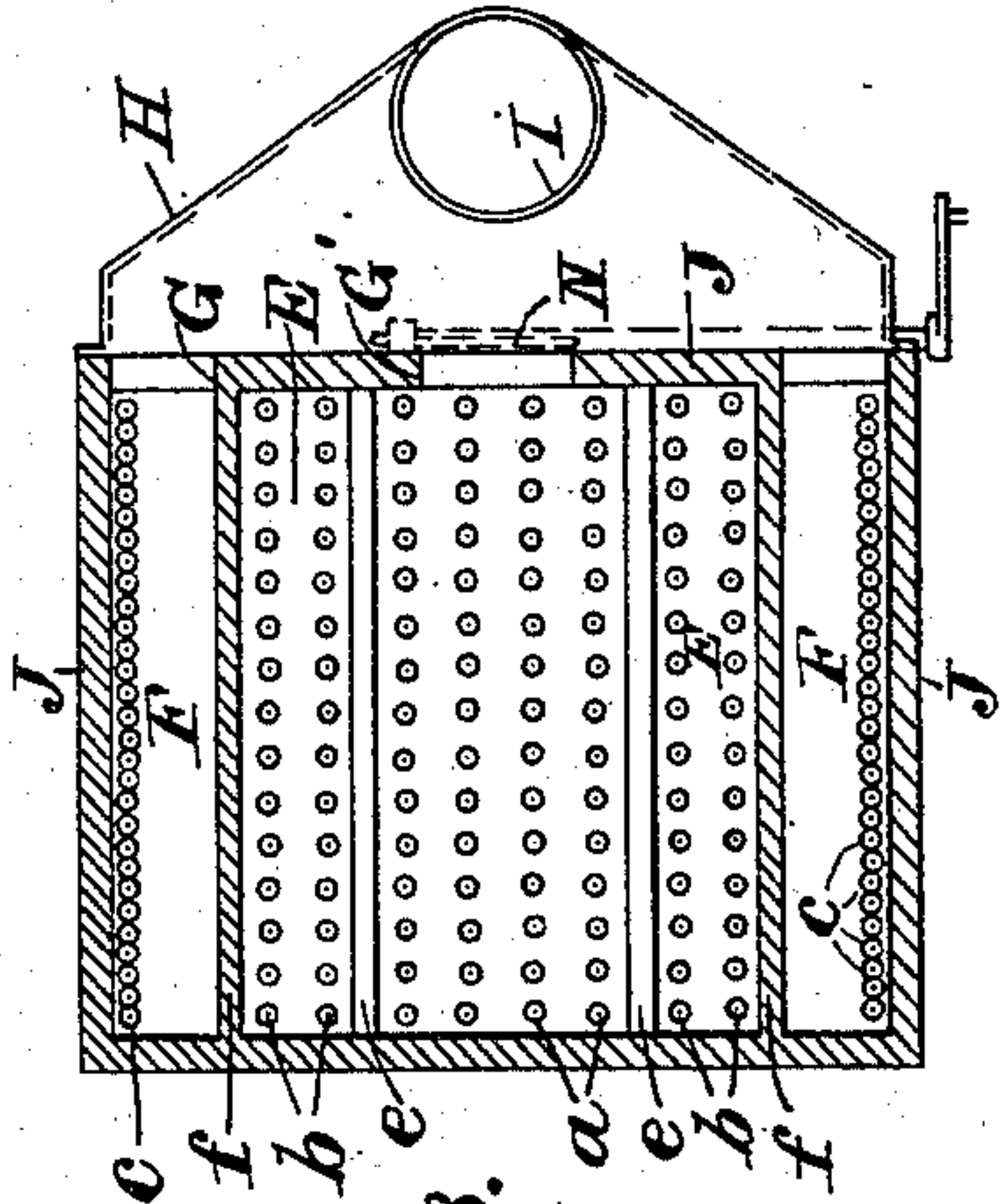


Fig. 3.

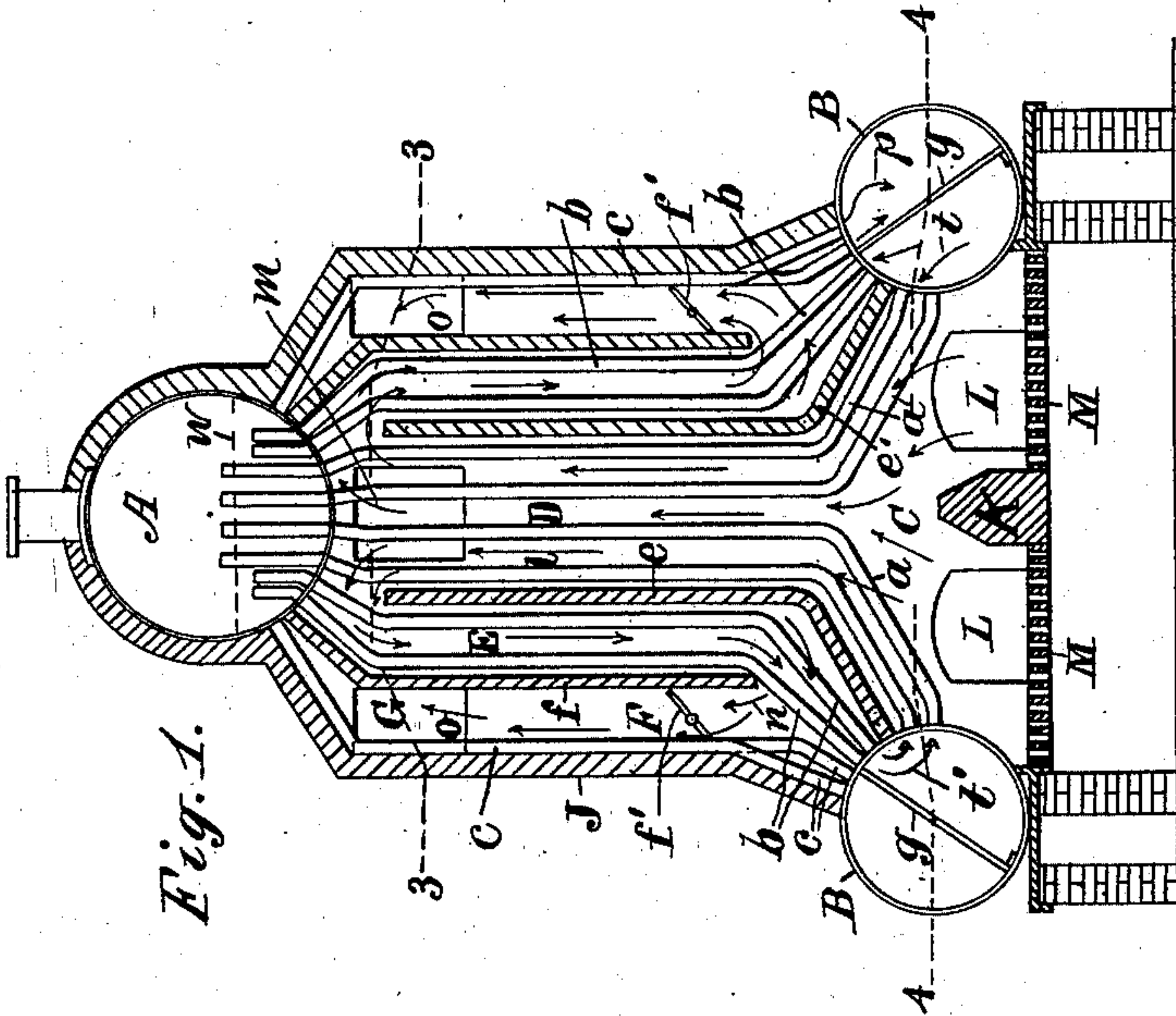


Fig. 1.

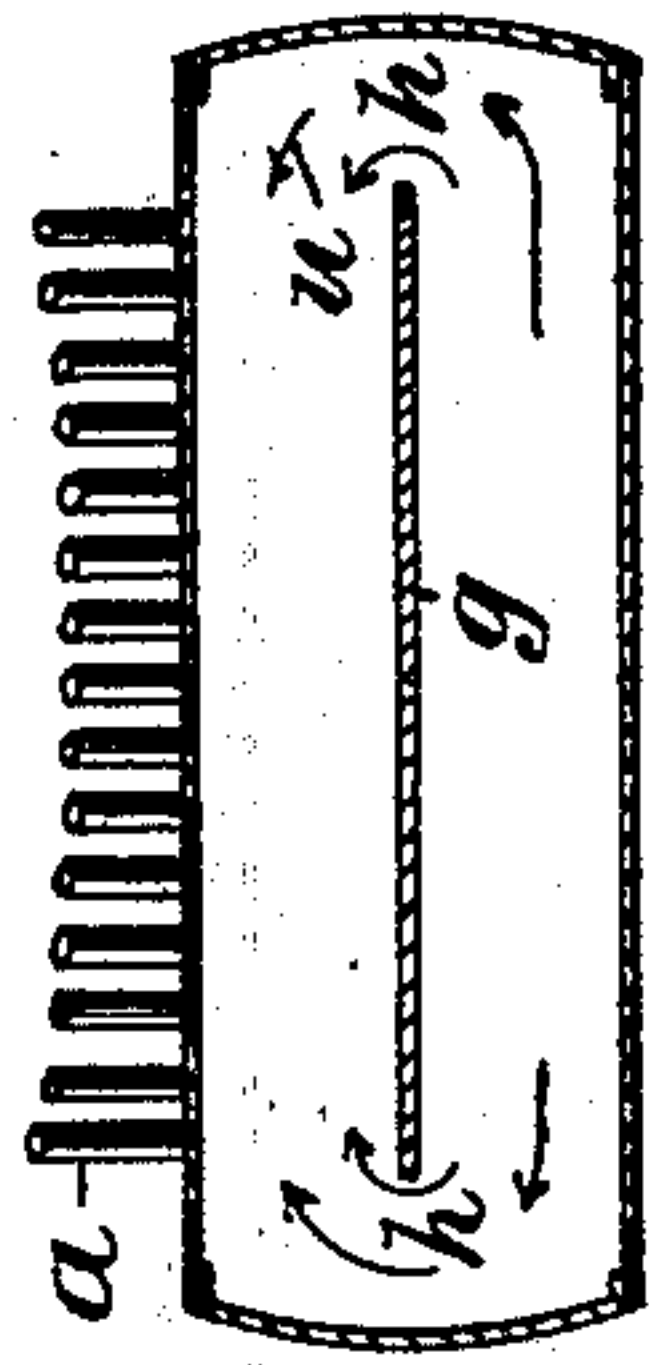


Fig. 4.

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UNITED STATES PATENT OFFICE.

JOHN J. HOGAN, OF MIDDLETOWN, NEW YORK.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 578,747, dated March 16, 1897.

Application filed January 16, 1896. Serial No. 575,744. (No model.)

To all whom it may concern:

Be it known that I, JOHN J. HOGAN, a citizen of the United States, residing at Middletown, Orange county, New York, have invented certain new and useful Improvements in Steam-Boilers, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to that class of boilers in which a horizontal steam-drum in the upper part of the boiler is connected by water-tubes with a distributing-drum adjacent to the fire-grate; and the invention consists partly in means for improving the distribution of the heat and its absorption by the tubes and partly in means for preserving a proper movement of the water within the distributing-drum.

The invention will be understood by reference to the annexed drawings, in which—

Figure 1 is an end elevation with the nearer wall of the boiler-casing removed. Fig. 2 is a side elevation of the boiler with the smoke-pipe attached and the supports beneath the distributing-drum omitted. Fig. 3 is a plan of the boiler with the casing and water-tubes in section upon line 3 3 in Fig. 1, and Fig. 4 is a horizontal section of one of the distributing-drums on line 4 4 in Fig. 1.

A designates the steam-drum, and B the distributing-drums, of which two are shown at opposite sides of the grate M and furnace C. Each distributing-drum is connected with the steam-drum by three groups of tubes *a*, *b*, *c*, which are extended from separate longitudinal portions of the distributing-drum to separate longitudinal portions of the steam-drum. The casing J incloses the boiler adjacent to the outer groups of tubes, and the tubes of the inner group are projected inwardly from the distributing-drum, over the grate, and upwardly to the bottom of the steam-drum and conduct the ascending current between such drums through the furnace and fire-box, as they are exposed to the greatest heat of the fire.

Partitions *e* and *f* are extended upward and downward, respectively, from the distributing and steam drums longitudinally of the boiler between the groups of tubes *a*, *b*, and *c*, forming a descending flue E and an as-

cending flue F. An opening G extends from the upper end of the ascending flue to the chimney I.

The tubes *c* are preferably arranged, as shown in Figs. 1 and 3, to form a close wall of water-tubes next the casing to prevent wasteful radiation of heat. The tubes *a* are sloped inwardly and upwardly from the drums B to the bottom of the fire-box D, and a wall K, of refractory material, like fire-brick, is arranged in the furnace to absorb the heat of the fuel and is formed upon its upper side with inclined surfaces adapted to radiate heat directly to the lower parts of the tubes *a*. Fire-doors L are shown in Fig. 1 for introducing fuel to the furnace at opposite sides of the wall K, and the same is thus heated by the beds of fuel at its adjacent sides and operates powerfully to convey such heat in the most effective manner to the ascending water-tubes.

The tubes *a* are obviously exposed to the greatest heat of the fire. The tubes *c* are exposed to the gases only after their heat has been chiefly abstracted, while the tubes *b*, which pass through the intermediate flues E, are at an intermediate temperature. The tubes *a* thus provide effectively for the ascending current of fluid and the tubes *c* for the descending current, while the tubes *b* are adapted to conduct the fluid either upward or downward, according to the conditions which prevail at any given time.

The water-tubes most remote from the fire are commonly used to convey to the distributing-drum the descending current of fluid, from which drum the water is supplied to the ascending current which rises within the hotter tubes.

Heretofore a guard or partition has been extended a part of the way downward within the top of the descending drum, between the inlets from such groups of tubes, and in some cases the descending water-tubes have been projected downward within the distributing-drum; but where the distributing-drum is exposed to the direct heat of the fire the ebullition is liable to drive the water upward within the tubes which are provided for downward currents, and the proper circulation within the tubes is thus impeded.

In the present invention I am enabled to

utilize the direct heat of the fire upon the distributing-drum and to maintain the desired movement of the water-currents by extending a complete partition *g* longitudinally within the distributing-drum nearly to its opposite ends and introducing the descending current of fluid upon the rear or colder side of such partition. By this construction the water upon the front side only of the partition receives the heat of the fire, and the outlets of the descending currents are protected from the rising current of fluid, which is diverted by the partition wholly into the tubes provided for the ascending current, as indicated by the arrows *t* in Fig. 1.

The spaces *h* shown in Fig. 4 at the ends of the partition *g* afford a free communication from the rear to the front side of the same.

The operation of the construction is as follows: The heat of the fuel is absorbed partly by the wall *K* and radiated to the tubes *a*, while the heated gases which rise through the furnace, as indicated by arrows *l* in Fig. 1, enter the upper ends of the flues *E*, as indicated by the arrows *m* in Figs. 1 and 2, and pass from the bottom of the same into the flues *F*, as indicated by arrows *n*, escaping finally to the chimney *I* by the flue-openings *G*, as indicated by the arrows *o* in the same figures. The water and steam rise in the tubes *a* and are separated in the drum *A*, where the water-line *w* is indicated. Such separated water descends constantly through the tubes *c*, entering the drums *B* upon the outer side of the partition *g*, as indicated by the arrows *p* in Figs. 1 and 2, the shell of the drum being broken away at one end to expose the partition and inlets from the tubes *c*.

The water received upon the rear side of the partition passes freely through the passages *h* at the ends of the partition, as shown by the arrows *u* in Figs. 2 and 4, and thus replaces that which enters the ascending tubes, the lower ends of which are indicated in Fig. 4. When the fire is sufficiently hot to generate steam in the tubes *b* within the intermediate flue *E*, the current passes upwardly in such tubes, but when the heat generates steam in the tubes *a* only the tubes *b* carry a descending current like the tubes *c*, which enters the tubes *a*, as shown by arrows *t* in Fig. 1. The tubes *a* are extended upward above the water-line of the boiler to discharge their steam without obstruction, but the tubes *b* are extended upward a part only of the way to the water-line, that they may carry a downward current when required. The above is the normal action when the fire is in operation, but a direct draft to the chimney may be secured when kindling the fire by a passage *G'*, leading from the fire-chamber *D* into the breeching *H*, with a damper *N*, Figs. 1 and 2, to open the same when required.

The furnace is shown with two grates and fuel-doors *L* and one radiating-wall *K*, located between the same; but it is obvious that in boilers of large proportions a greater num-

ber of fuel-doors may be used, with radiating-walls between the adjacent doors.

The invention may obviously be practiced with a single distributing-drum arranged at one side of the grate, with the steam-drum over the grate, by arranging the boiler-casing to form one side of the fire-box and furnace. Three longitudinal groups of tubes *a*, *b*, and *c* would be employed in such case, the same as are described herein, and the partitions *e* and *f* would furnish the double return-flues, which would be connected with the chimney by outlet *G* from the top of the ascending flue, as shown herein. A damper *f'* may be inserted in the ascending flue *F*, as shown in Fig. 1, or in the smoke-outlet *G* to check the draft when desired, and thus retain the products of combustion for a longer time in contact with the tubes.

The partition *g* extended from the top to the bottom of the distributing-drum, with passages *h* at one or both ends, is adapted to perform the function described herein in any type of boiler where ascending and descending tubes are arranged in longitudinal groups and connected with longitudinal portions of the distributing-drum, so that the partition can be inserted between their inlets. It thus serves to separate the ascending and descending currents within the distributing-drum and secures a much more rapid and perfect circulation of the fluid.

Having thus set forth the nature of my invention, what I claim herein is—

1. In a boiler, the combination, with a steam-drum sustained above the fire-grate, with distributing-drum at the side of the grate, of groups of water-tubes forming ascending and descending channels for the water, and connected with separate longitudinal portions of the distributing-drum, and a partition extended from side to side of the distributing-drum between the mouths of the ascending and descending tubes, and arranged with passages *h* between the ends of the partition and the heads of the drum, the whole arranged and operated as and for the purpose set forth.

2. In a boiler, the combination, with a steam-drum sustained above the fire-grate, with distributing-drum at the side of the grate, of three groups of water-tubes extended from separate longitudinal portions of the distributing-drum to separate longitudinal portions of the steam-drum, substantially as set forth, a casing inclosing the boiler adjacent to the outer groups of tubes, the partitions *e* and *f* extended upward and downward longitudinally of the boiler between the groups of tubes to produce descending and ascending smoke-flues, a fire-box over the grate, and the outer flue having the chimney-opening *G* at the top, as and for the purpose set forth.

3. In a boiler, the combination, with a steam-drum sustained above the fire-grate, with distributing-drum at the side of the grate, of three groups of water-tubes connect-

ing the steam and distributing drums and arranged substantially as set forth, a casing inclosing the boiler adjacent to the outer groups of tubes, and the partitions *f* and *e* extended
5 respectively downward and upward from the steam and distributing drums between the groups of tubes and producing descending and ascending smoke-flues, a fire-box over the grate, the breeching *H* with flue-openings *G*
10 and *G'* connecting the ascending flue and the fire-box respectively with the breeching, and the dampers *N* and *f'* applied to such openings, the whole arranged and operated substantially as herein set forth.

15 4. In a boiler, the combination, with a steam-drum sustained above the fire-grate, with distributing-drums at the opposite sides of the grate, of three longitudinal groups of water-tubes connecting each of the distribut-
20 ing-drums with the steam-drum, and arranged substantially as set forth, a casing inclosing

the boiler adjacent to the outer groups of tubes, the partitions *e* and *f* extended respectively upward and downward from the steam and distributing drums between the groups
25 of tubes, and producing descending and ascending smoke-flues, a fire-box over the grate, a breeching *H* with flue-opening *G'* to such fire-box, and flue-openings *G* from the tops of the ascending flues to the said breeching, with
30 dampers *N* and *f'* for connecting the fire-box and the ascending flue respectively with the breeching, the whole arranged and operated substantially as herein set forth.

In testimony whereof I have hereunto set
35 my hand in the presence of two subscribing witnesses.

JOHN J. HOGAN.

Witnesses:

L. LEE,

EDW. F. KINSEY.