

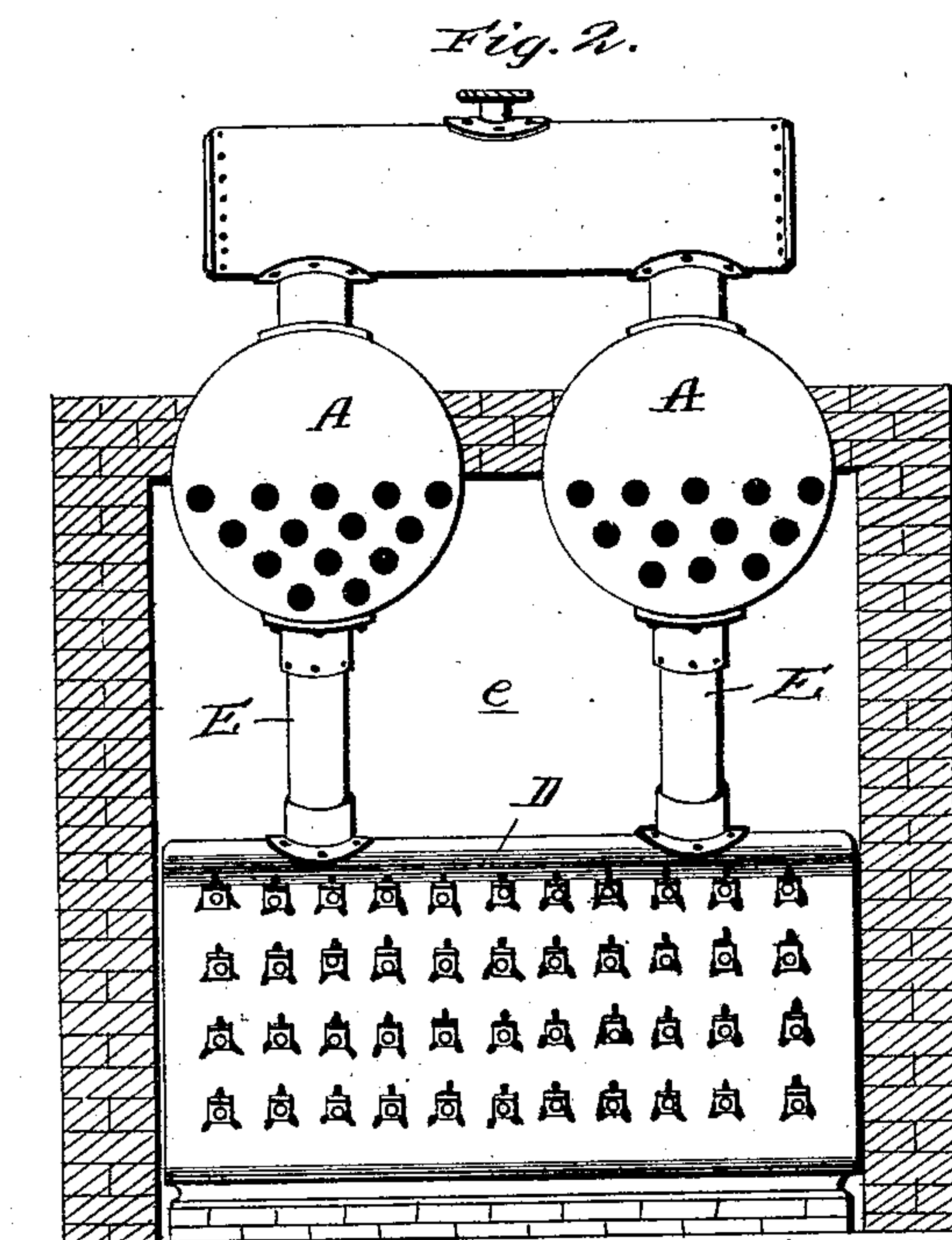
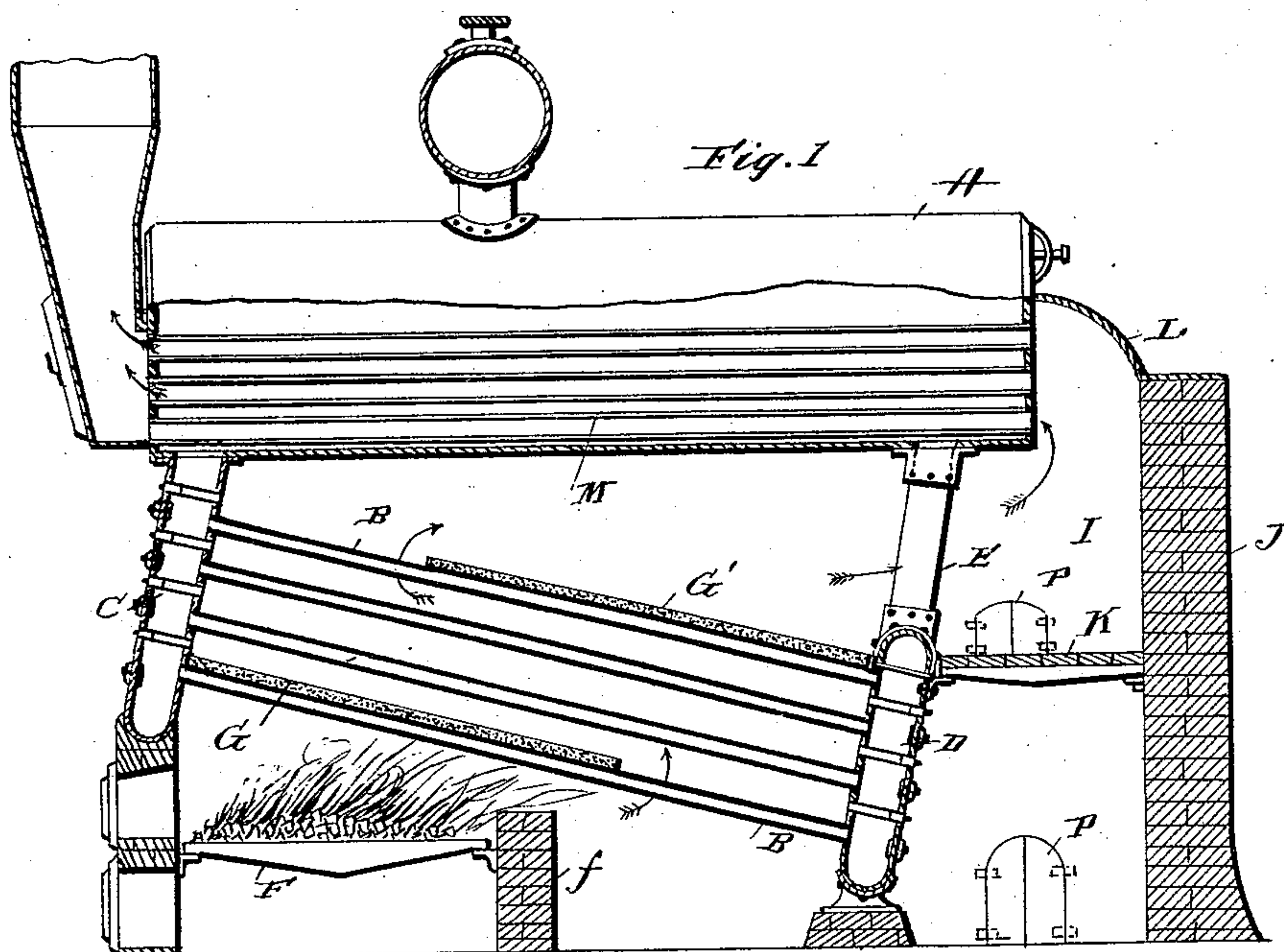
(No Model.)

2 Sheets—Sheet 1.

W. W. SUTCLIFFE.
STEAM BOILER.

No. 455,805.

Patented July 14. 1891.



Witnesses:

C. H. Gaeder

Thomas C. Turpin

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By Attorney

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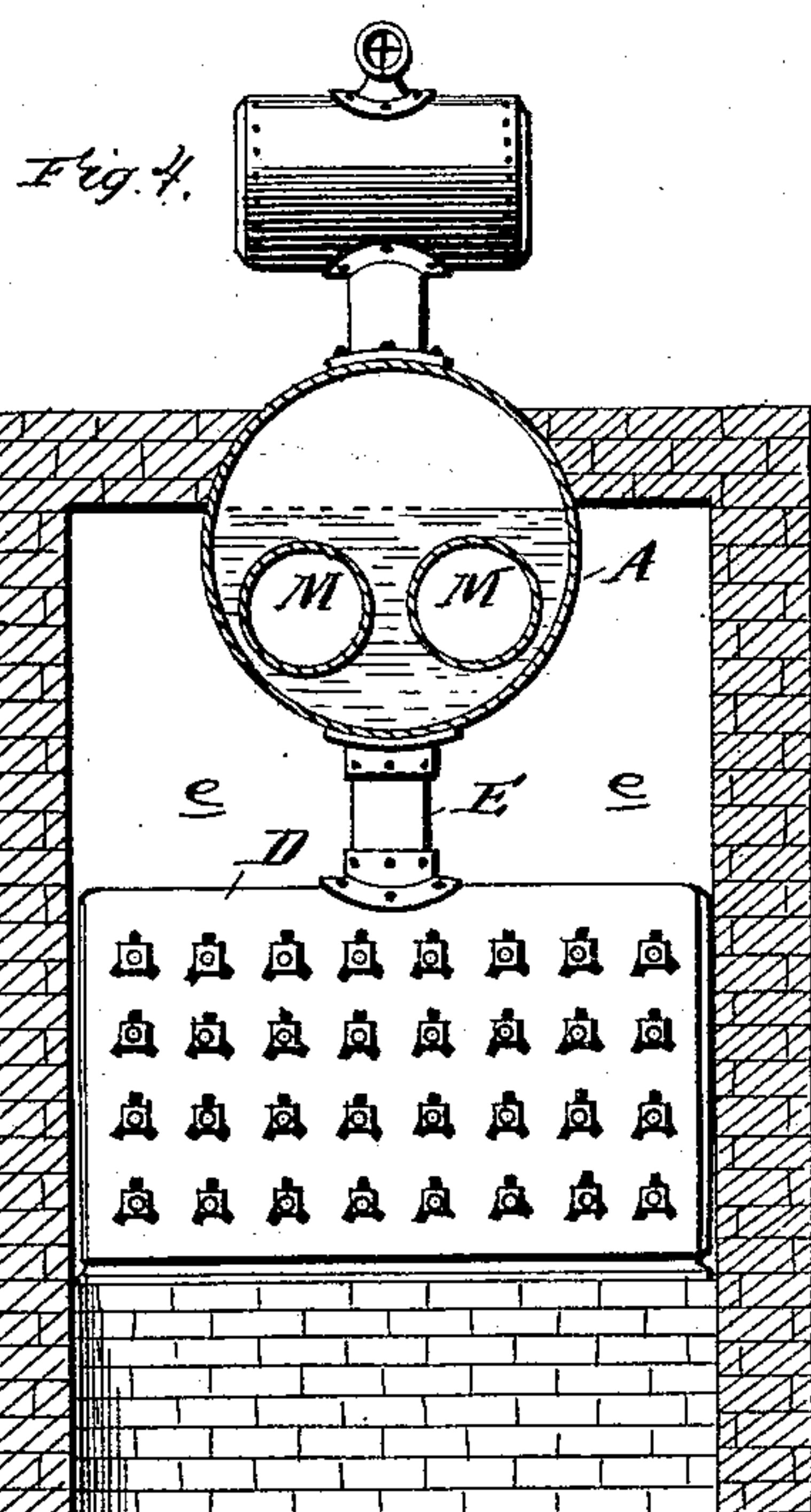
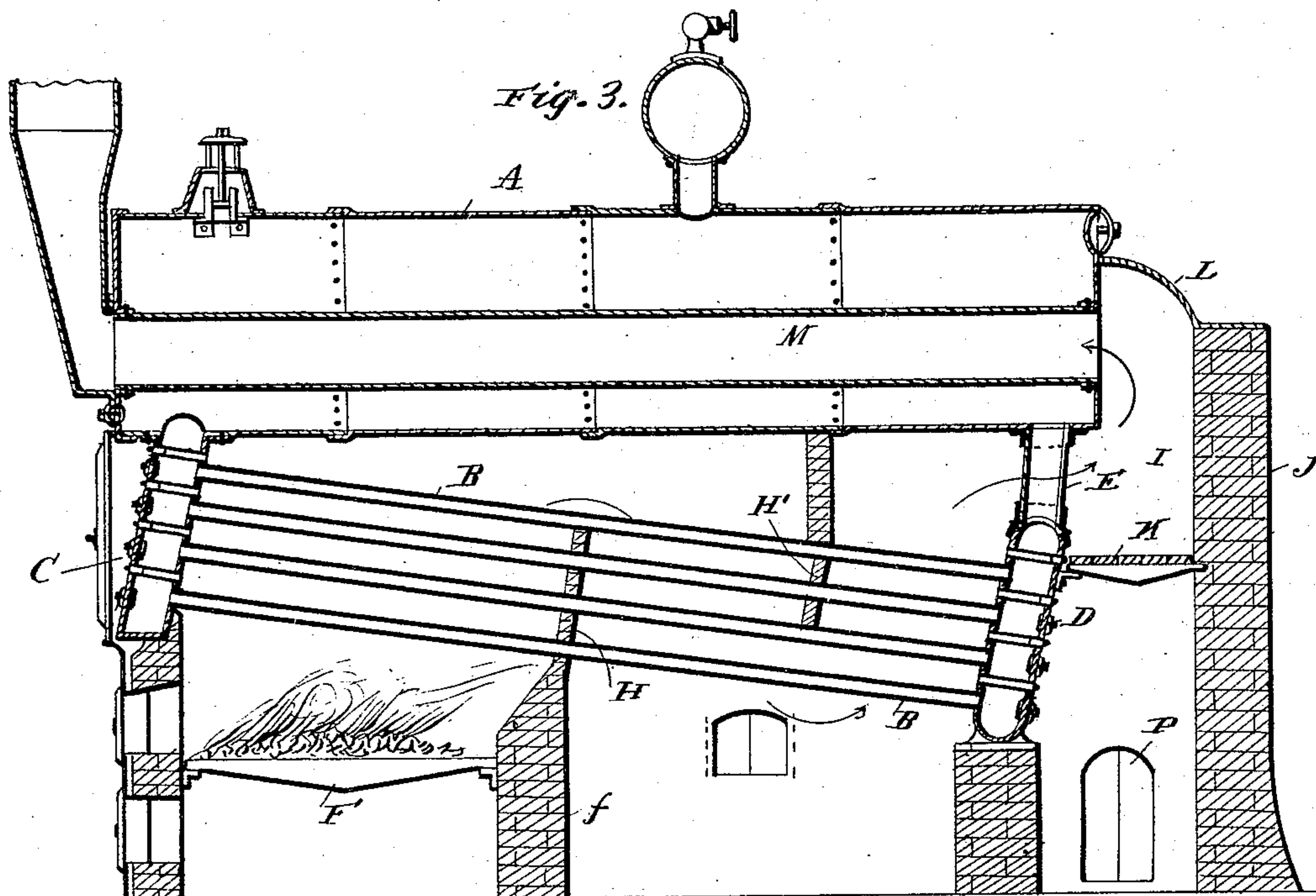
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Witnesses:
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UNITED STATES PATENT OFFICE.

WILLIAM WILSON SUTCLIFFE, OF NEW ORLEANS, LOUISIANA.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 455,805, dated July 14, 1891.

Application filed September 19, 1890. Serial No. 365,473. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM WILSON SUTCLIFFE, a citizen of the United States, residing at New Orleans, in the State of Louisiana, have invented certain new and useful Improvements in 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.

My present invention relates to boilers for generating steam, and the primary object I have in view is to utilize the heat resulting from combustion to greater advantage than has heretofore been accomplished.

A further object is to so construct the boiler that steam will be rapidly generated; and a further object is to protect by a body of water the parts which are exposed to the direct action of the heat, to provide for equal expansion of the exposed parts, and insure greater increased longevity to these parts as well as greater safety in the use of the boiler, as a high-pressure steam-generator.

With these and other ends in view my invention consists in the combination and construction of parts, as will be hereinafter fully described, and specifically pointed out in the claims.

To enable others to understand my invention, I have illustrated the same in the accompanying drawings, in which—

Figure 1 is an elevation, partly in section, of a steam-boiler embodying my present improvements. Fig. 2 is an elevation of the boiler, taken from the rear thereof. Fig. 3 is a side elevation, with parts in section, of a modified form of the steam-generator, showing a single horizontal boiler. Fig. 4 is a rear elevation of the same.

Like letters of reference denote corresponding parts in all the figures of the drawings.

In carrying my invention into practice I employ two horizontal fire-tube boilers A A, as shown in Figs. 1 and 2, inclusive, or a single fire-tube boiler A, (shown in Figs. 3 and 4 of the drawings,) my improvements being equally capable of use in connection with a single or double horizontal boiler, in which the fire-tubes open or extend through the heads of the boilers.

Below the horizontal tubular boiler or boiler

I employ the inclined water-circulation tubes B B, which are arranged in gangs or series one above the other. The ends of these water-tubes are connected directly to the headers, manifolds, or water-legs C D, as is usual, and the front header C receives the forward end of the horizontal boiler or boilers, and is in communication therewith in the usual manner.

Between the rear header D of the water-tubes and each horizontal boiler A, where more than one is employed, is a vertical or pendent tubular water-leg E, which connects said rear header with its boiler, and which pendent leg is of a size corresponding to the combined area of the water-tubes to insure free circulation of the water through the same. The pendent water-leg E communicates centrally with the boiler, so as to provide the passages *e e* on opposite sides of the leg and between the latter and the side walls of the furnace for the escape of the smoke and products of combustion, and when two boilers A A and the independent water-legs E E are employed between said boilers and the rear header the said water-legs are separated a suitable distance from each other and thus provide a smoke-space *e* between the same, as shown. As is usual, the water-tubes are subjected to the direct action of the heat, smoke, &c., from the fire on the grate F of ordinary form, and in the preferred embodiment of my invention I secure rearward, upward, and forward, and return of the smoke and gases by means of the two partitions G G'. These two partitions are arranged in vertically-inclined positions parallel with the water-tubes, the one G being situated immediately above the grate and terminating in rear of and above the bridge-wall *f* of said grate, while the other partition G' is above the water-tubes with its rear end in contact or close juxtaposition to the rear header and with its forward end considerably in advance of the rear end of the lower partition. To insure deterioration of the partitions from the direct contact of the heat, &c., I preferably make the same of asbestos or a magnesia mixture.

By the described arrangement of the partitions I am enabled to secure a circuitous course for the smoke, &c., between the water-

tubes, as natural draft from the chimney or stack causes the heat and smoke to first pass rearward beneath the lower partition, then upward and forward between the two partitions and in contact with the water-tubes, and thence rearward over the upper partition; but I do not strictly confine myself to this exact arrangement and use of the two horizontal partitions, as I may adapt the arrangement of bridge-walls shown in Fig. 4 or any other arrangement of parts which secures the circuitous course or circulation of heat and smoke around and through the water-tubes.

In Fig. 3 of the drawings I employ two vertical walls H H', the one arranged in advance of the other. The front wall H extends upward from the bridge-wall *f* of the grate nearly to the top of the water-tubes, and the rear wall H' extends from the lower side of the elevated boiler or boilers nearly to the bottom of the water-tubes, whereby the smoke and heat are caused to pass upward and over the front wall H, then downward and underneath the rear partition, and upward again between the rear header and the rear wall H' to the outlet-spaces *e*.

To provide a maximum heating-surface and utilize to greater advantage all the heat in the escaping products of combustion and at the same time quicken the generation of steam, I deem it important to pass the products of combustion in rear of the water-tubes, the rear header, and the upper horizontal boiler, and to provide for this passage of the hot products of combustion I provide a flue-chamber I in rear of the boiler and water-tubes, and which receives the smoke, &c., from the spaces around said water-tubes and delivers the same into the fire-tubes of the horizontal boiler. This flue-chamber I is secured by erecting a vertical wall J in rear of the rear header and the boiler, and providing the horizontal transverse floor or partition K and the return-flue plate L. This transverse partition K extends between the rear header and the wall J, and it is on a plane substantially flush with the upper side of the rear header, and the return-flue plate L extends over the space between the top of the wall J and the boiler or boilers A. After the smoke and other highly-heated products of combustion leave the spaces between the water-tubes and the flues provided by the partitions or walls hereinbefore described, the same passes through the spaces *e* in contact with the pendent legs E, and then enters the return-flue chamber I, which conducts the same upward and delivers them into the boiler or boilers A A at the rear thereof, said boiler or boilers having the breeching or smoke-flue M, leading from the front thereof to the chimney or stack, as is usual.

In operation water is fed to the boilers by any approved appliances (not shown) and thence to the water-tubes, and the fire is started in the combustion-chamber. The natural draft of the stack or chimney inducts

the current of flame, smoke, and products of combustion to circulate around about and through the spaces of the water-tubes, and the flames, &c., pursue the circuitous course described until they pass through the spaces *e* between the pendent water-legs and the sides of the furnace, after which they enter the back-flue connection I, when the hot currents are returned and delivered into the flues of the upper cylindrical boiler or boilers A A.

It is evident that many slight changes in the form, proportion, and arrangement of parts and in the minor details of construction of the devices herein shown and described as an embodiment of my invention may be made, and I therefore hold myself at liberty to make such modifications as fairly fall within the scope and spirit of my invention. I also provide cleaning-out doors P P in the return or back flue connection, the one above the transverse partition and the other below said partition, as is obvious.

I am aware of Patent No. 291,959, in which drums are used instead of water-legs, and therefore do not claim such construction, as when drums are used it is impossible to take out a tube or insert one, which is so desirable.

I have found by experience that a tube cannot be removed or inserted through the man-hole, as set forth in the patent referred to.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a steam-generator, the combination of a flue-boiler A, the inclined water-tubes B, the vertical rear wall J, the overhanging flue-plate L between the vertical rear wall J and the boiler, and the transverse horizontal partition K in front of the wall J and below the flue-plate, the front and rear connections, whereby communication is made with boiler A and tubes B, substantially as described.

2. In a steam-generator, the combination of the flue-boiler A, the rear header or water-leg D, the front header C, the water-tubes B, communicating with said header, the water-leg intermediate of the rear header and the boiler and arranged to form the smoke-passages *e*, the vertical wall in rear of the header, the transverse partition K between said vertical wall and the header, and the flue-plate L between the vertical wall and the boiler, for the purpose described, substantially as set forth.

3. In a steam-generator, the combination of the flue-boilers, the water-tubes, the rear header with which the water-tubes communicate, the front header C, the independent water-legs E between the rear header and the flue-boilers and separated to form the smoke-spaces *e*, the return-flue connection I, situated in rear of the boilers, and the water-tubes to return the smoke and gases received from the spaces about the water-tubes into the flues of the boilers, substantially as described.

4. In a steam-generator, the boiler A, com-

posed of tubes or flues arranged as shown, in combination with the water-tubes B, front header C, back header D, adapted for the removal and replacement of a tube or tubes, 5 the intermediate connecting-legs E, and return back-connection chamber e, adapted for the return and utilization of the products of combustion from the spaces about the water-tubes into and through the boiler tubes or

flues into the uptake or breeching-flue, substantially as specified.

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

WILLIAM WILSON SUTCLIFFE.

Witnesses:

JAS. M. WALSH,

JNO. S. McDONALD.