

(No Model.)

W. ENNIS.

Boiler and other Furnaces.

No. 234,972.

Patented Nov. 30, 1880.

Fig 1.

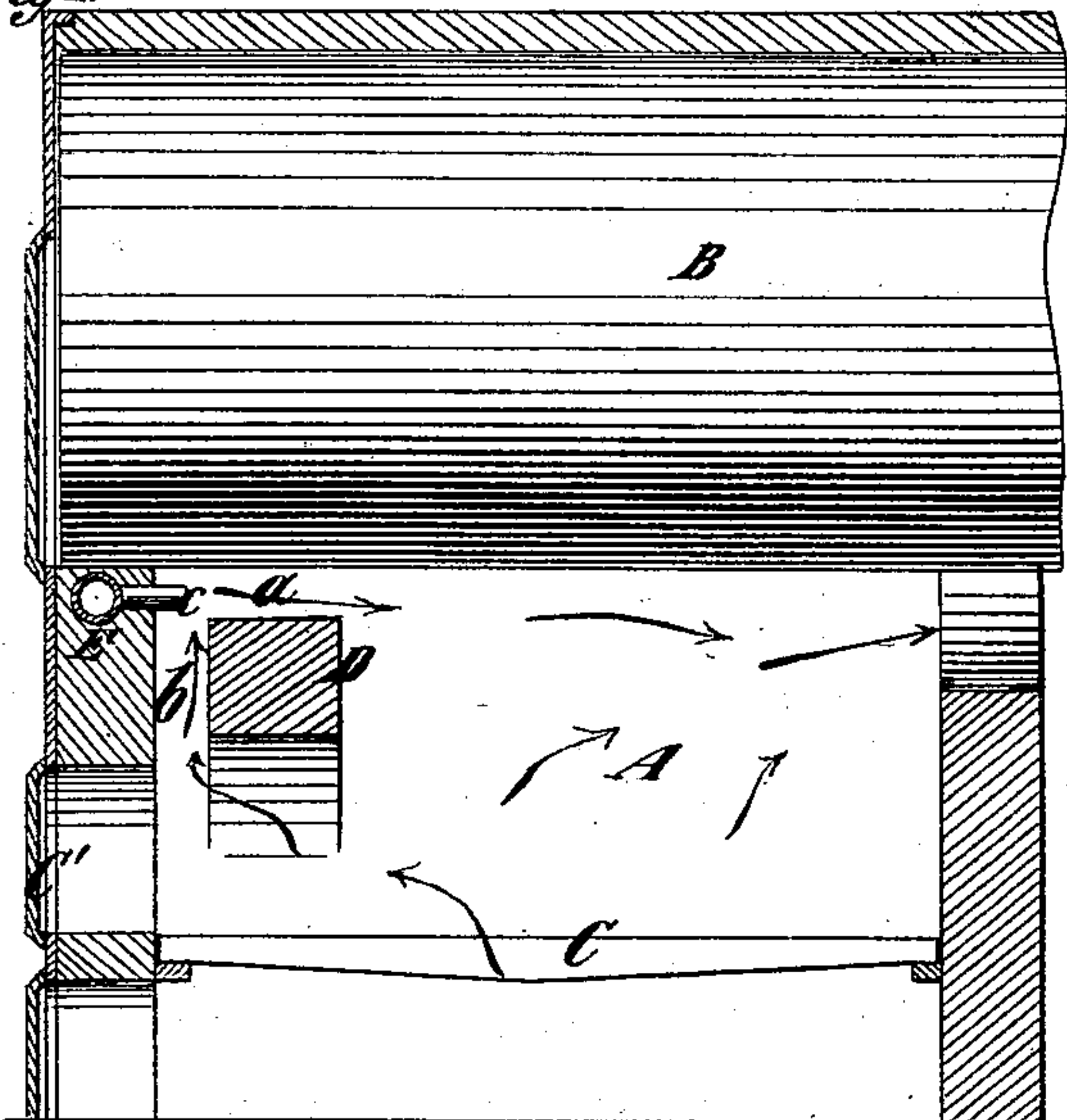


Fig 2.

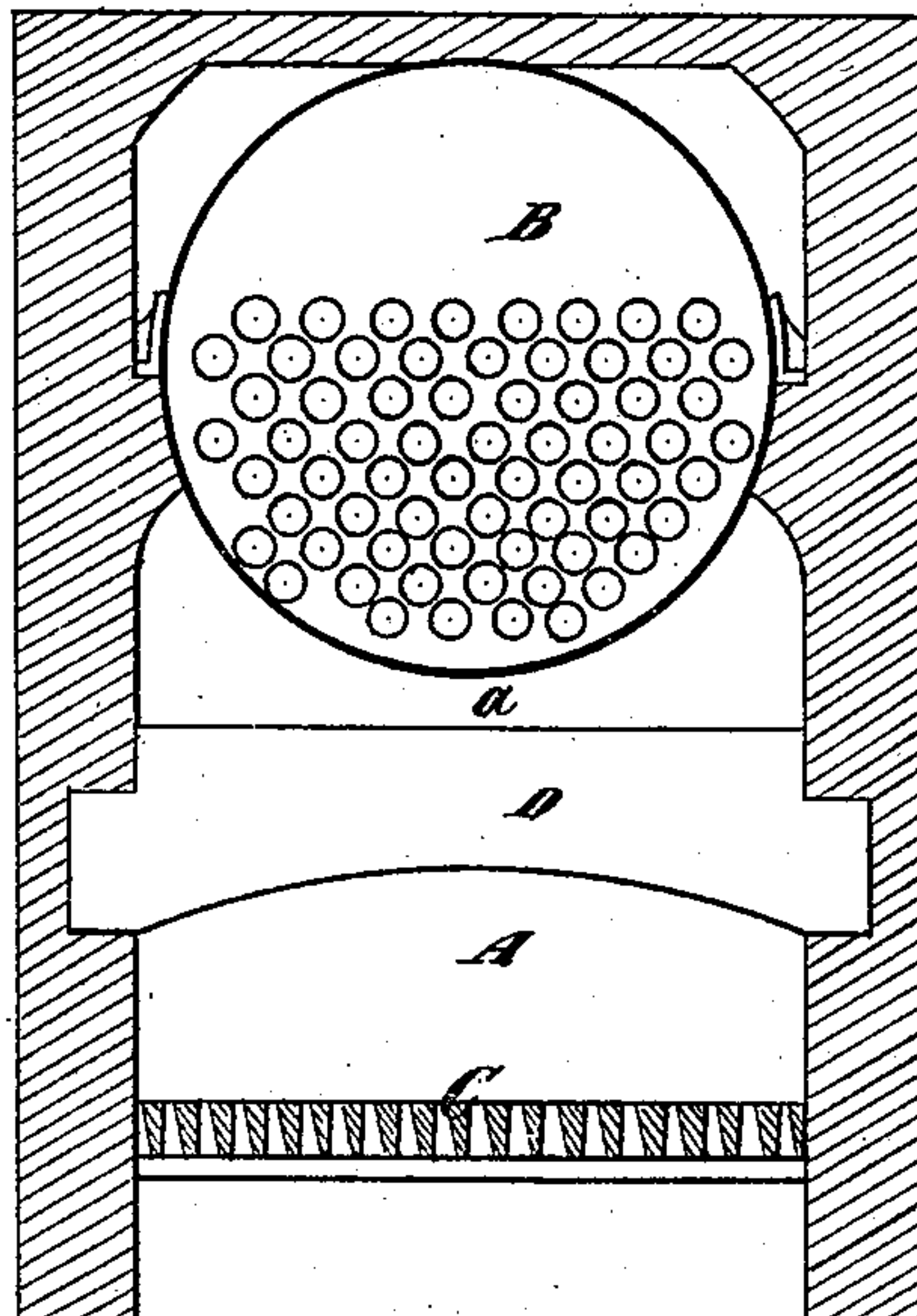


Fig 3.

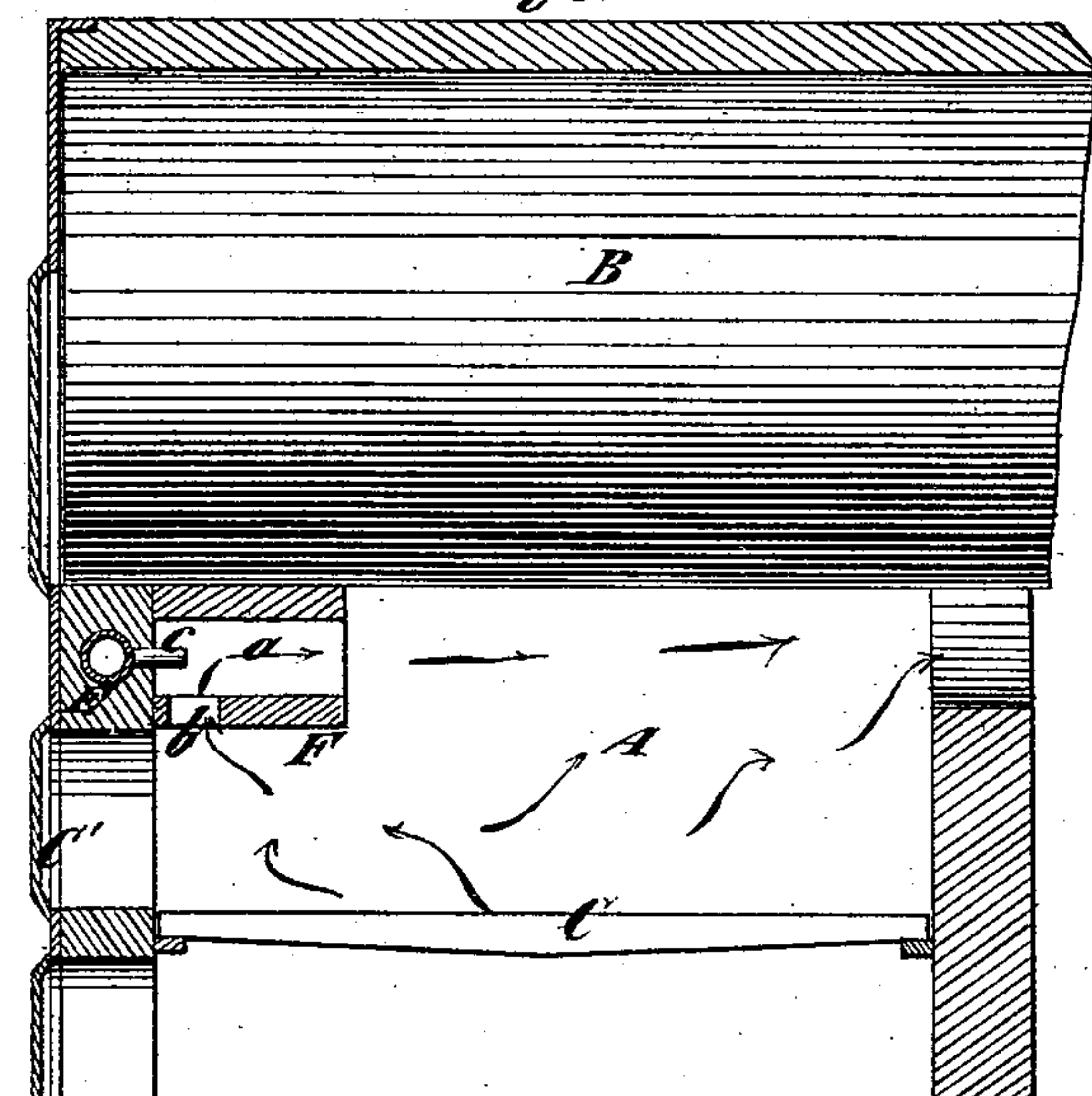


Fig 4.

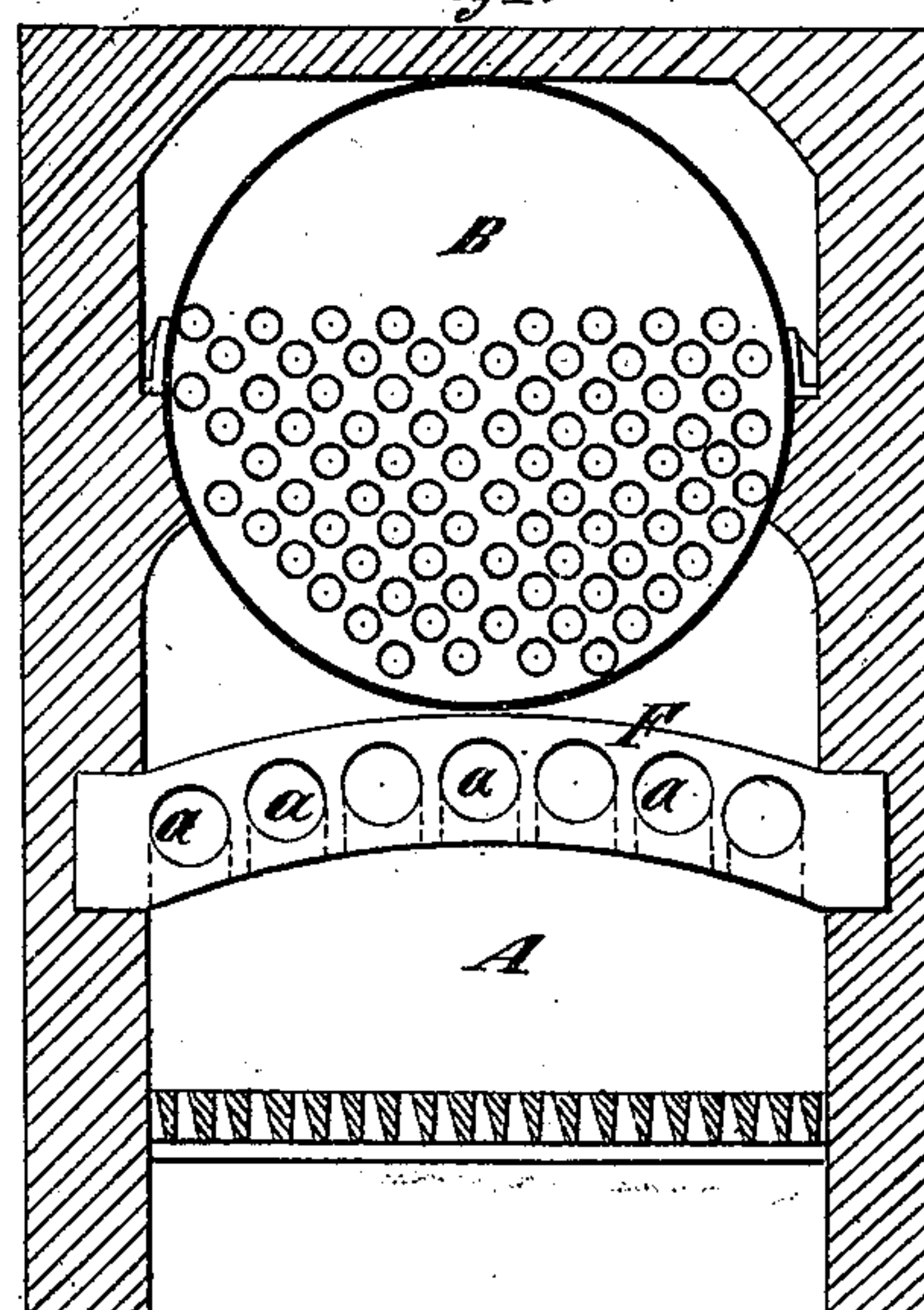


Fig 5.

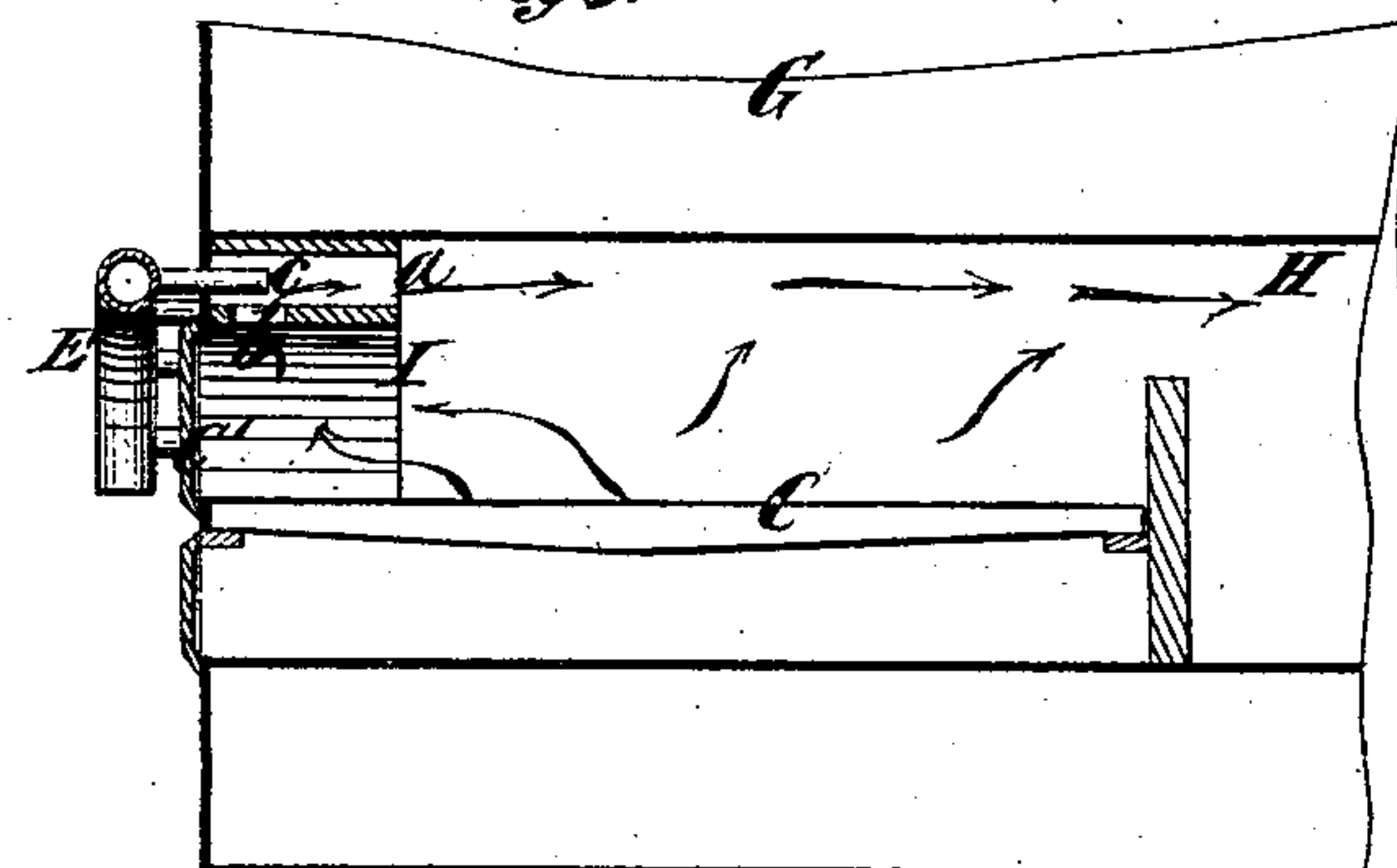
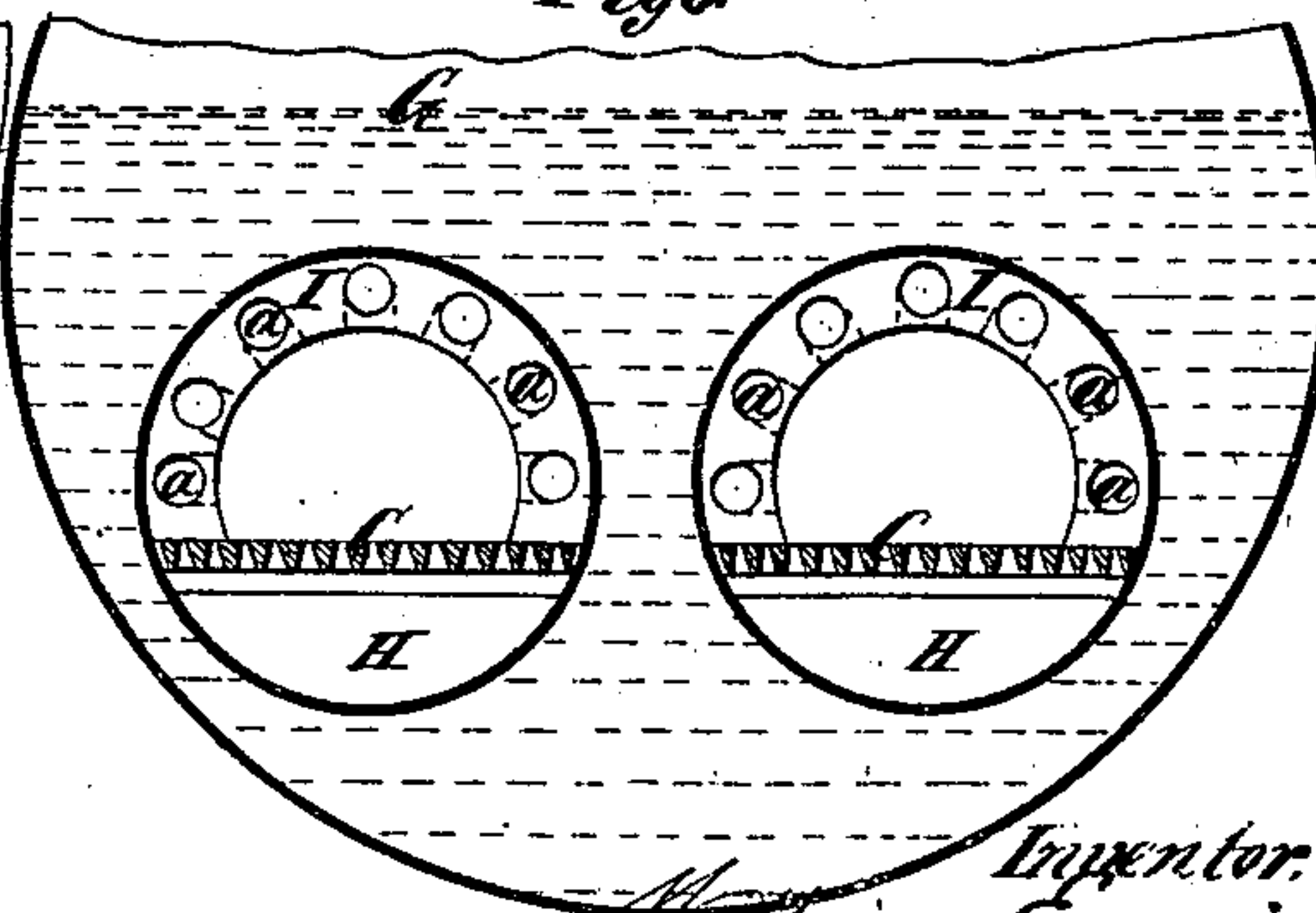


Fig 6.



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UNITED STATES PATENT OFFICE.

WILLIAM ENNIS, OF BROOKLYN, ASSIGNOR TO HIMSELF AND WRIGHT
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BOILER AND OTHER FURNACES.

SPECIFICATION forming part of Letters Patent No. 234,972, dated November 30, 1880.

Application filed May 6, 1880. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM ENNIS, of the city of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Boiler and other Furnaces, of which the following is a specification.

The object of my invention is to provide for the more intimate and thorough commingling within the fire-chamber of a furnace of the gaseous products of combustion and the air introduced through the grate or otherwise, and thereby to effect a more perfect combustion of the gases; and to this end the invention consists in a furnace constructed with a system of passages and means of injecting air or steam thereinto, whereby portions of the gases and the air, instead of being allowed to circulate directly toward the outlet in the rear of the furnace, are caused to be drawn directly upward in the front part thereof, and thence along the upper part thereof, where they meet the air and gases which are ascending from the fuel farther back in the furnace, the effect being to retain the air and gases longer in the furnace and effect their mixture where they are exposed to the radiant heat of the incandescent fuel on the fire-bed, and where consequently they will more readily combine to produce combustion.

The several passages may be variously produced. I may employ a solid arch or bar arranged transversely near the front end of the furnace and under side of the boiler, or a hollow arch containing all the passages; and the invention may be applied to the furnaces of stationary, marine, or locomotive boilers.

In the accompanying drawings, Figure 1 represents a longitudinal section through a boiler-furnace embodying my invention and a side view of a portion of the boiler. Fig. 2 represents a transverse section of the furnace and boiler. Fig. 3 represents a similar view to Fig. 1 of a furnace in which the arch or bar is hollow and contains the several passages. Fig. 4 represents a transverse section of the furnace and boiler shown in Fig. 3. Fig. 5 represents a flue-boiler having the furnaces in the flues, and Fig. 6 represents a transverse

section of the boiler and furnace shown in Fig. 5.

Similar letters of reference designate corresponding parts in all the figures.

Referring first to Figs. 1 and 2, A designates the furnace, and B a boiler of the return tubular type. C designates the grate, and C' designates the fire-door for the introduction of fuel. These several parts may be constructed in any suitable manner, as my invention does not depend in any way upon their construction.

Immediately under the boiler, and in the front of the furnace, I construct a passage or passages, *a*, which extend in an approximately horizontal direction rearward from said front toward the rear of the furnace. Communicating with the aforesaid horizontal passage or passages, near the front end thereof, is an upward passage or passages, *b*. Both these passages may be formed in any desirable or convenient manner.

In the present example of my invention I employ a solid arch, bridge, or cross-bar, D, which is arranged transversely of the furnace, and near the under surface of the boiler and the front wall of the furnace, leaving a sufficient space between the said arch or cross-bar and the boiler and front of the furnace to constitute single passages *a* and *b*.

E designates a pipe provided with a series of jet-pipes, *c*, through which jets of steam or air, preferably under pressure, may be discharged toward the rear of the furnace. As here shown, the pipe E is built into the front wall of the furnace; but where the boiler is furnished with a water-front, or for any other reason, the said pipe may be placed across the furnace outside the front thereof.

The jets of steam or air issuing through the horizontal passage *a* create a partial vacuum in the passage *b* and draw upward through said passage a continuous current of the unconsumed gases and any air passing upward through the grate or entering the furnace in any other way, effecting the perfect mingling of the steam or air and gases, and exposing them to the radiated heat of the fire as they pass rearward against the under side of the boiler. This construction has the effect of re-

5 taining the gases, steam, and air within the furnace for a greater length of time than they otherwise would be, and raises them to a temperature at which they are entirely, or almost
entirely, consumed, thereby effecting an important economy of fuel.

10 The air and gases, instead of all passing rearward over the bridge-wall, are divided and a portion thereof drawn through the passages *b* and *a*, and caused to pass across the currents of air and gas ascending from the incandescent fuel, thereby more effectually combining the gases and air.

15 It is obvious that as the arch or cross-bar soon becomes heated to a very high temperature the air and gases are raised in temperature by contact therewith in passing through the passages *a* and *b*.

20 The furnace shown in Figs. 3 and 4 differs from that just described only in that the arch or cross-bar *F* is hollow and has formed in it the passages *a* and *b*, as clearly illustrated.

25 Referring now to Figs. 5 and 6, *G* designates a boiler constructed with two flues, *H*, in which the grates *C* are placed. The arch *I* in this example of my invention is semicircular in form and fits within the mouth of the flue above the grate. The said arch *I* is hollow and constructed with the passages *a* and *b* formed
30 therein, as shown in Figs. 3 and 4, and the steam-pipe *E* is placed outside the flue in front

of the boiler. The pipe *E*, which communicates with a steam-boiler, or with a reservoir or other source from which air may be obtained, should be furnished with a suitable valve for
35 regulating the supply of air, and by graduating the force of the steam or air jets or currents the proper amount of draft may be produced.

What I claim as my invention, and desire 40 to secure by Letters Patent, is—

1. A furnace having constructed in its upper front part, above the door or opening for fuel, a bridge or partition, forming in said upper
45 front part communicating upward and rearward passages, and provided with a pipe or pipes for injecting air or steam into said rearward passage or passages, and thereby producing a draft upward from the forward portion of the furnace, and thence backward
50 directly along the upper part thereof, substantially as specified.

2. The combination, with the furnace, of the arch or cross-bar *D*, passages *a b*, and the pipe
55 *E*, provided with jet-apertures, all arranged and operating substantially as and for the purpose specified.

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