

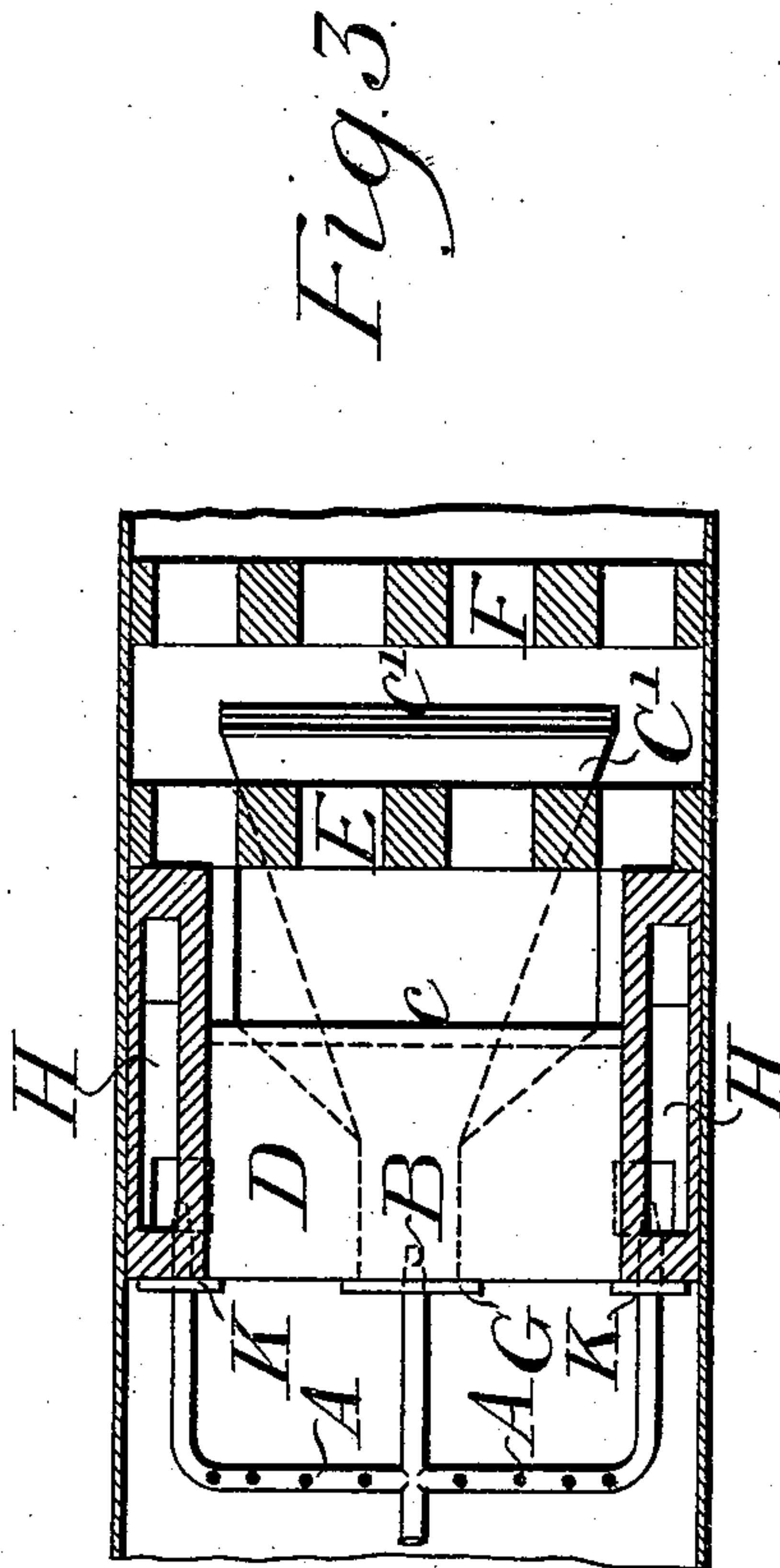
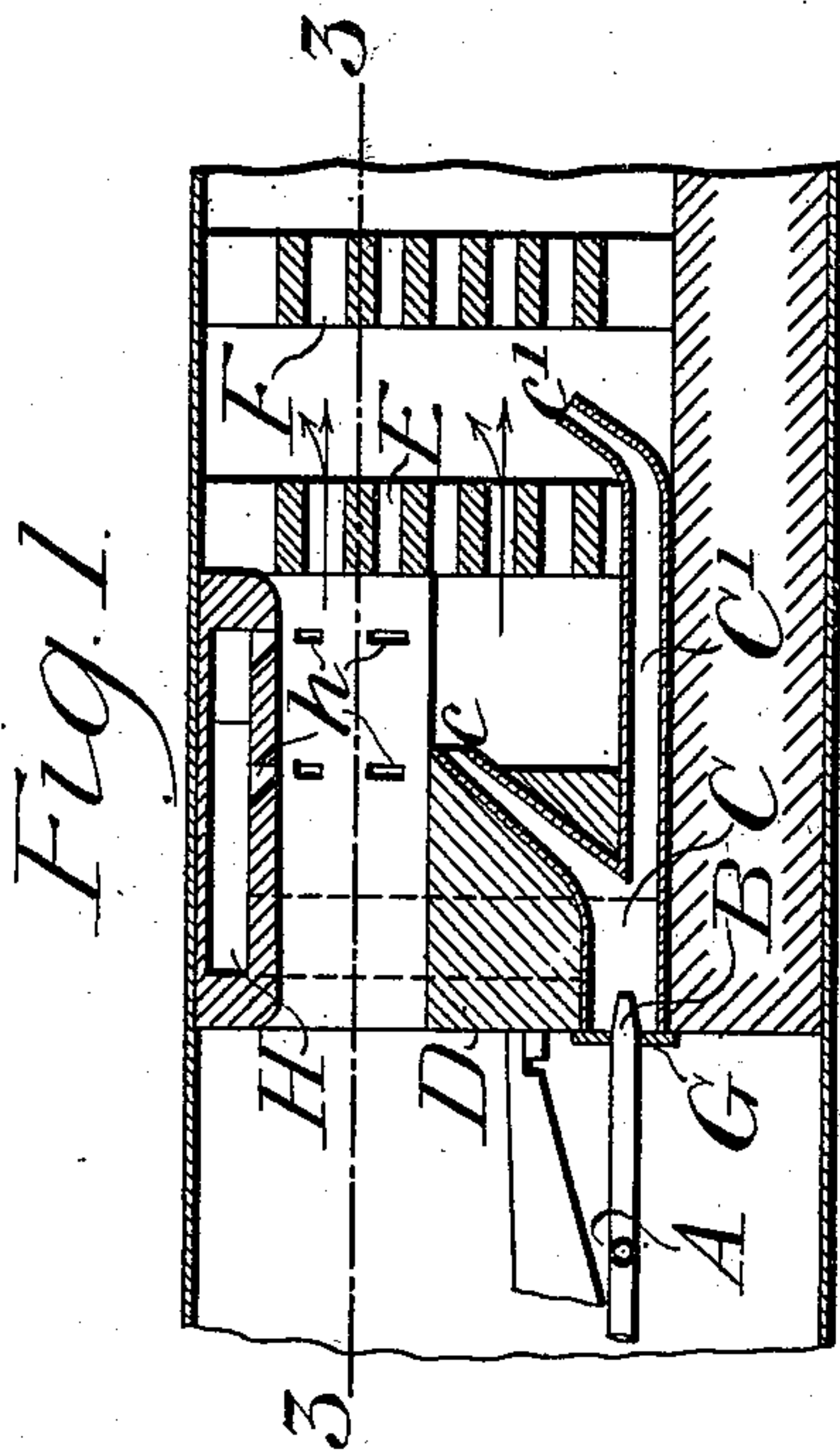
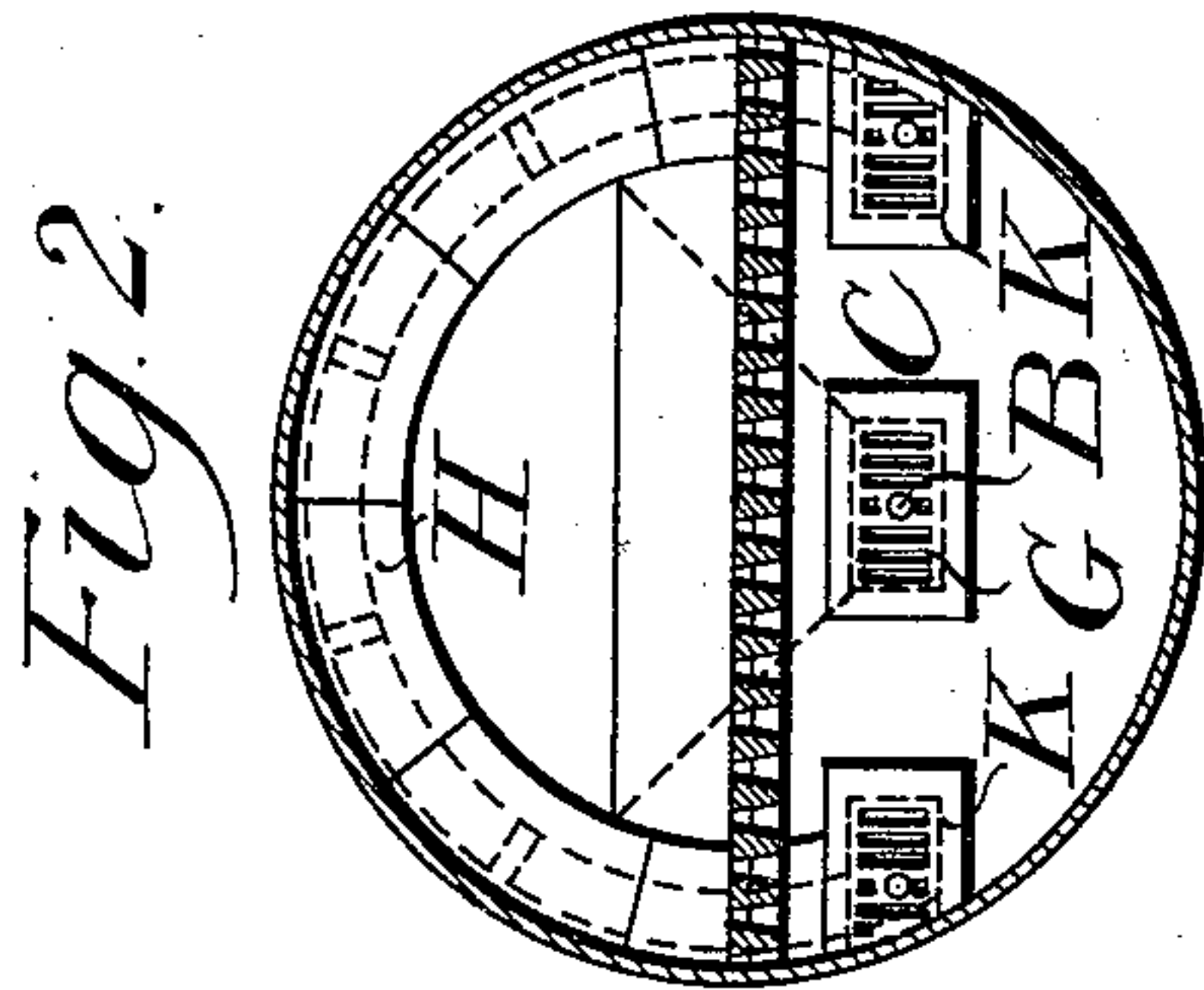
(No Model.)

2 Sheets—Sheet 1.

J. S. D. SHANKS.
FURNACE FOR STEAM BOILERS.

No. 562,252.

Patented June 16, 1896.



Witnesses.
Thos. A. Gunn
Robert Everett.

Inventor:
John S. D. Shanks.
By James L. Norris.
Atty.

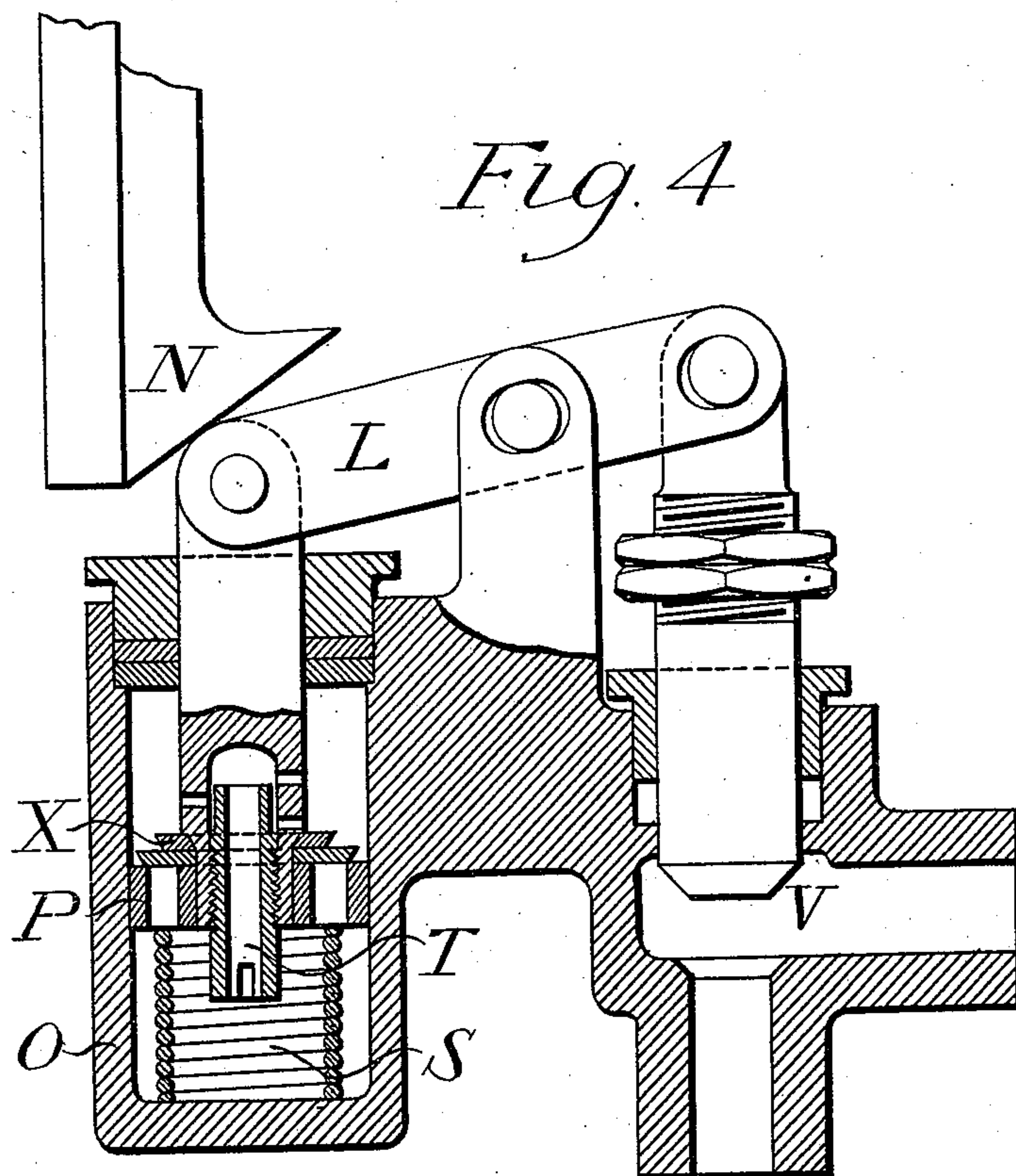
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Att'y.

UNITED STATES PATENT OFFICE.

JOHN STEEL DIXON SHANKS, OF BELFAST, IRELAND, ASSIGNOR OF TWO-THIRDS TO JOHN MACCORMAC, OF SAME PLACE, AND THOMAS HARRISON, OF CRAIGWOOD HOUSE, COUNTY DOWN, IRELAND.

FURNACE FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 562,252, dated June 16, 1896.

Application filed January 8, 1896. Serial No. 574,693. (No model.)

To all whom it may concern:

Be it known that I, JOHN STEEL DIXON SHANKS, mechanical engineer, a citizen of Ireland, residing at 42 Brougham Street, Belfast, Ireland, have invented certain new and useful Improvements in Furnaces for Steam-Boilers, of which the following is a specification.

The objects of my invention are to provide a means in furnaces of steam-boilers for the more complete combustion of the fuel used and to burn or consume the smoke and other volatile matter produced by the combustion of the fuel, and I effect these objects by means of the arrangements which I shall describe, referring to the accompanying drawings.

Figure 1 is a longitudinal, and Fig. 2 is a transverse section, of parts of a boiler fire and flue near the bridge. Fig. 3 is a sectional plan on 3 3, the fire-bars being removed. Fig. 4 is a section of an automatic steam-valve hereinafter referred to.

I employ a number of steam-jets, some, as A, directed underneath the fire-bars, and one, such as B, or it may be more, into a box C, which is built into the bridge D of the furnace and preferably has an extension C', terminating between two walls E F of fire-brick or other refractory material, built up behind the bridge and separated from each other at a little distance. These walls E F have alternate bricks left out to give passage for the combustion-gases.

The box C has an upwardly-inclined divergent passage terminating in a slit *c*, or it might be a number of holes, and the extension C', when such is used, has a similar passage terminating with a slit or set of holes *c'*, so that air drawn into C through a perforated plate G by the injector action of the steam and heated in its passage along the ash-pit and through C and C' is directed in a thin stream or in numerous separate streams among the combustion-gases which pass over the bridge, so as to effect their more complete combustion. Resting on the sides of the bridge D is a hollow arch H of fire-clay, forming a space or chamber receiving a supply of air drawn through perforated plates K by the injector action of steam-jets. Currents of

heated air mingled with steam issue from slits or holes *h* to mingle with the combustion-gases.

I use an automatic valve shown in Fig. 4 connected with the steam supply, to the jet-pipes, and so arranged that when the fire-door is fully opened the valve is opened to its full extent, thus supplying the full strength of steam-jets when fresh fuel is being applied to the furnaces.

The valve V is formed at the end of a plunger which works through packing and is connected by a lever L to a piston P, which works in an oil-cylinder O and is urged upward by a spring S. Through the piston passes a hollow screw T, which can be adjusted so as to throttle more or less openings to the space above the piston. On the fire-door is fixed an inclined nose N, which, when the fire-door is opened to supply fresh fuel to the fire, presses down the piston P, causing the oil to pass from below it through holes in the piston covered by a valve X to the space above it. By this movement the spring S is compressed and the valve V is fully opened. When the fire-door is closed, the spring S expands, raising the piston P and closing the valve V, but this action takes place slowly as the passage for the oil from above the piston to the space below is throttled by the screw T.

The action of the apparatus above described is as follows: First, the steam-jets directed beneath the fire-bars urge the fire to a more speedy and complete combustion; secondly, the heated currents of steam and air issuing from *c*, *c'* and *h* impinge against and mingle with the smoke and combustion-gases, and these acting in conjunction with the large surface of highly-heated bricks of the arch H and perforated walls E F cause complete combustion of the gases and prevent evolution of smoke.

Having thus described the nature of this invention and the best means I know of carrying the same into practical effect, I claim—

1. The combination in a boiler-furnace, of a bridge-wall D, a hollow arch H built over the bridge-wall and provided with air-inlets K and steam and air outlets *h*, a steam and

air box C having an air-inlet G, and an inclined, diverging passage opening at the rear of the bridge-wall to deliver steam and air to the combustion-gases, and steam-nozzles
5 A and B communicating, respectively, with the hollow arch and the steam and air box, substantially as described.

2. The combination in a boiler-furnace, of a bridge-wall, a hollow arch built over the
10 bridge-wall and having an air-inlet and steam and air outlets, a steam and air box built in the bridge-wall and having an air-inlet and steam and air outlets, steam jets or nozzles connected with the hollow arch and the steam
15 and air box, and a series of vertically-arranged open-work or skeleton partitions located in the flue in rear of the hollow arch and bridge-wall, substantially as described.

3. The combination in a boiler-furnace, of a hollow arch, a steam and air box or chamber, steam-nozzles, and an automatic valve
20 controlling the flow of steam to said nozzles and having devices acted upon by the fire-door of the boiler-furnace, so that opening and closing movements are imparted to the
25 valve when the fire-door is opened and closed, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 23d day of
30 December, A. D. 1895.

JOHN STEEL DIXON SHANKS.

Witnesses:

JOHN MCQUADE,
JOSEPH GLANCY.