

No. 693,634.

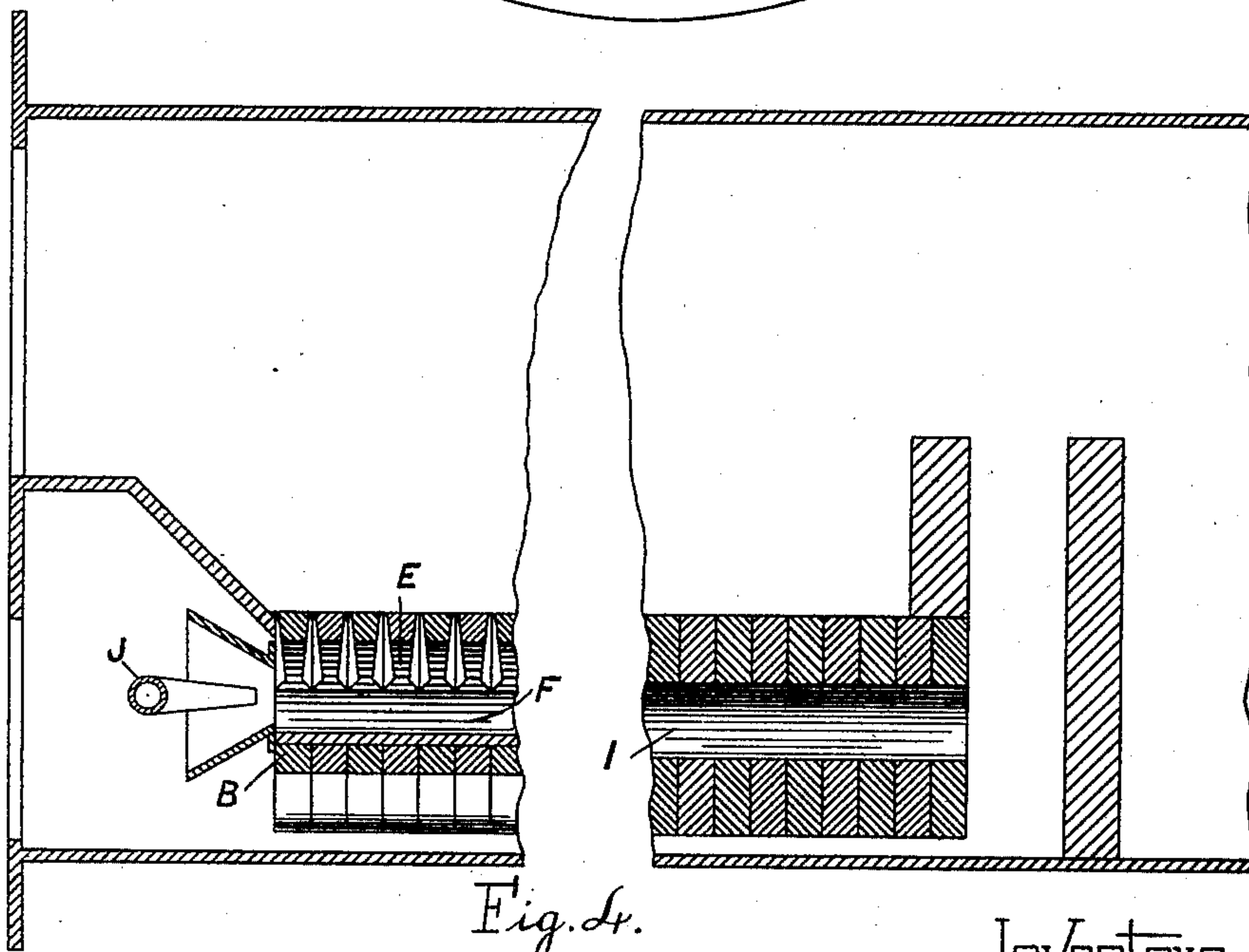
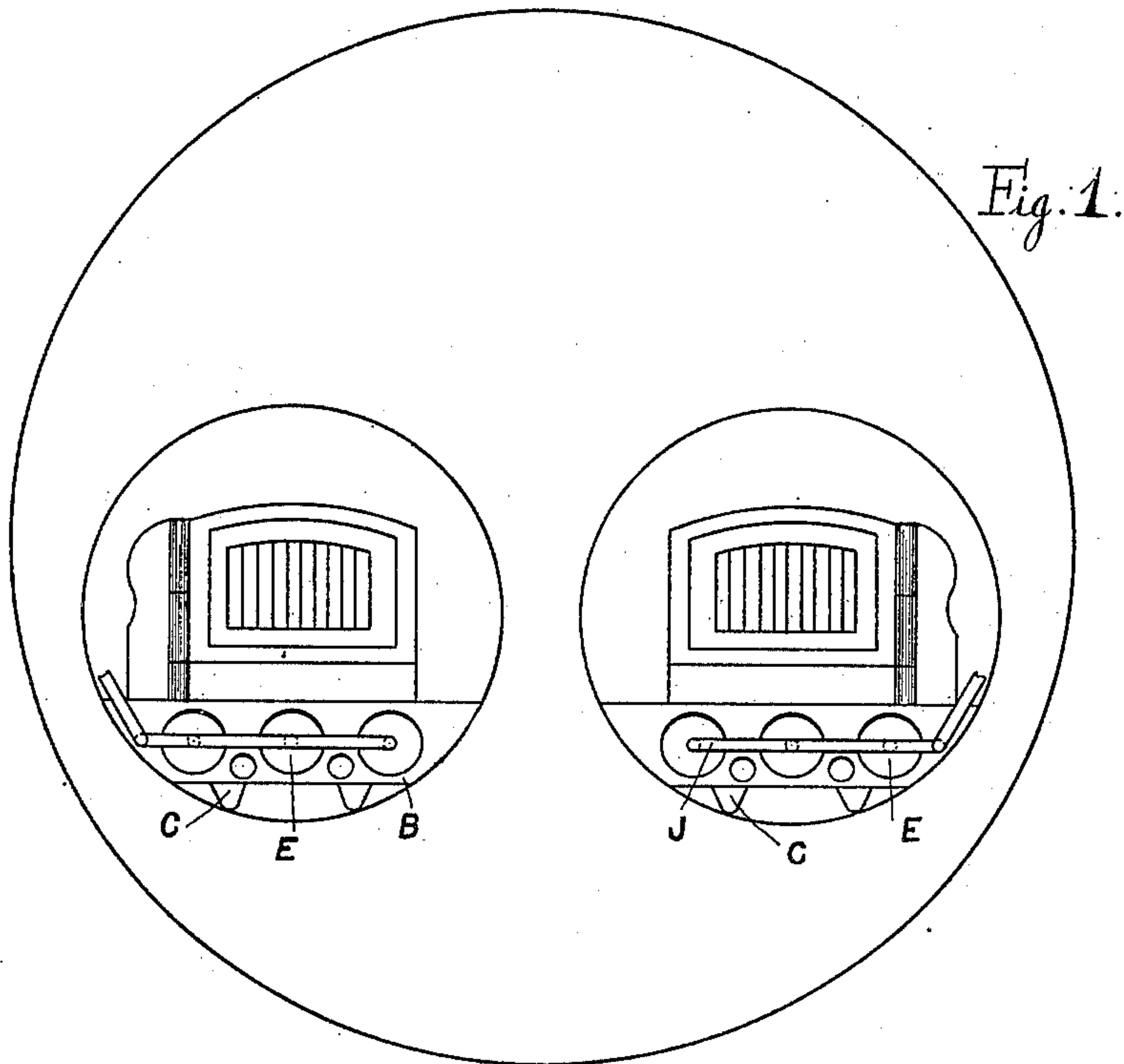
Patented Feb. 18, 1902.

T. WESTERBY & W. G. CROSTHWAITE.  
BOILER OR OTHER FURNACE GRATE.

(Application filed June 10, 1901.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses

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Fig. 7.



Fig. 5.

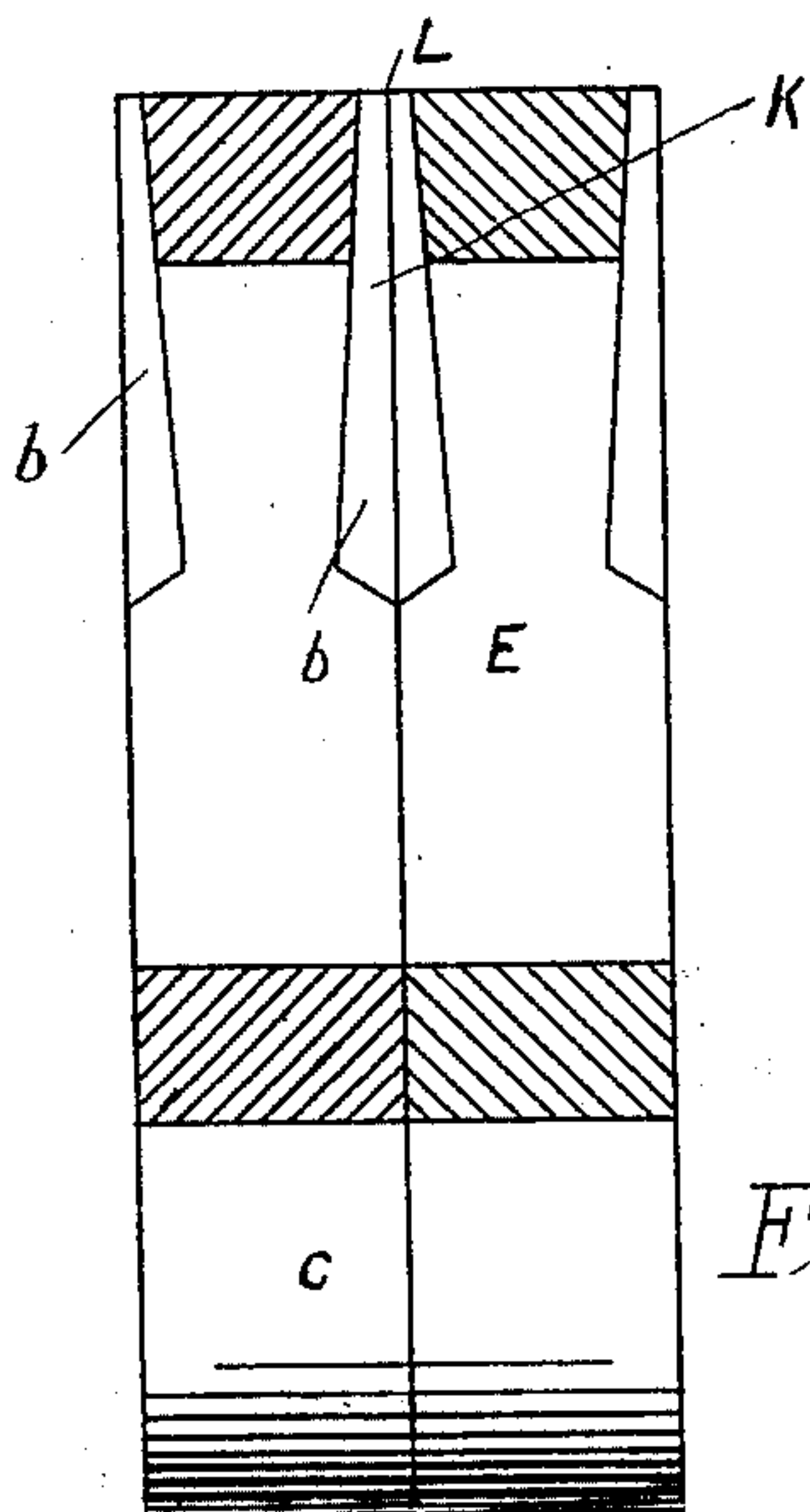
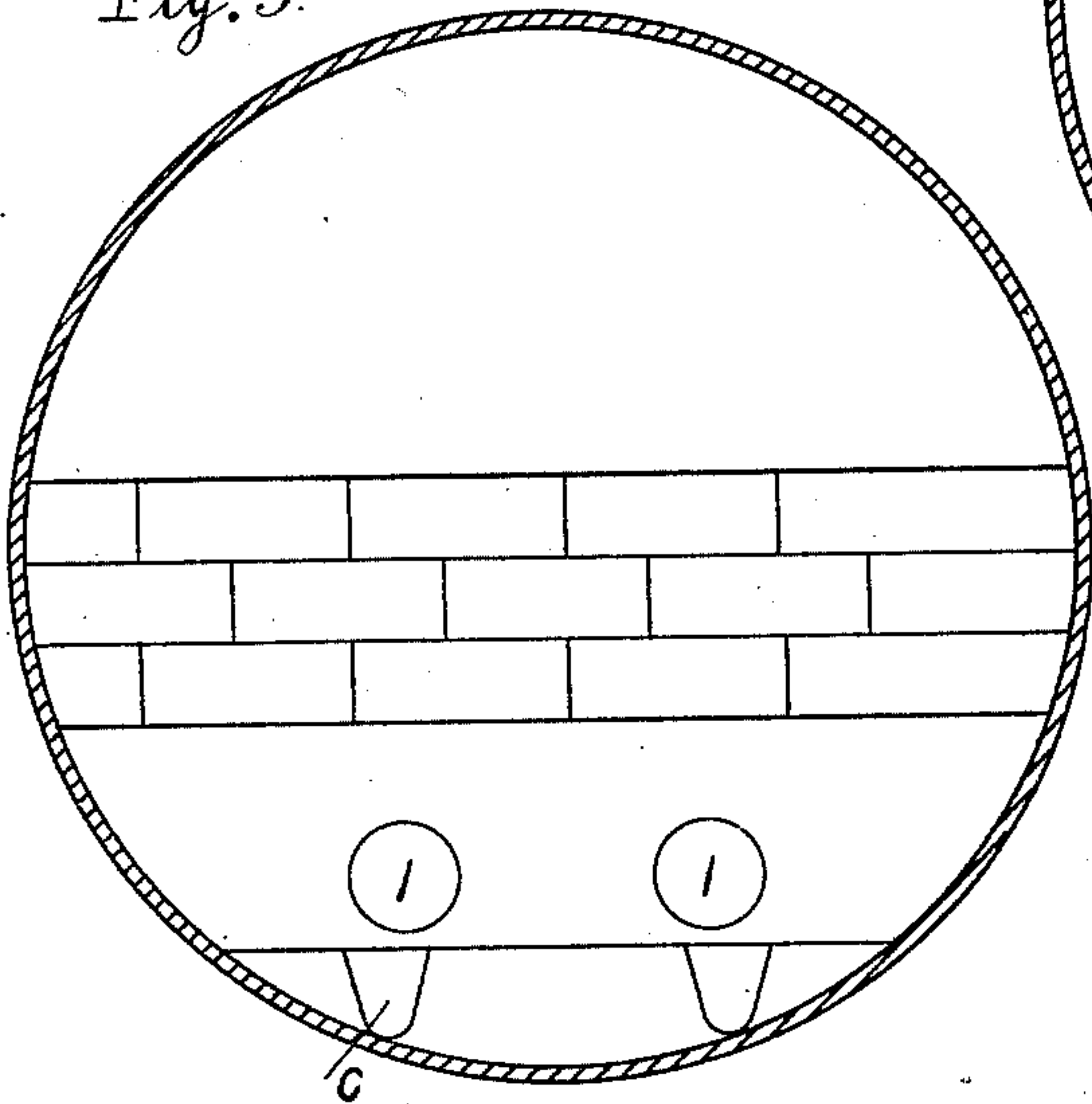


Fig. 3.

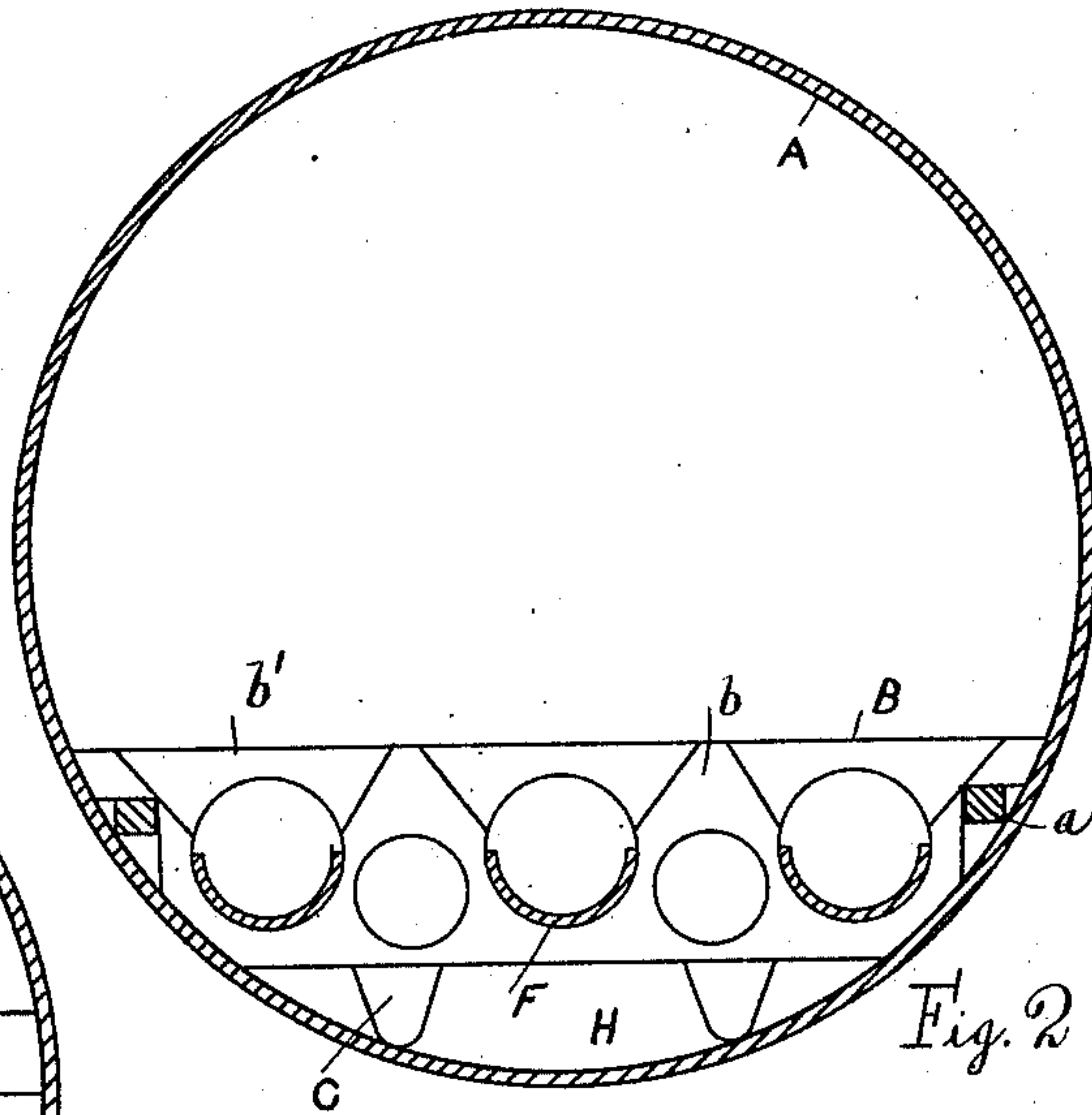


Fig. 2.

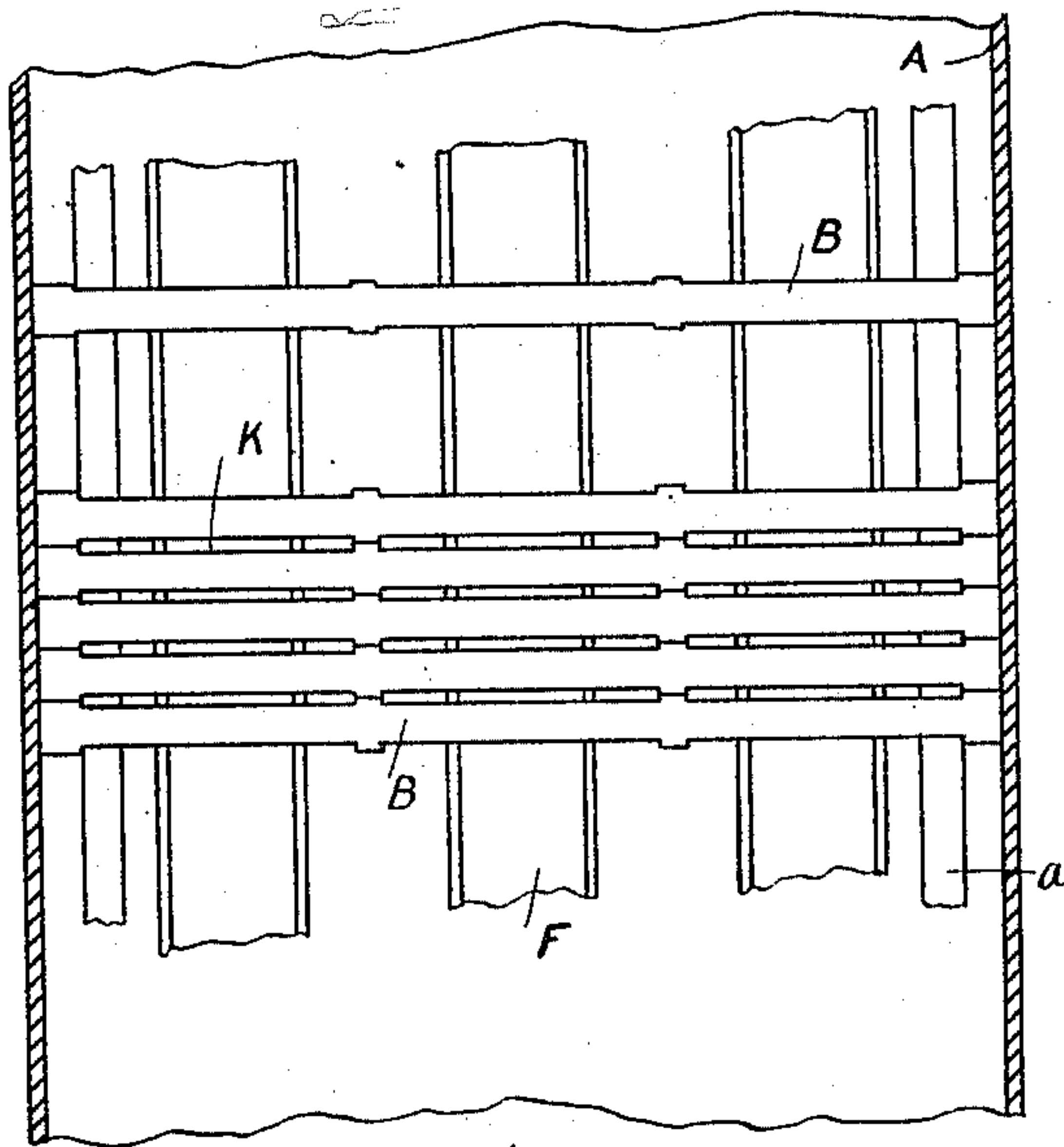


Fig. 6.

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# UNITED STATES PATENT OFFICE

THOMAS WESTERBY AND WALTER GEORGE CROSTHWAITE, OF LEEDS,  
ENGLAND.

## BOILER OR OTHER FURNACE GRATE.

SPECIFICATION forming part of Letters Patent No. 693,634, dated February 18, 1902.

Application filed June 10, 1901. Serial No. 63,889. (No model.)

*To all whom it may concern:*

Be it known that we, THOMAS WESTERBY and WALTER GEORGE CROSTHWAITE, subjects of the King of Great Britain, residing in Leeds, in the county of York, England, (whose full postal address is 6 Compton road, Leeds,) have invented certain new and useful Improvements in Boiler or other Furnace Grates, of which the following is a specification.

10 This invention has for its object a furnace-grate so constructed of fire-bars as to constitute not only a grate for the fire, but also provide air-conduits for conveying forced or  
15 forced or natural draft to the bridge for smoke consumption by separate passages, all formed in the bars themselves.

The invention will be understood from the following description, reference being had to  
20 the accompanying drawings, in which—

Figure 1 is an end view of a Lancashire boiler fitted with our invention; Fig. 2, an enlarged view showing a bar in position; Fig. 3, a cross-section through the bars; Fig. 4, a fragmentary longitudinal section of the furnace-flue and bridge through the holes E and I, respectively; Fig. 5, a vertical section through the air-chamber at bridge; Fig. 6, a plan of the bars; and Fig. 7, a detail view of air-tube  
30 with grids.

Referring to the figures, the furnace-grate is formed of fire-bars B. (Shown more particularly in Figs. 2 and 3.) These bars are supported on bearers *a* and have feet C, upon  
35 which they rest on the bottom of the furnace-flue A, and are formed with holes E, which when the bars are placed side by side in the flue constitute passages for the air-blast. The bars abut against each other at their  
40 surfaces *b*, but at *b'* have fan-shaped recesses communicating directly with the passages E, so as to deliver a blast from the passages E in a fan-shaped current into the fire, the flat abutting faces *b* preventing any escape of air  
45 below. The fan-shaped recesses *b'* are inclined or formed wedge-shaped, leaving channels K between each wedge, which gradually narrow toward the top and finally terminate in narrow openings L in the surface of the  
50 grate. It will be seen that the uprising air enters the channels where there is a large

area, and by reason of the channels gradually contracting in area toward the narrow openings L the air is relatively compressed in volume, which causes it to rush through the openings with a greatly-augmented force, and this rush of air through the grid tends to keep the grid cool.

In order to avoid any possibility of air leaking out between the bars at their abutting faces *b* should said faces be cast not quite true, we can provide semicircular tubes F, passed through the holes E. These tubes insure the blast being delivered upward through the fan-shaped passages exclusively. If preferred, complete tubes, with grids cut therein so as to coincide with the fan-shaped passages *b'* of the bars, may be passed into the holes, as shown in Fig. 7. The result in any case is that the blast of air being delivered in a fan-shaped current causes the heat to impinge against the top of the furnace-flue and produce a fire of great heat and uniform intensity. Further, this fan-shaped air-current through the bars ventilates the grate and keeps it from getting as hot as would otherwise be the case; also, no clinker will adhere to the bars. The air-space H, also below the bars, helps to keep the grate cool. I represents separate air-passages in the bars so arranged as to deliver forced or natural draft at will into the air-chamber N at the bridge. J is the steam-jet at the entrance to the air-passages for inducing the forced draft. The holes E are closed at end of grate, so as not to deliver air to the bridge.

The mode of action is as follows: The fuel is thrown on the grate either by hand or mechanical stoker, and the air besides being delivered out beyond the bridge by the passages I for smoke consumption is also delivered in fan-shaped currents all over the grate-surface with a vertically-upward motion through the grate, which, being well ventilated, will be found to not get so hot as would otherwise be the case, and the adhering of clinker is entirely prevented. The air rises through the fuel vertically, and the flame strikes directly upward, or nearly so, forming an intense flame bearing right against the crown of the furnace, passing over the bridge with a considerable amount of carbon uncon-



sumed. This flame meets the hot air issuing through the bridge, and the remaining carbon, hydrogen, and other combustibles are at once consumed. The attendant in charge of the furnace can at any moment increase or decrease the forced air-current by regulating the steam-jets J, and thus the draft can be controlled to a nicety. The grate is well suited for burning small coal, coal-dust, sawdust, and rubbish, and applied to destructors and marine boilers is unequalled for economy and efficiency.

We declare that what we claim is—

1. The furnace-grate consisting of a series of fire-bars placed close together side by side, and having transverse registering apertures which form air-conduits extending from front to rear of the furnace, and having also upwardly-expanding air-passages extending from said conduits and formed by recesses in the contiguous sides of the bars, whereby the air can freely reach the fuel along practically the entire length of the bars, substantially as described.

2. A furnace-grate having fire-bars transverse to the axis of the furnace, said fire-bars having air-conduits parallel to the axis of the furnace and pierced through them for conveying forced or natural draft, said fire-bars having fan-shaped recesses in their sides at intervals communicating directly with the aforesaid air-conduits whereby the air is forced through the bars, abstracting heat therefrom, and rises up between the bars into the furnace, substantially as described.

3. In furnace-grates, fire-bars having sectional conduits registering with those in the next bar passing transversely through the bar at a point where the bar is at its fullest width so that each bar touches the next at this point but has a portion cut away immediately above such conduit, leaving a space between the bars of fantail-like form, the broadest part being at the orifice on the

surface of the bars and the narrowest at the orifice from the conduit.

4. In furnace-grates, fire-bars transverse to the axis of the furnace provided with air-conduits pierced through all the bars successively in a direction parallel with the axis of the furnace and the conduits of all the bars registering with each other when in place, and forming when the bars are in place a passage for forced or other draft, said fire-bars being provided with fan-shaped spaces between them opening out to these conduits, while closed to the ash-pit, such spaces being wider in the direction of the axis of the furnace at the conduits and gradually narrowing in its direction as they approach the fuel-surface of the bars, but at the same time widening out rapidly in a plane at right angles to the axis of the conduit whereby the spaces through which ashes can fall at the fuel-surface of the bars are very narrow, while their entire area is approximately equal to the much broader openings in the conduits.

5. In a furnace, a series of transverse fire-bars having conduits cut through the entire series of the bars, and spaces in the sides of the bars open from the fuel-surface to these conduits, but closed below whereby the air is prevented from entering the ash-pit but goes up freely through the narrow spaces between the bars into the furnace and openings from one or more of these conduits into the bridge whereby the forced draft of the conduits can be supplied both to the furnace and to the bridge while the ash-pit remains open.

In witness whereof we have hereunto signed our names, this 23d day of May, 1901, in the presence of two subscribing witnesses.

THOMAS WESTERBY.

WAITER GEORGE CROSTHWAITE.

Witnesses:

WILLIAM JAMES COUSINS,

WILLIAM HENRY MCELLROY.