

JOHN DURAND.

Smoke-consuming apparatus for  
Locomotive Fire-Boxes.

No. 119,832.

Patented Oct. 10, 1871.

Fig. 1.

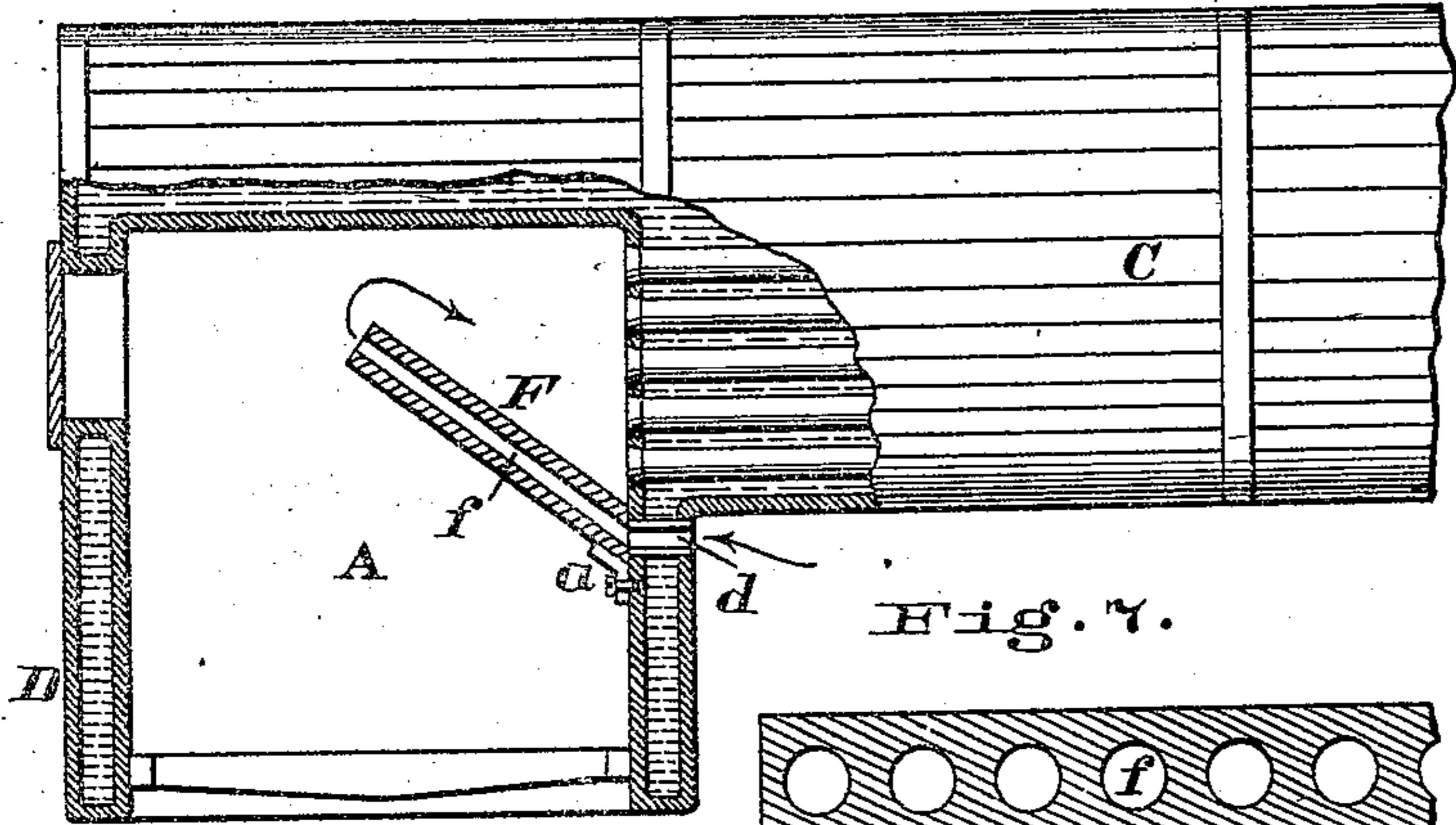


Fig. 2.

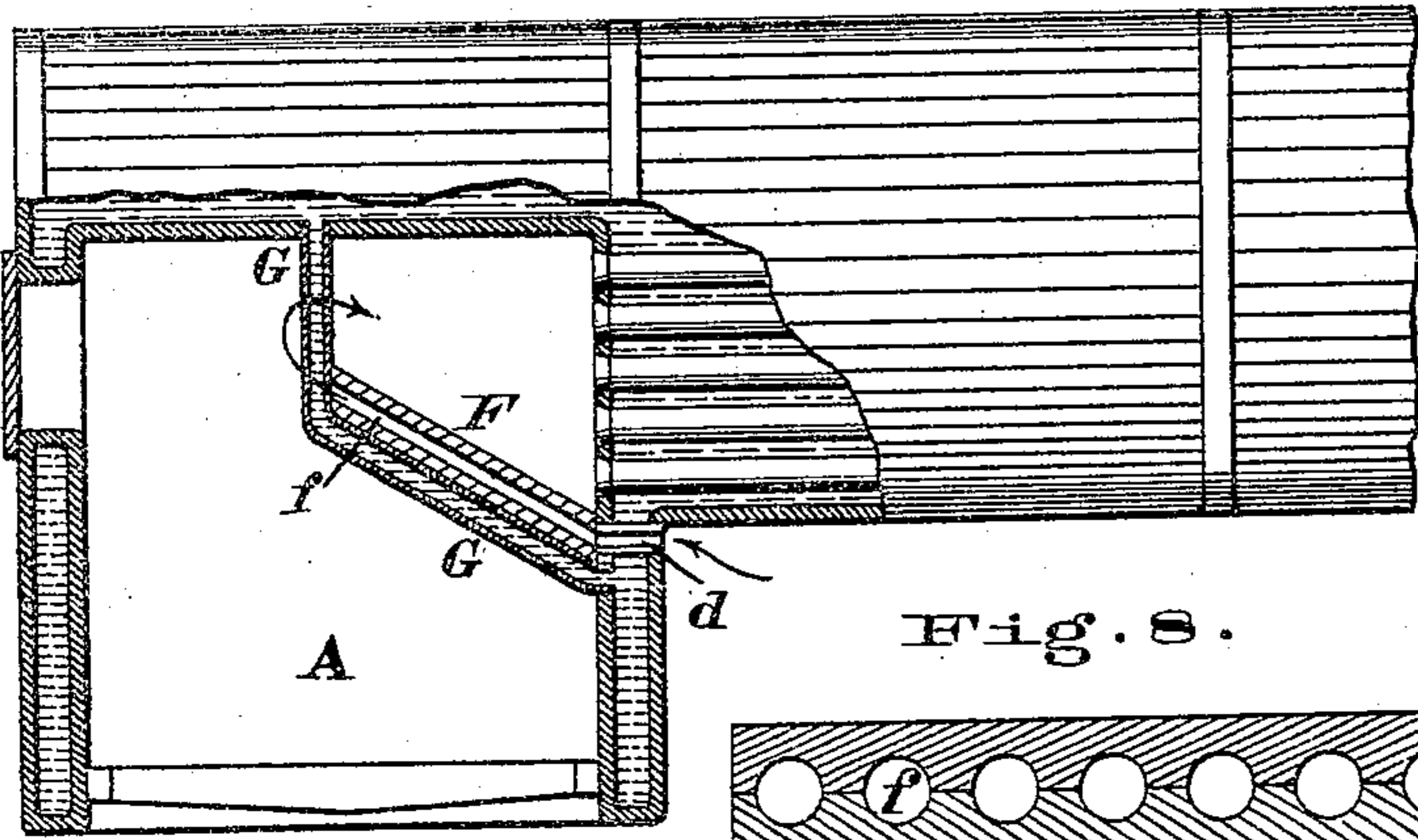


Fig. 3.

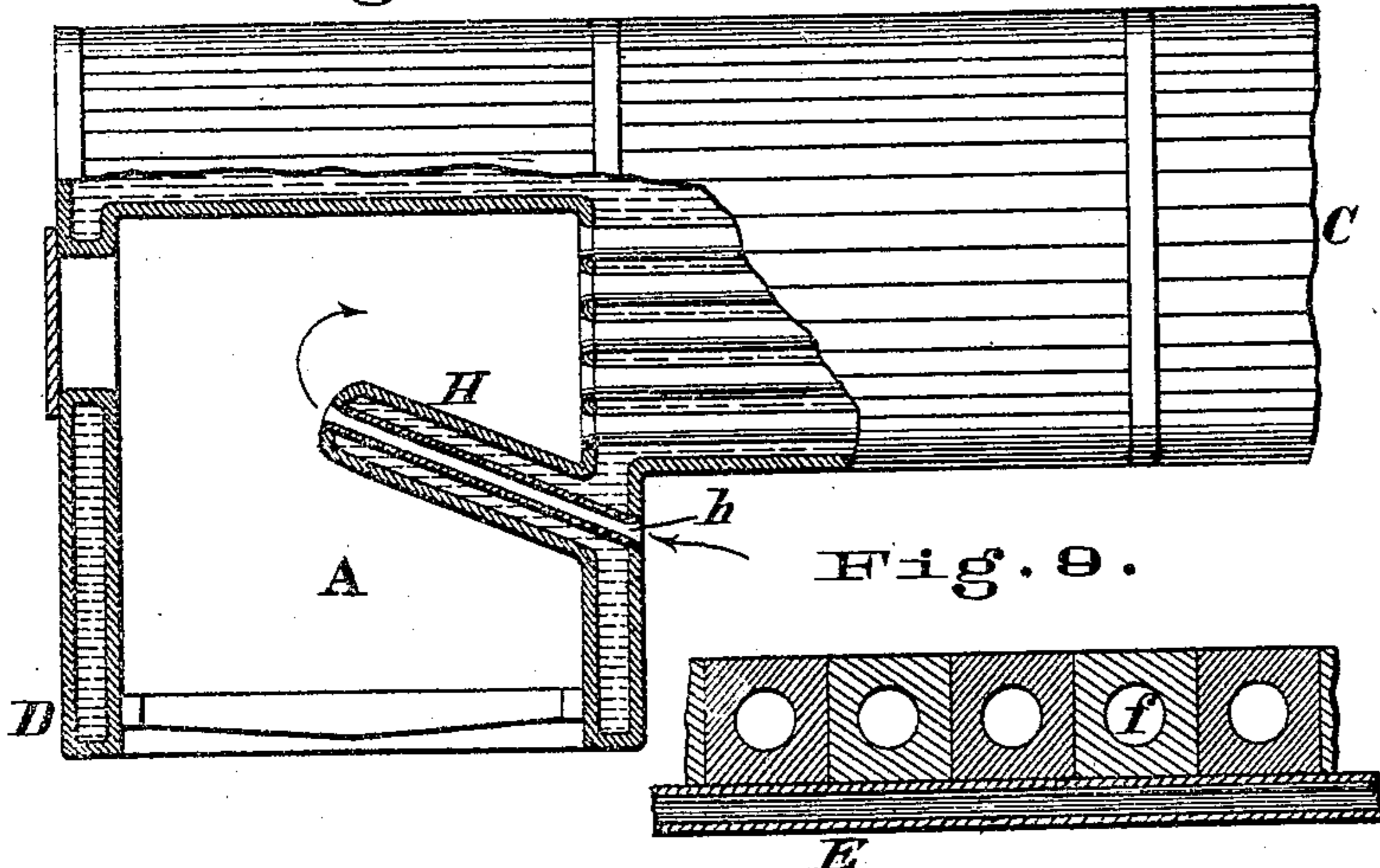


Fig. 10.

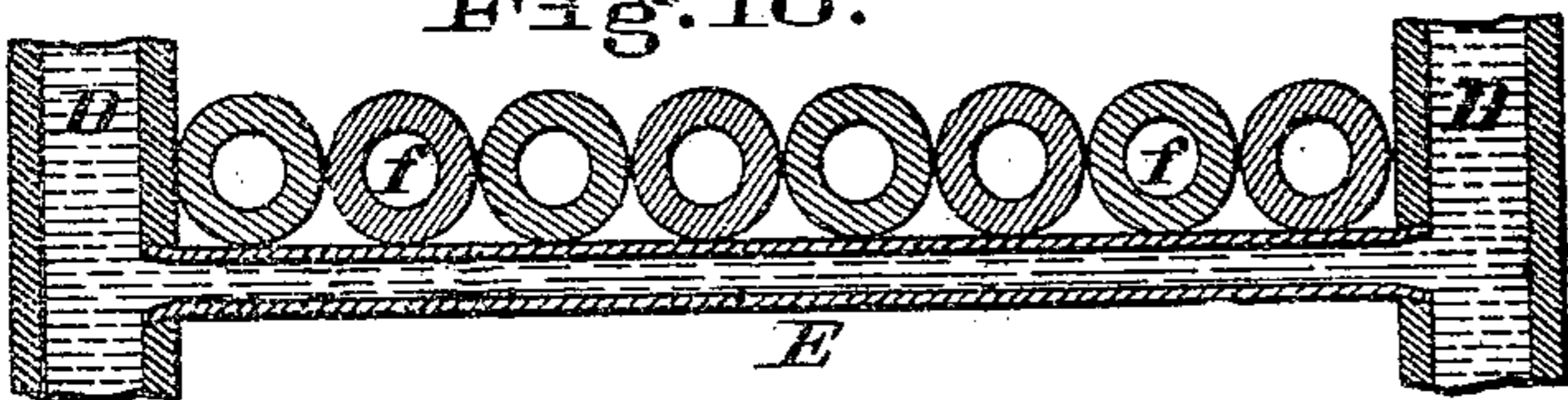


Fig. 4.

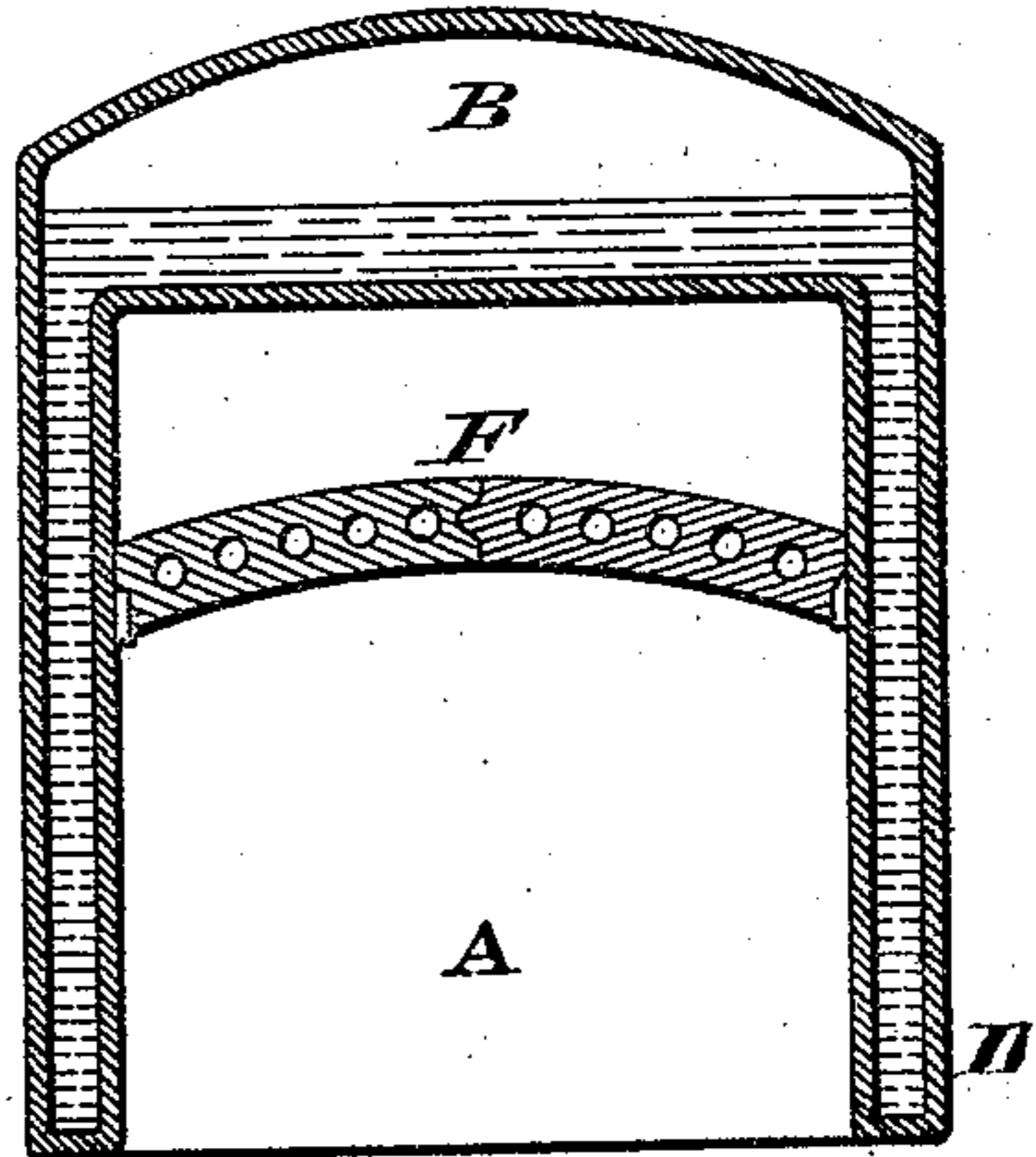


Fig. 5.

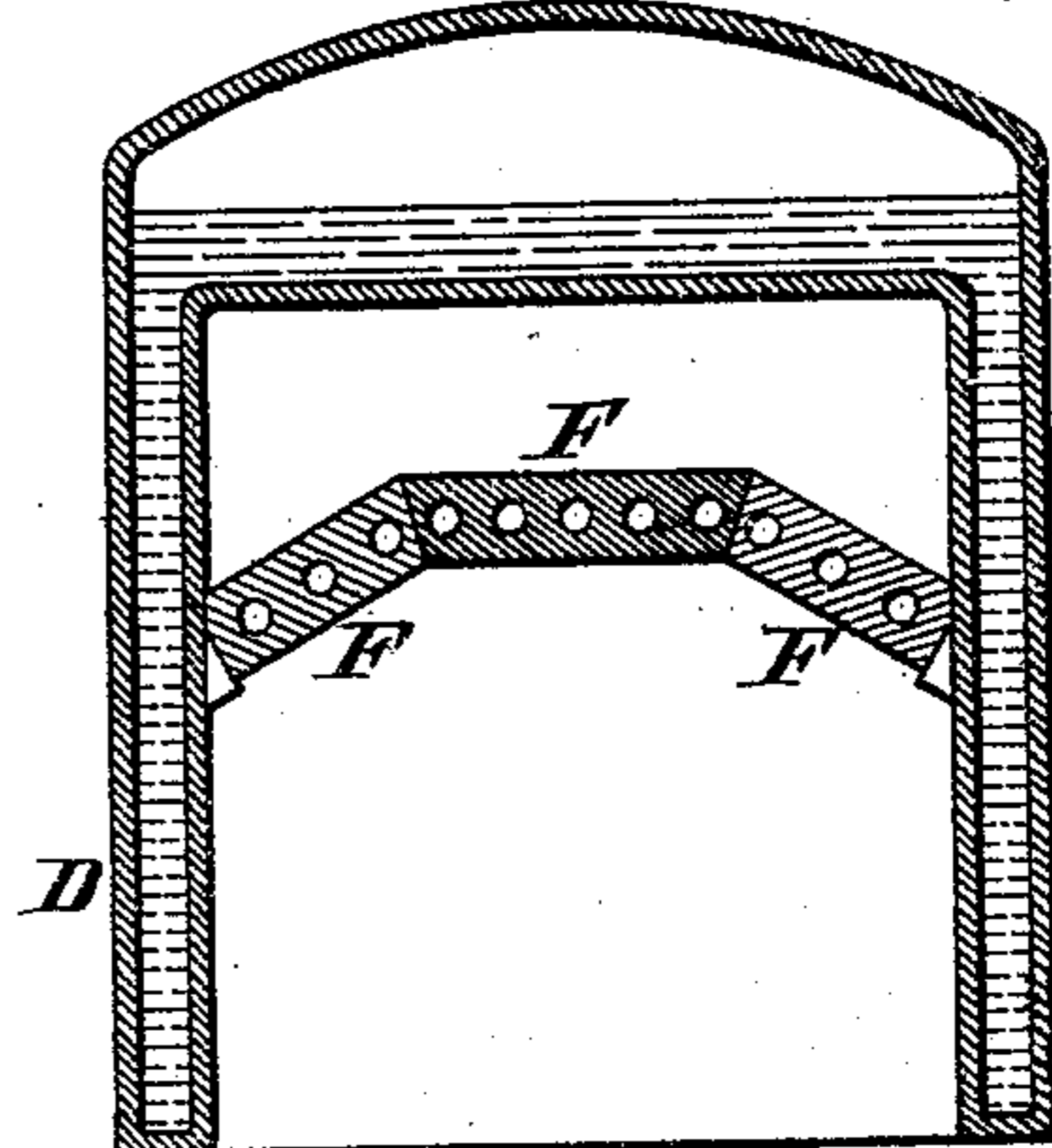
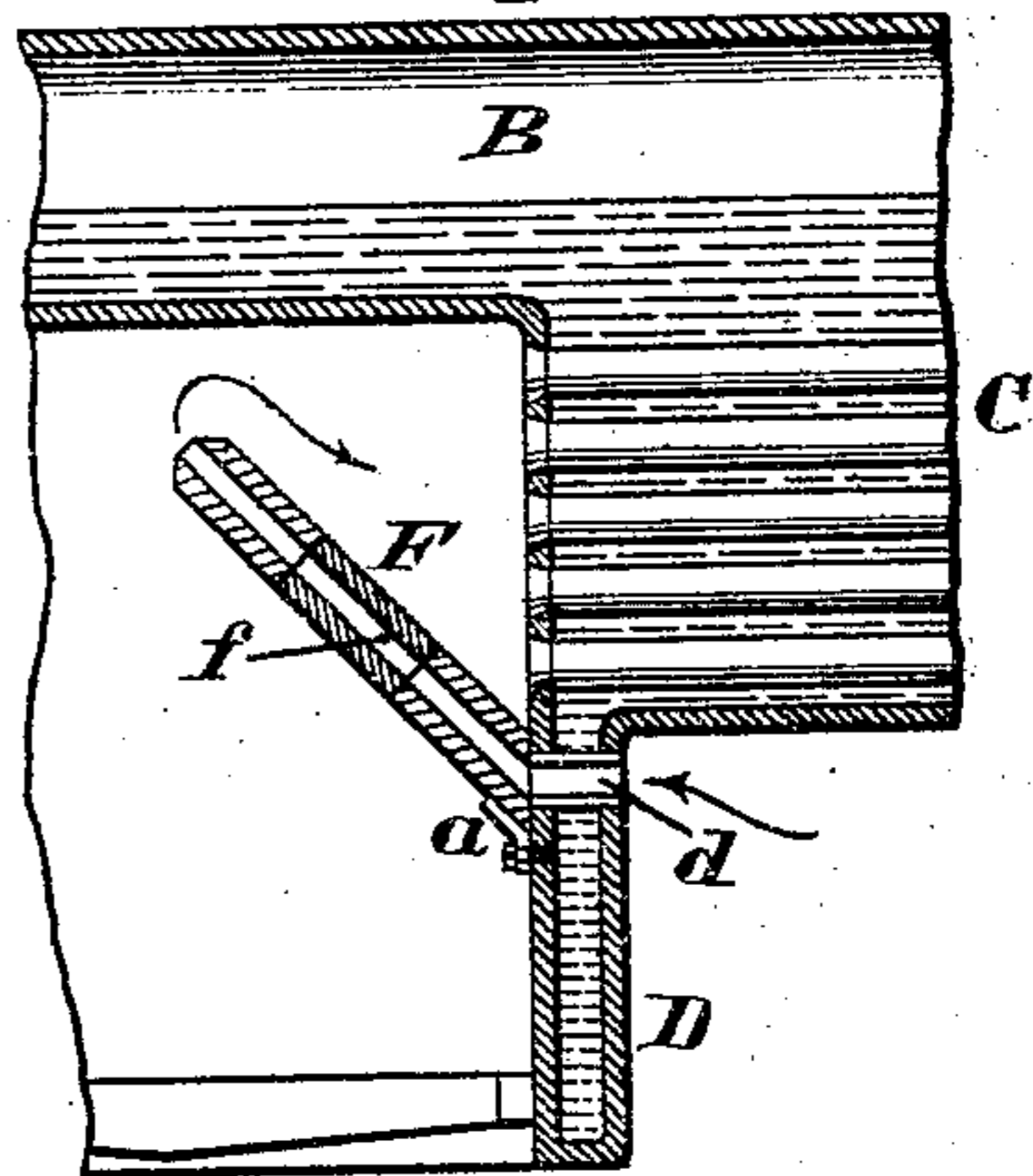


Fig. 6.



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By Knight Bros.  
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Attest.

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John Knight

# UNITED STATES PATENT OFFICE.

JOHN DURAND, OF COLUMBUS, OHIO.

## IMPROVEMENT IN SMOKE-CONSUMING APPARATUS FOR FIRE-BOXES.

Specification forming part of Letters Patent No. 119,832, dated October 10, 1871.

*To all whom it may concern:*

Be it known that I, JOHN DURAND, of Columbus, Franklin county, Ohio, have invented a new and useful Smoke-Consuming Apparatus for Locomotive Fire-Boxes, of which the following is a specification:

This is an improvement in the class of smoke-consumers for locomotive-engines which admits heated air to the interior of the fire-box through suitable ducts, chambers, or apertures in a bridge, deflector, or arch made of fire-brick, tiles, or other suitable material. My invention relates to that class of perforated deflectors which are placed in the fire-boxes of locomotives for the purpose of discharging heated air therein so as to induce the most perfect combustion of the gases; and the first part of my improvements consists in making such deflectors of a tile which is provided with longitudinal channels or ducts, through which the air circulates. This tile is to be furnished with as many longitudinal channels as experience may suggest, and the forward or receiving ends of said channels communicate with tubes that pass through the water-leg of the fire-box, whereby air is allowed to enter the deflector and become highly heated by traversing said longitudinal ducts. The air, after being thus heated, is discharged from the rear end of the channels directly into the fire-box in such a manner as to promote combustion of the gases, as hereinafter more fully described. The second part of my improvements consists in making such a deflecting-tile in sections that are arranged either longitudinally or transversely of the fire-box, by which arrangement a broken or burnt-out section can be removed and a new one substituted for it without taking out the entire deflector, it being understood that said sections are provided with ducts or channels that are arranged in the longitudinal manner previously alluded to. The third part of my improvements consists in supporting the deflector upon tubes which communicate with the water-spaces of the boiler; and said tubes may be located either transversely of the fire-box, or may follow the inclination of the tile or tiles and be attached by their upper ends to the crown-plate.

Figures 1, 2, and 3 are longitudinal sections, and Figs. 4, 5, and 6 are transverse sections of a locomotive fire-box, showing six different modifications of my device. Figs. 7, 8, 9, and 10 are

transverse sections, showing as many modifications of my deflecting-tiles or plate.

A represents the fire-box, B the steam-dome, C the barrel, and D the water-leg of an ordinary locomotive-boiler. I will first describe the preferred type or form of my invention. F represents a tile or series of tiles, of which either Fig. 7, 8, or 9 may be taken as the transverse section. This tile (or series) is supported at front sheet and sides by suitable flanges or shoulders, *a*, that project from the interior plates of the fire-box, from whose front portion the said plate extends backward and upward at an angle of about thirty-five degrees—about two-thirds of the distance from front to back of the fire-box. This plate is traversed from front to back by numerous passages, channels, or ducts, *f*, for draught-air, which, at their front or receiving ends, communicate with metallic tubes *d* in the leg D, through which tubes air is enabled to enter the said ducts, and thence to pass into the hottest portion of the smoke-space in streams of highly-heated and rarefied air and furnish oxygen to combine with the carbon or smoke, and produce combustion of combustible matter not already burned. The tile may consist of a single piece, as in Fig. 7, or of two pieces, namely, an upper and a lower one, one or both channeled out on the opposing surfaces, so as, when placed in position, to compose the series of ducts required, as in Fig. 8; or the ducts may be formed by a series of tiles longitudinally separated and supported upon one or more water-pipes, E, that extend from side to side of the water-leg, with which they communicate; and these tiles may be square externally, as at Fig. 9, or cylindrical, as at Fig. 10, or of octagonal or other exterior form. Or the tile may be supported by a series of bent tubes, G, that extend from the water-leg to the crown-sheet of the fire-box and communicate with the water-space at each end. Still another modification might consist in a protuberance, H, from the water-leg, traversed by tubes *h*, conducting air from the outer atmosphere into the furnace in the same manner and with approximately the same results as the tubes *d* and ducts *f* would; or the combined air-inlet and deflector may consist of two tiles, as in Fig. 4, whose back and side edges rest in projections from the walls of the water-leg, and whose contiguous edges interlock by tongue and groove, in the manner shown. Or

the deflector may consist of a number of pieces formed like the voussoirs of an arch, as in Fig. 5. Still another form may consist of a congeries of tiles, which extend from side to side of the fire-chamber, and are so perforated as to present, when in juxtaposition, a series of air-inlets, as in Fig. 6; or two perforated tiles may start from the sides of the fire-box, and may discharge their heated air-jets opposite to each other at or near the middle of the box. The perforated tile may extend across so much of the fire-box as experience may dictate, and may be horizontal or be inclined at any suitable angle, and may have either a flat or a concave lower surface.

When the locomotive is under steam the necessary volume of air is introduced into the fire-box through the tubes in the water-leg and the channels or apertures in the arch, bridge, or deflector, causing oxygen to commingle in the proper proportion with the carbon or smoke and at such a degree of heat as to prevent the reduction of temperature of the carbon below the point of effective combustion, and the carbon, being thus entirely consumed, escapes in gaseous form instead of smoke.

I am aware that perforated tile-deflectors have been employed in locomotive fire-boxes for some time; but those in use have their apertures made transversely through them; and in order to discharge a sufficient quantity of air to be of any utility it is necessary to provide a great number of such apertures, which arrangement weakens

the tile to such an extent as to render it incapable of resisting the vibrations and jars to which it is continually subjected, and the result is that such tiles are very soon destroyed. This serious objection is completely overcome by the provision of longitudinal channels, which do not weaken the tile in the least, and which afford a better opportunity for imparting a higher degree of heat to the air, and are not liable to choke up with dust and cinders, as the small transverse apertures are.

I claim herein as new and of my invention—

1. The provision, in the fire-box of a locomotive, of a deflector composed of a tile having longitudinal channels or ducts that are adapted to receive atmospherical air through the tube *d* or its equivalent, and to discharge said air, when heated, into the upper portion of the fire-box, substantially as herein shown and described.

2. Such longitudinally-channeled deflector, when made of two or more tile-sections, for the purpose herein explained.

3. The said deflector in a locomotive fire-box, supported upon tubes which communicate with the water-spaces of the boiler, for the object stated.

In testimony of which invention I hereunto set my hand.

JOHN DURAND.

Witnesses:

GEO. H. KNIGHT,  
JAMES H. LAYMAN.

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