

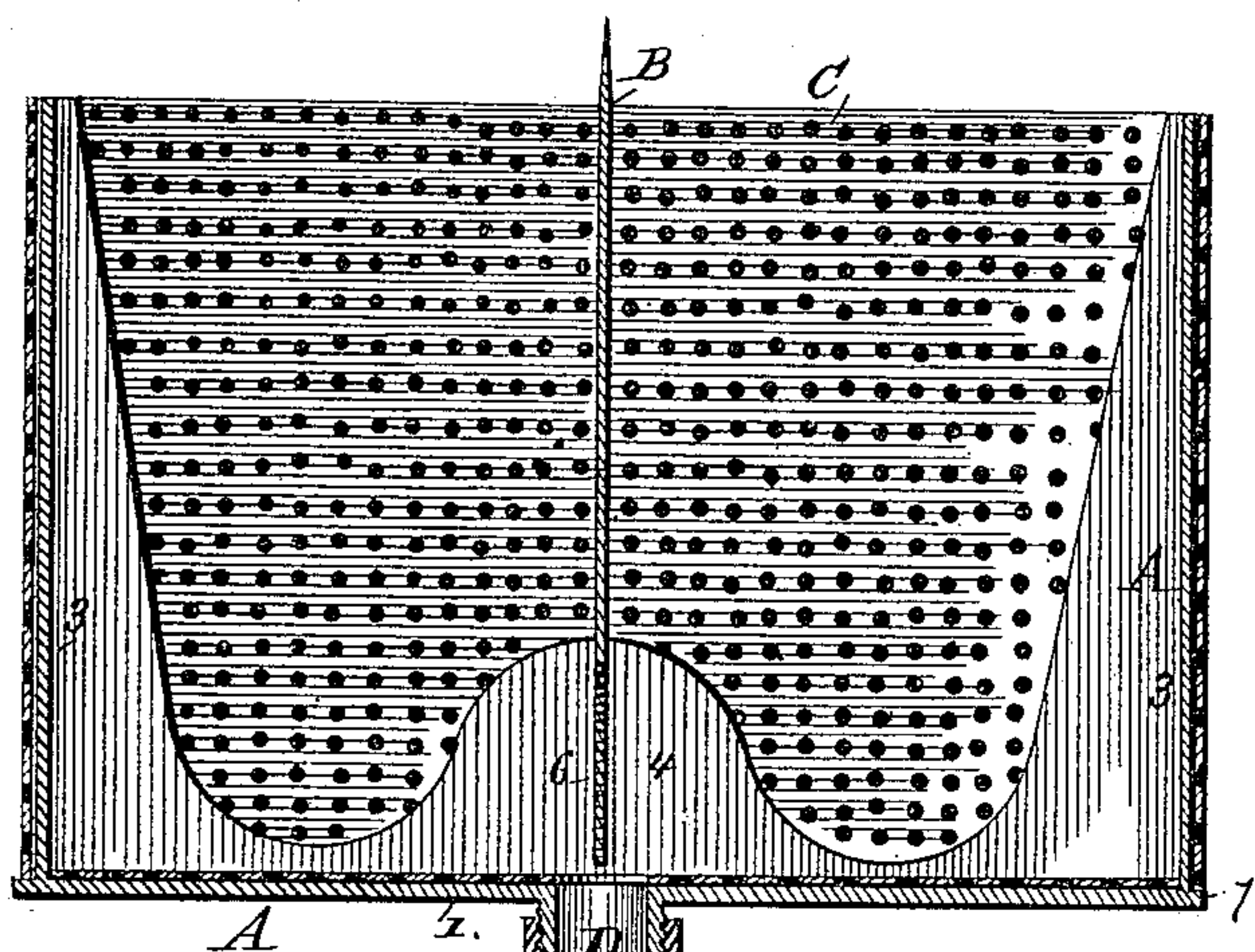
(No Model.)

F. E. MILLS.  
GAS BURNER ATTACHMENT.

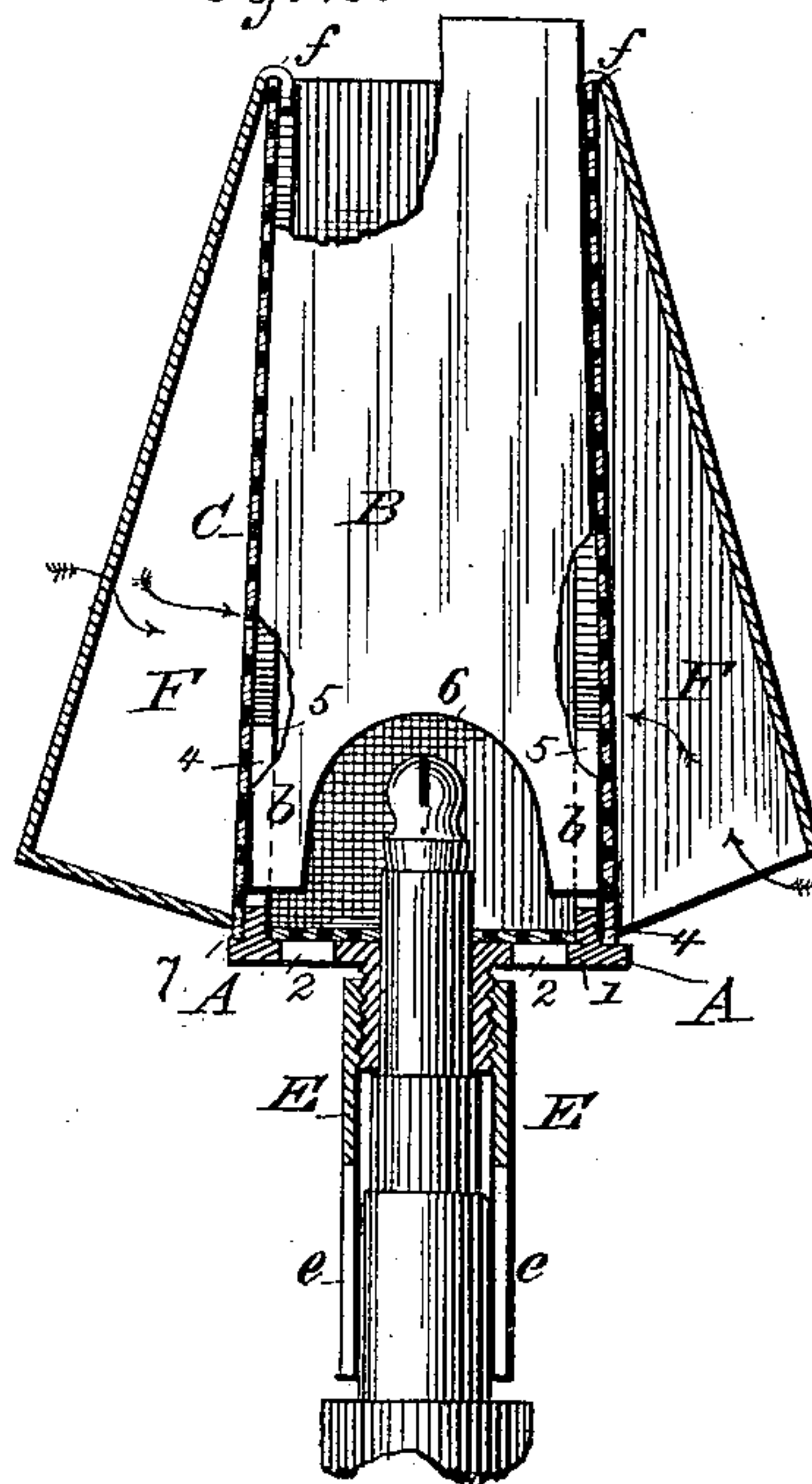
No. 353,494.

Patented Nov. 30, 1886.

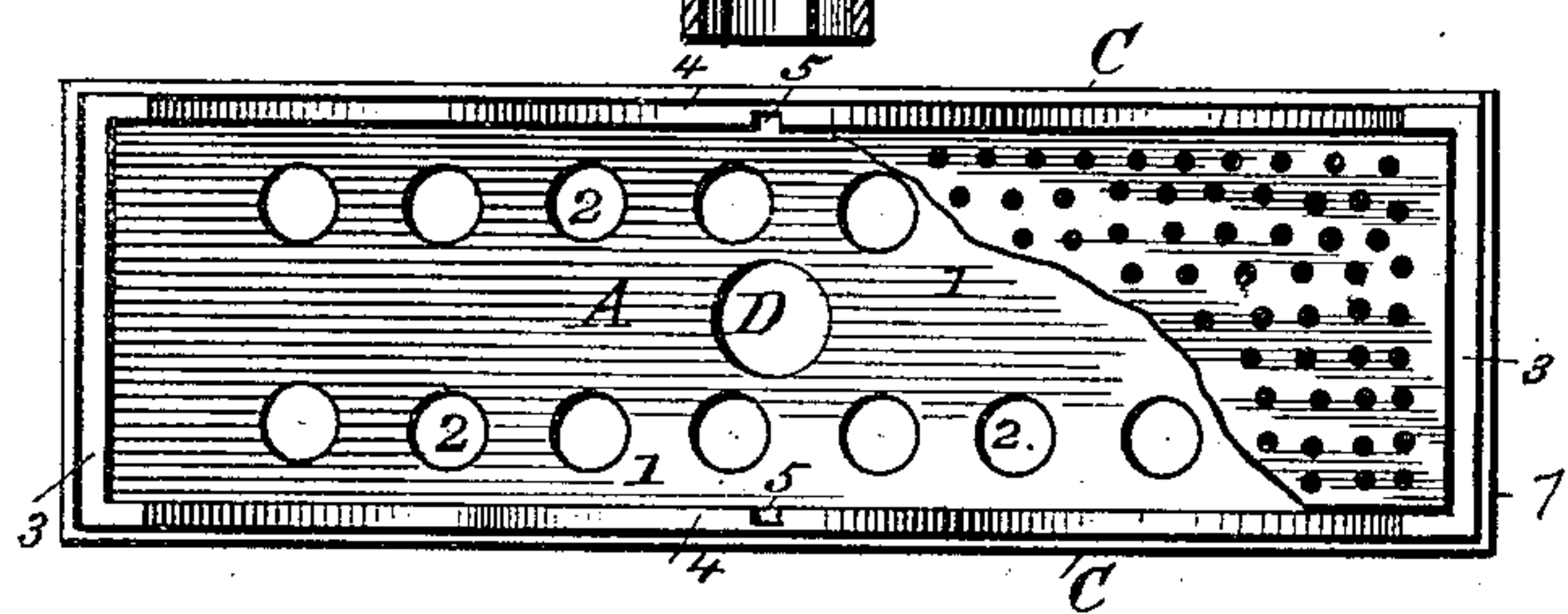
*Fig. 1.*



*Fvg. 2.*



*Fig. 3.*



*Fig. 6.*

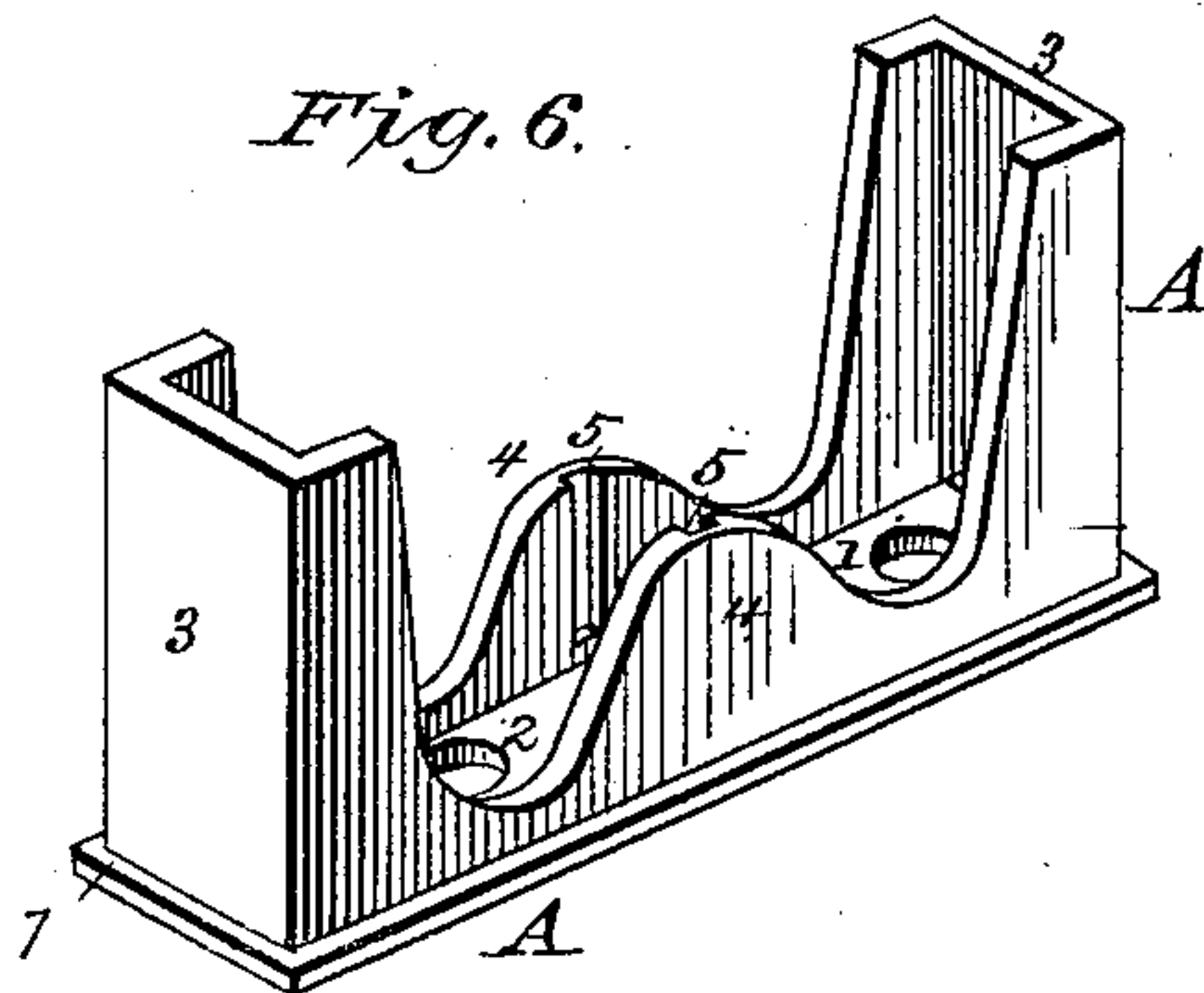
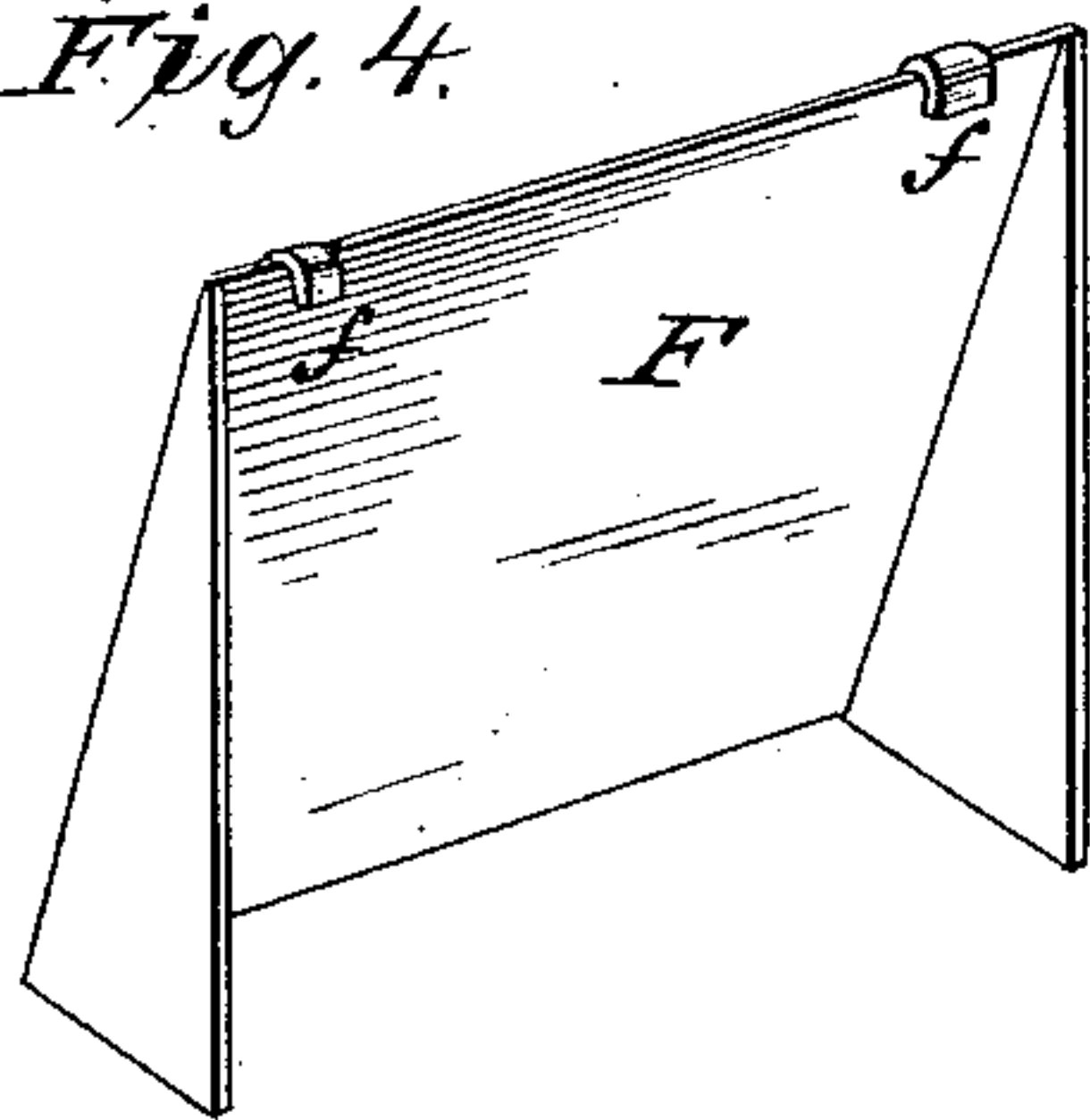
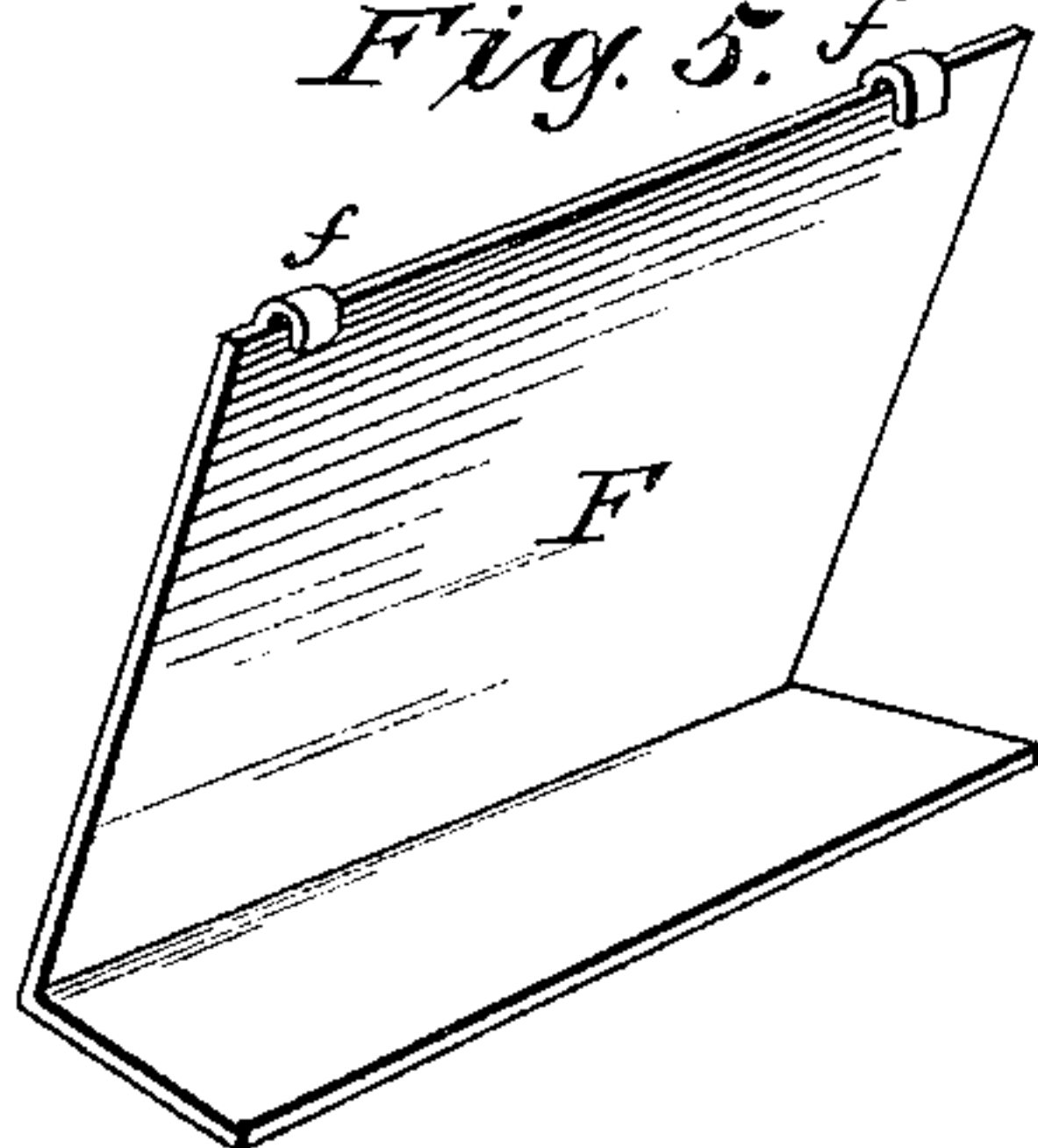


Fig. 4.



*Fig. 5. f*



WITNESSES:  
Fred G. Dieterich  
P. B. Turpin,

INVENTOR:  
*F. E. Mills*  
BY *Munn & Co*  
ATTORNEYS.



# UNITED STATES PATENT OFFICE.

FRANCIS E. MILLS, OF PITTSBURG, PENNSYLVANIA.

## GAS-BURNER ATTACHMENT.

SPECIFICATION forming part of Letters Patent No. 353,494, dated November 30, 1886.

Application filed June 30, 1886. Serial No. 206,740. (No model.)

*To all whom it may concern:*

Be it known that I, FRANCIS E. MILLS, of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Burner Attachments, of which the following is a specification.

This invention is an improved attachment for burners, and is intended especially for use in connection with burners consuming natural gas.

The invention consists, broadly, in an attachment for burners comprising a cage having foraminated or perforated sides and imperforate ends.

It consists, further, in other improvements, as will be described.

The most economical burner (other things being equal) is conceded to be the one now in general use, in which the jet issues in a broad thin sheet from a narrow slit and spreads out laterally as it rises, thus producing a greater degree of tenuity in the film of gas and exposing a larger surface in contact with the air in proportion to the amount of gas flowing than any other form of jet. The wider it spreads laterally the more attenuated it becomes.

The nature of my invention consists, mainly, in inclosing the flame of this class of burners from the base upward for one-third or more of its height with an oblong or elongated cage, whose two sides opposite the flat sides of the flame are formed with small interstitial openings or perforations, through which the external air is drawn into and against the flame from both sides, and whose ends opposite the edges of the flame are closed and imperforate, in order to allow the flame to spread laterally to its greatest possible width and to more effectually heat the gas below.

The operation of the device when placed upon a flat-flame burner is as follows: The ascending flame and rarefied air tend to form a vacuum within the cage, by which the air from the outside is drawn by suction forcibly against the thin flame in fine needle-like streams from both sides, effecting a more thorough commingling of its oxygen with the burning gas than would occur if the air simply floated upward with the flame. The closed ends of the cage protect the edges of the flame from a rush of opposing air from that direction (which if the ends were open would nar-

row and thicken it) and permit it to spread outward to its utmost width and tenuity. Although the perforated sides of the cage, which may be termed a "screen," are in close proximity to the flame, this screen remains comparatively cool, its caloric being imparted to and carried inward by the constantly entering air; but the ends of the cage, being imperforate, become quite hot and impart their heat by conduction to the burner below, raising the gas to a high temperature before it issues from the tip.

The effect of the attachment when placed on the ordinary flat-flamed burner with natural gas is to secure a more perfect combustion and greatly increase the width, steadiness, power, and whiteness of the light; yet, owing to the predominance of hydrogen in the natural gas and the large quantities of aqueous vapor diffused through the flame by its combustion, it still retains a trace of that watery hue characteristic of the natural-gas flame; and in order to remove that and render the flame still whiter I usually place a thin blade of metal vertically within the cage and transversely across the center of the flame, with its lower and sharp edge standing directly over and close to the tip of the burner or base of the flame. The top of the blade, which I call the "dividing-blade," may reach as high as the top of the cage, or even higher, without detriment. The effect of this blade is to tap the flame at that point where the combustion is in its nascent state, bisect it, and draw off a large proportion of the burning hydrogen, with its aqueous vapor, in a central column by itself, leaving the solid particles of carbon to float upward on either side, where, relieved largely of their watery envelope, they glow with increased brightness.

Having described the principal features of my improvement, I will now describe the preferred and particular construction, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical longitudinal, and Fig. 2 a vertical transverse, section of my improvement in place on a burner. Fig. 3 is a top plan view of the attachment. Fig. 4 shows one form of shield. Fig. 5 shows another form of shield, and Fig. 6 is a detail perspective view of the main frame.

The main frame A is formed with a base-



plate, 1, having perforations 2, which may be covered by wire-gauze, with upwardly-extended imperforated end wings, 3, and short upwardly-extended side wings, 4. These latter serve as supports for the dividing-blade B, and are formed with grooves 5, to receive such blade, as shown. These side wings also serve to protect the base or root of the flame from side draft. The dividing-blade B is arched or cut out at 6, forming legs *b*, to allow as long a support as possible in the holding-slots of the side wings. The end wings, 3, form the imperforate ends of the cage, and the perforated sides C may be of perforated metal, as shown, or of wire frame or netting, or may be of glass wire. For general use, I prefer perforated sheets of metal; but glass wire may be used and the screen extended above the top of the flame, if desired, constituting an interstitial glass chimney, in which case none of the light would be obscured by the meshes.

The perforated screen I generally make in the form of a band having its ends fastened suitably together, and adapted to fit over the wings of the frame and rest down on the outwardly-extended flange 7.

The invention is designed, principally, as an attachment to be placed on burners already in use where natural gas is employed as the illuminant, and is furnished with a socket so constructed that it may be easily slipped over the burner and secure the cage firmly in place. To this end the frame is provided with a central depending tubular boss, D, having an external thread, the opening through the boss being large enough to receive the small end of the ordinary "fan-tailed," "bat-wing," or "maple-leaf" burner. Onto this boss I thread one end of a short tube, E, the lower end of which is large enough to fit over the large ends of an ordinary burner, and in the lower end of the tube I form slits *e*, which permit the tube to be expanded or contracted to fit different burners, though varying somewhat in size at their lower ends. By this construction of the socket I give it two bearings on the tube of the burner—one at its upper and one at its lower end—and thus secure the cage firmly in an upright position.

When a lamp or burner is exposed to strong drafts or currents of air, I hang a shield, F, usually of thin metal, on either side of the cage, and provide them in the construction shown with small hooks *f*, which catch over the upper edge of the cage. This shield rests at its upper edge close to the cage, while its lower edge is held out therefrom. This shield may be open at the bottom and closed at the sides, as shown in Fig. 4, or be closed at the bottom and open at the sides, as shown in Fig. 5, the air in each case entering through the open space, as will be readily understood.

Heretofore a lamp with a flat wick for burning oil has been invented in which two perforated wings rise up by the sides of the flame; but it has no inclosure at the edges of the flame. Circular flames have also been sur-

rounded by a perforated cylinder in a gas-stove and in a packed oil-lamp with a round wick; but in such cases there are no imperforate ends for the cages.

In the class of burners to which my invention is applied the impulse given to the gas is outward as well as upward, and the closed ends of the cage operate to create a vacuous space in that direction, which draws the flame still farther outward and widens the flame—results not attained in either of the cases above referred to.

While the attachment is especially intended for application to the burners now in use, it will be understood that it would involve no departure from the broad principles of the invention to form the burner integral with or secure it permanently to the attachment.

Having thus described my invention, what I claim as new is—

1. In a burner attachment, a cage having perforated or foraminated sides and imperforate ends, substantially as and for the purposes specified.

2. In a burner attachment, the combination, with the main frame having end wings forming the imperforate ends of the cage, of the foraminated sides connected with and supported by said main frame, substantially as set forth.

3. A burner attachment comprising a cage having imperforate ends and foraminated sides, and provided with short imperforate side wings, whereby to protect the root or base of the flame, substantially as set forth.

4. The combination of the flame-inclosing cage having foraminated or perforated sides and the flame-dividing blade, substantially as set forth.

5. The combination of the main frame having end wings and side wings, the latter being provided with vertical grooves, the foraminated sides having their ends connected, forming a band fitted over the wings of the main frame, and the flame-dividing blade fitted into the grooves of the side wings, substantially as set forth.

6. A burner attachment comprising a cage having foraminated sides and imperforate ends, and provided with a socket provided with two bearings or points of contact for engaging the burner, substantially as set forth.

7. The combination, in a burner attachment, with a cage having foraminated sides, of a shield supported alongside of said cage and diverging outwardly toward its lower end, substantially as set forth.

8. In a burner attachment, the combination of the main frame having imperforate end wings, and side wings having vertical grooves, the foraminated sides, and the flame-dividing blade fitted into the grooves of the side wings, substantially as set forth.

FRANCIS E. MILLS.

Witnesses:

W. W. GUY,

JAMES FITZGERALD.