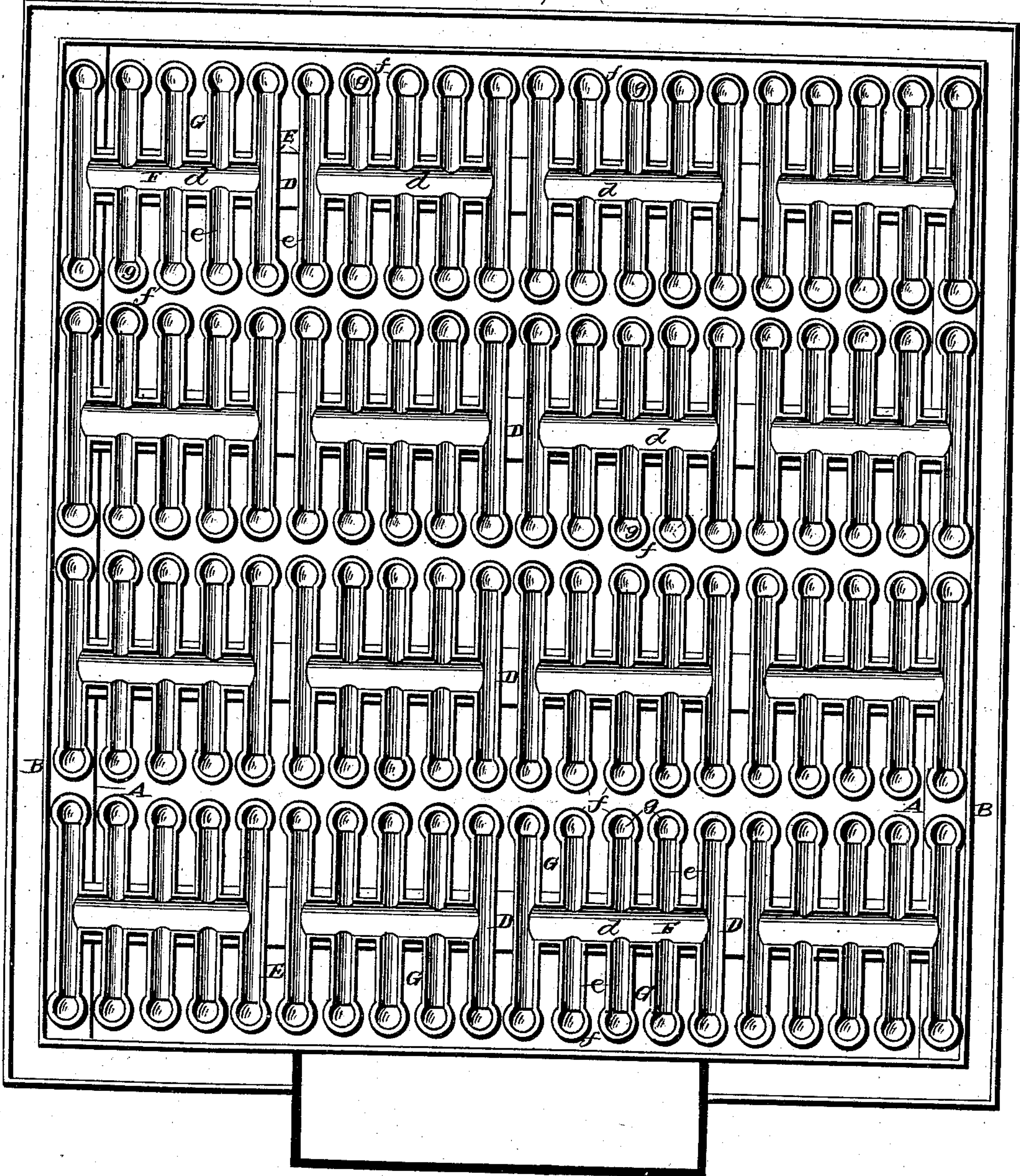


H. F. HAYDEN.
Furnace-Grate.

No. 215,274.

Patented May 13, 1879.

Fig 1



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Fig. 2.

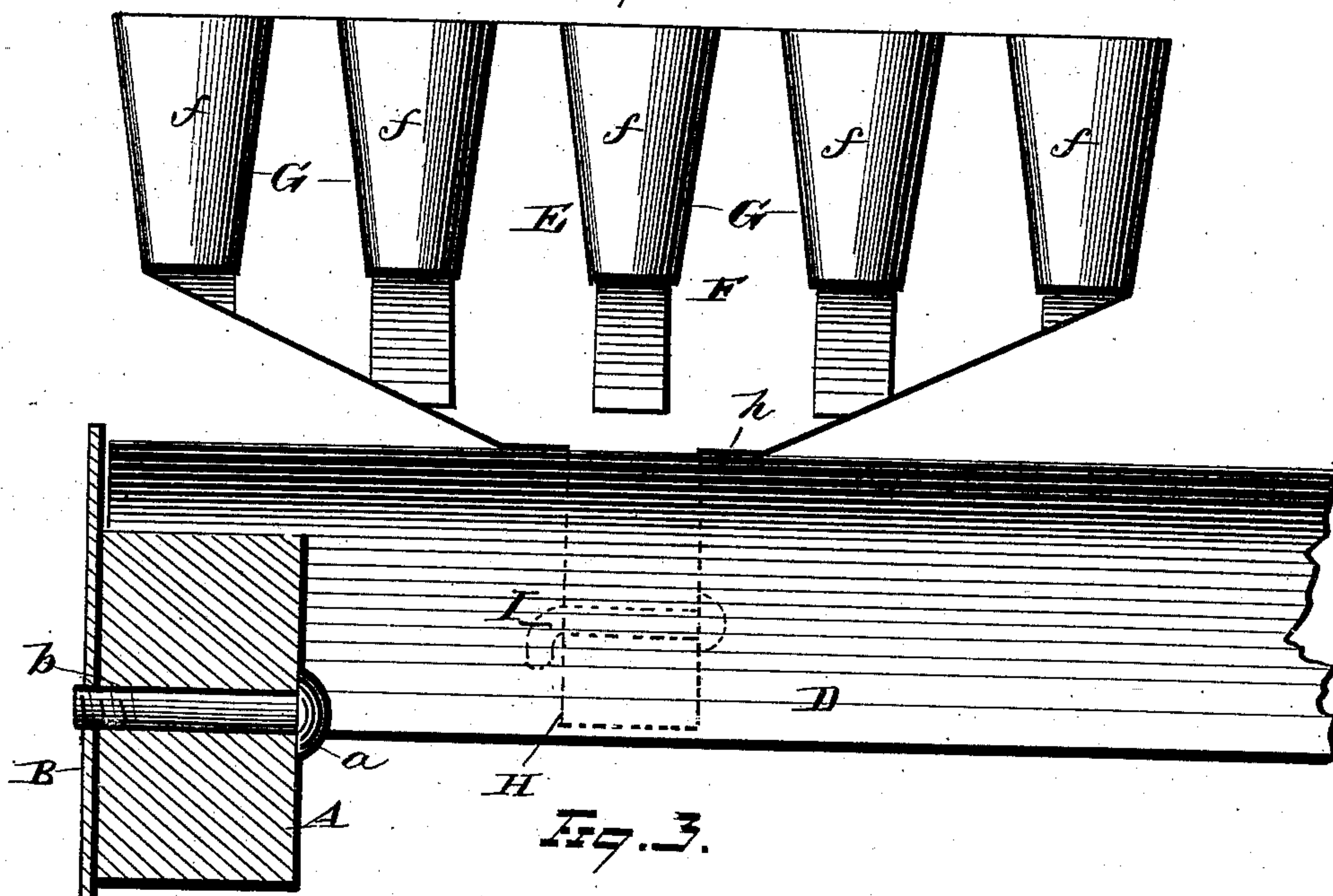
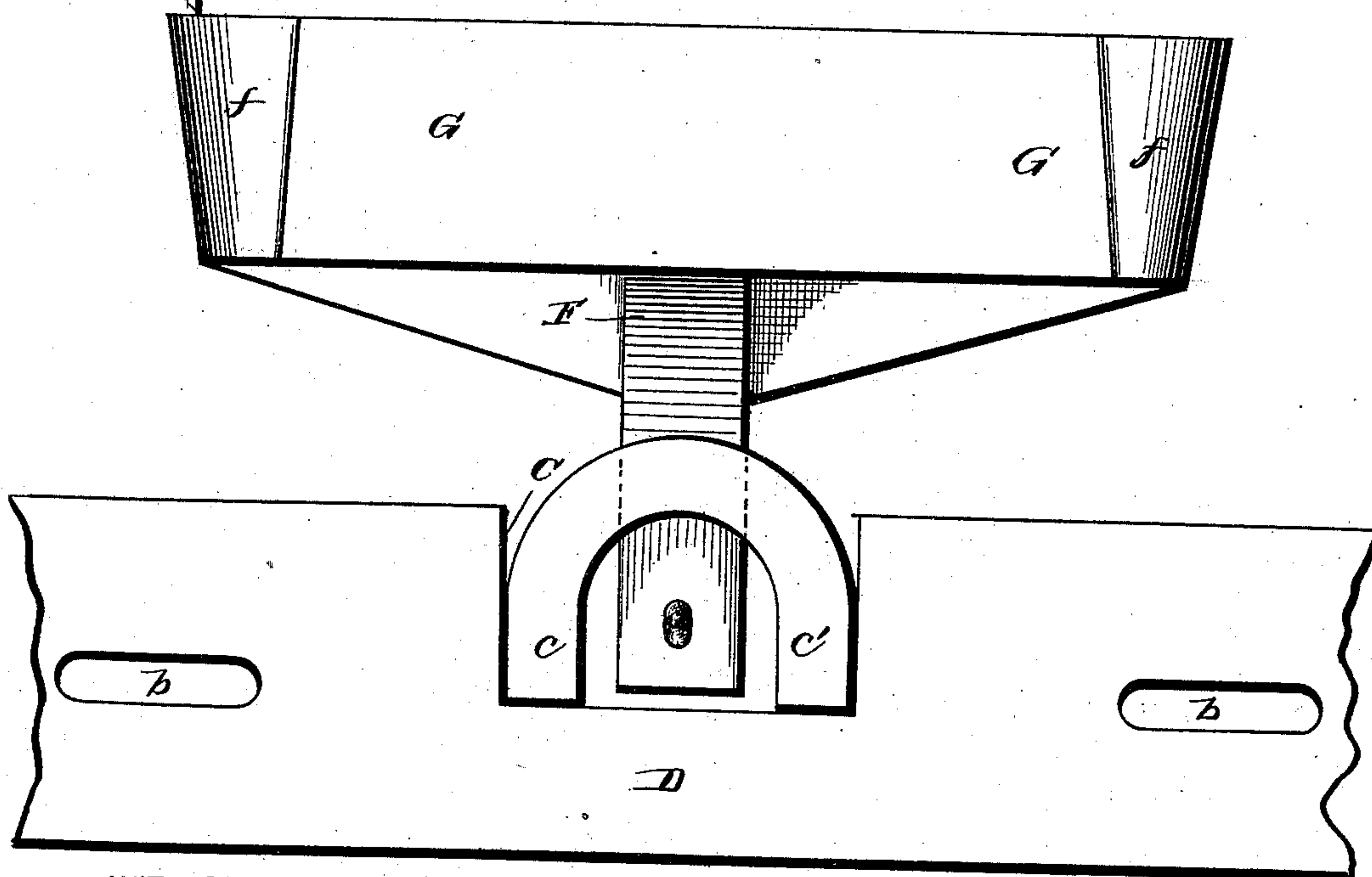


Fig. 3.



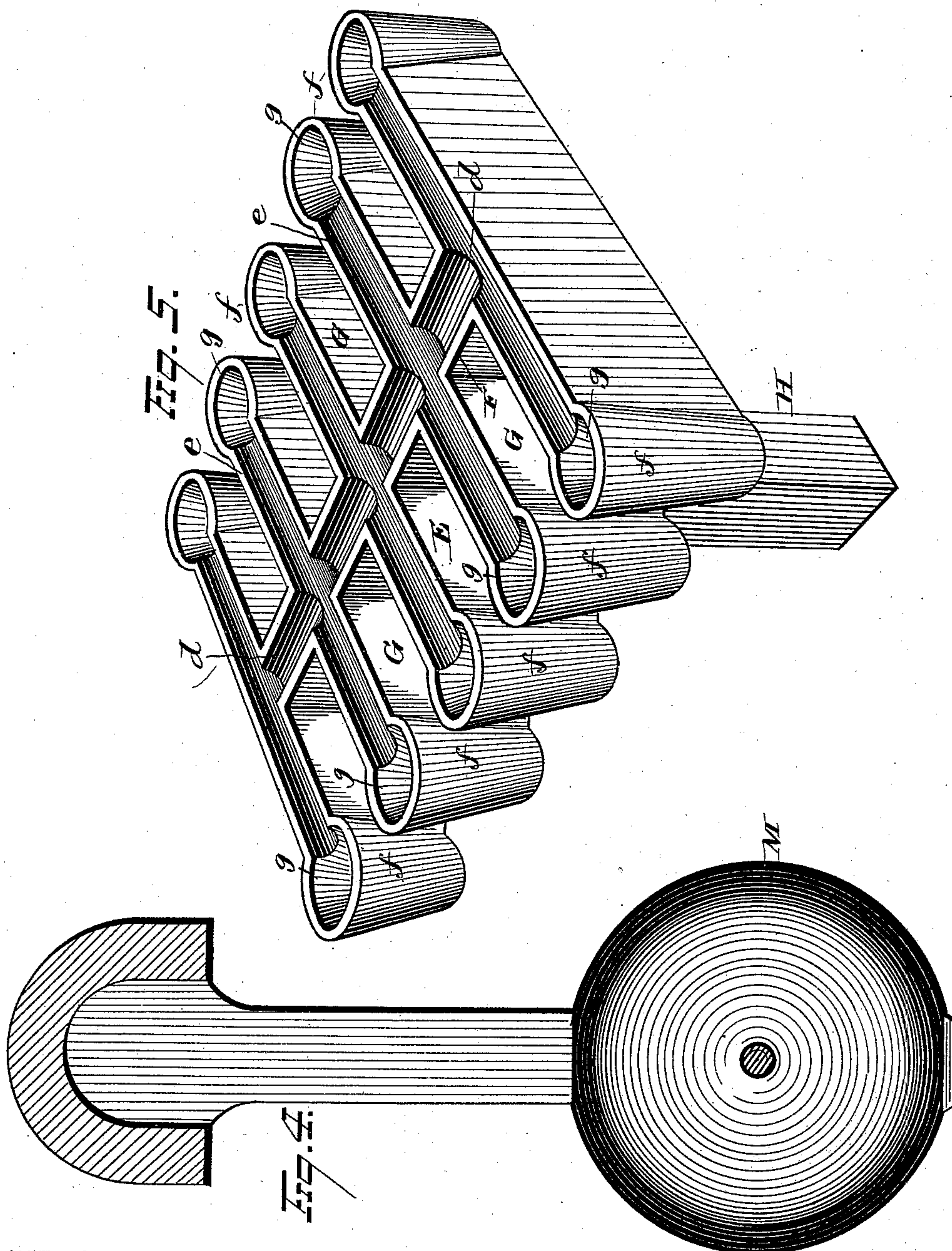
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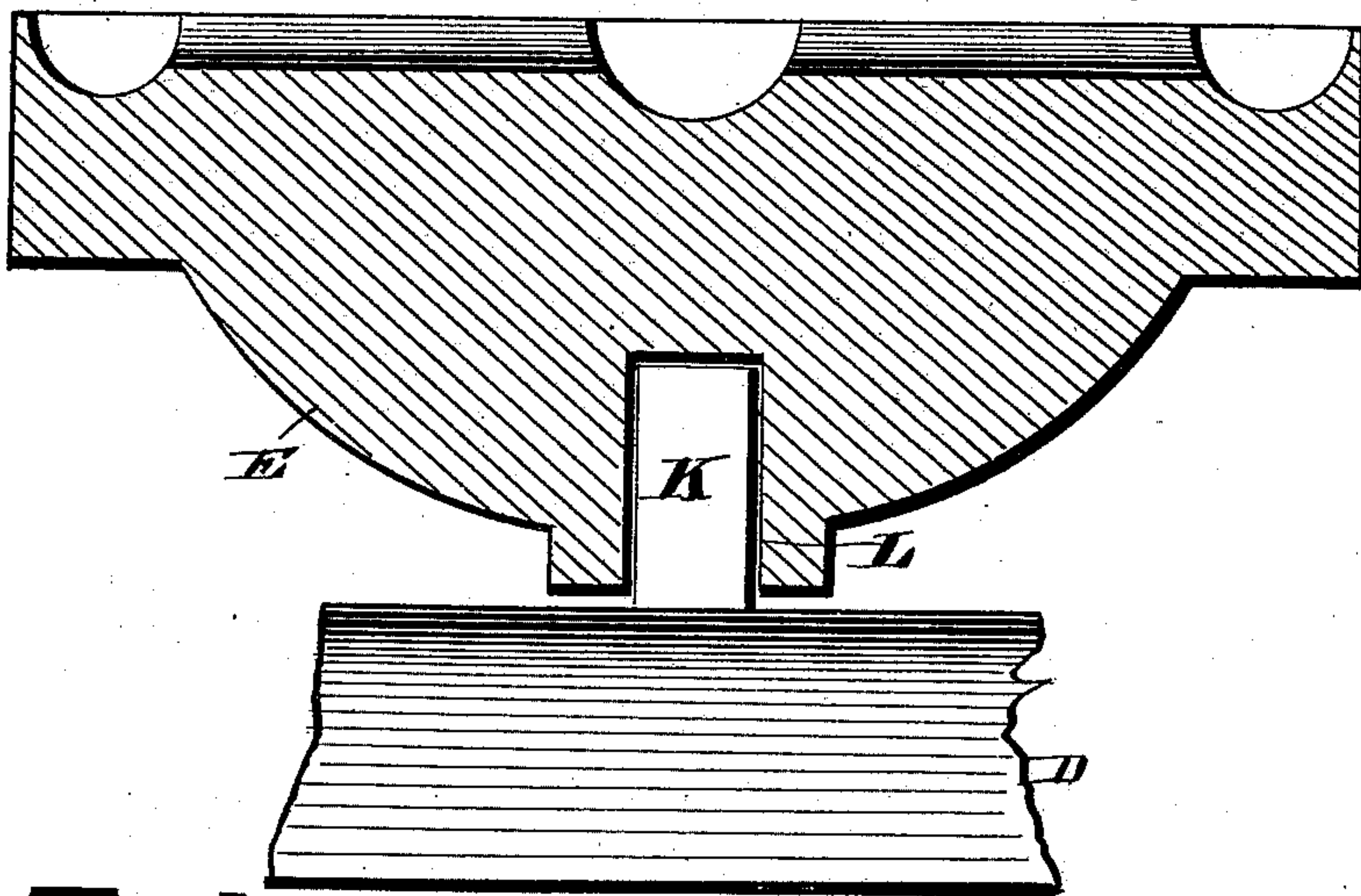


Fig. 6.

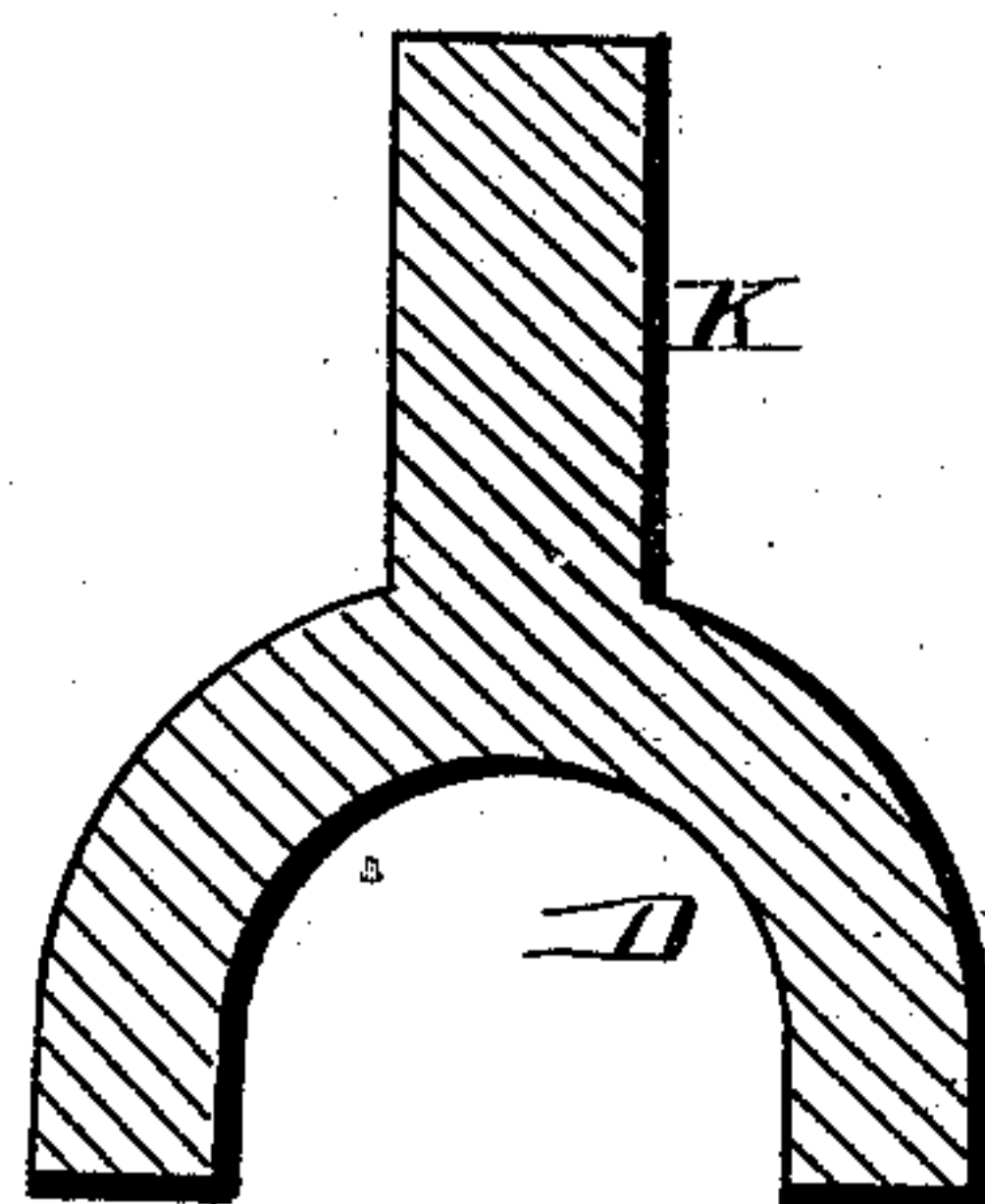
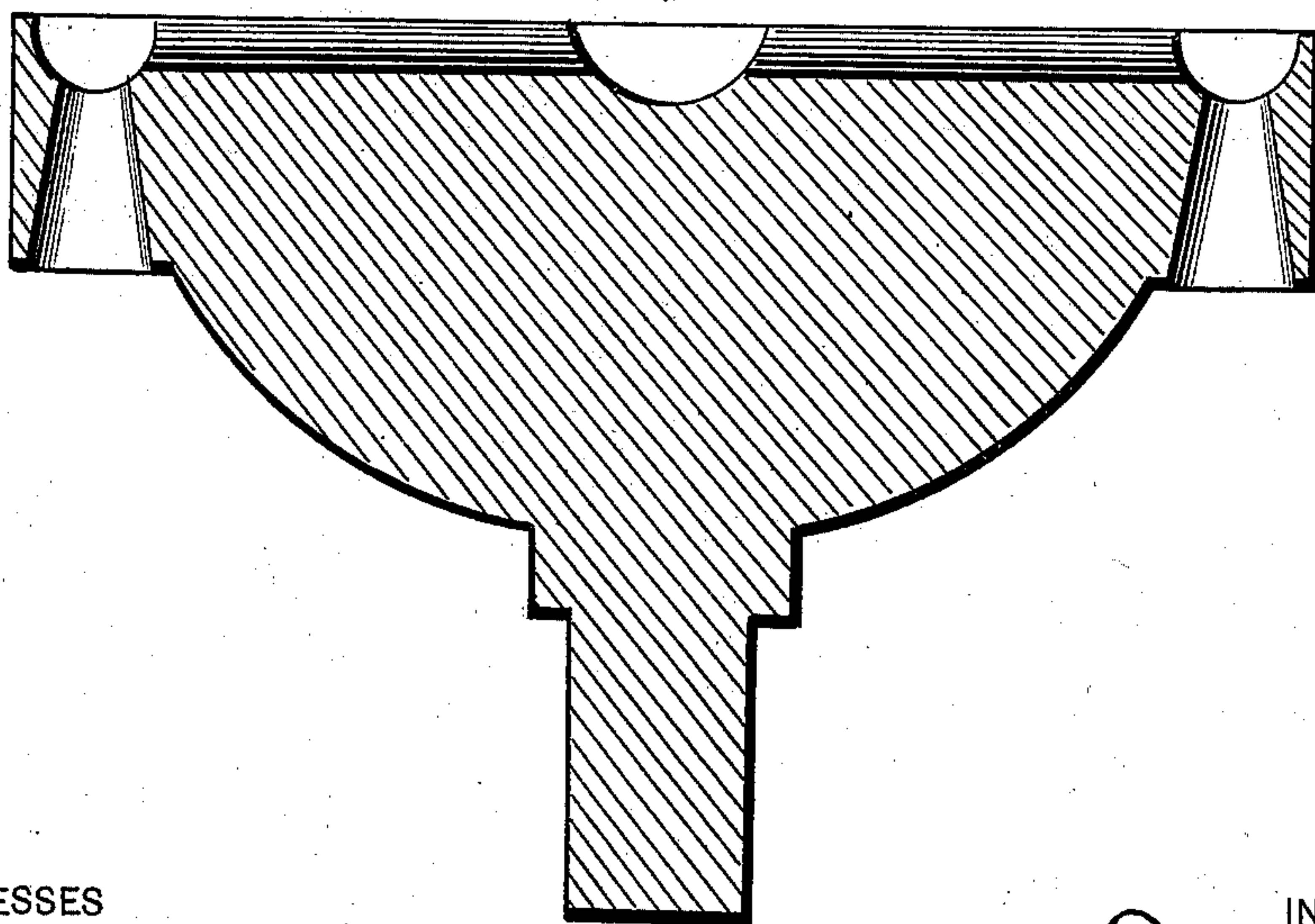


Fig. 7.



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UNITED STATES PATENT OFFICE.

HENRY F. HAYDEN, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR
TO ELIZABETH S. HAYDEN, OF SAME PLACE.

IMPROVEMENT IN FURNACE-GRATES.

Specification forming part of Letters Patent No. **215,274**, dated May 13, 1879; application filed
April 2, 1879.

To all whom it may concern:

Be it known that I, HENRY F. HAYDEN, of Washington, in the District of Columbia, have invented certain new and useful Improvements in Renewable Grates for Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to an improvement in renewable furnace-grates, the object being to provide a grate for furnaces of such construction that it will admit of the supply of the maximum quantity of air to the bed of burning fuel, will be thoroughly protected against rapid destruction by reason of the warping of the bars, due to expansion and contraction, will withstand great heat without danger of burning out the bars, or causing the slug to melt upon and become firmly attached to the upper surface of the grate, and also a grate so constructed that any section thereof may be readily renewed at small expense without removing or disturbing the main portion of the grate; and with these several ends in view my invention consists, first, in the combination, with a bearing-bar, of renewable grate-bar sections, each of which consists of a central web furnished with a series of short transverse grate-bars, the upper surface of the central web and transverse bars constructed with intersecting ash channels or grooves.

My invention further consists in the combination, with a bearing-bar, of renewable grate-bar sections, each of which consists of a central web furnished with a series of short transverse grate-bars having rounded ends, the upper surfaces of the central web and transverse bars constructed with ash channels or grooves, and the extreme ends of the transverse bars being provided with ash-pockets.

My invention further consists in the combination, with a bearing-bar provided with a suitable number of perforations, of renewable grate-bar sections, each of which is constructed with a central web furnished with a series of short transverse grate-bars having ash channels or grooves in their upper surfaces, and provided

with a shouldered shank, which fits into one of the perforations in the bearing-bar.

My invention further consists in the several other details of construction and arrangement of parts, as will hereinafter be described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a plan view of my improved renewable furnace-grate. Fig. 2 is a detail end view, and Fig. 3 a side view. Fig. 4 is a modification, illustrating a counterbalance-weight attached to the bearing-bar to retain the renewable grate-sections in horizontal position. Fig. 5 is an enlarged view, in perspective, of one of the grate-sections. Fig. 6 is a modified form of construction for securing the grate-sections to the bearing-bar, and Fig. 7 is a modified construction of grate-section.

A represents the side bars of a furnace-grate, and may be secured to the inner walls of the water-legs B of a locomotive fire-box by means of the bolts *a*, extending through the elongated slots or openings *b* in the side bars. This method of attachment allows of the free expansion and contraction of the side bars without injury to the water-leg of the fire-box, or causing undue strain on the fastening-bolts. Instead of securing the side bars to the fire-box of a locomotive, it may be secured to or within the side walls of the fire-box of a stationary boiler in any suitable manner, it being understood that my grate is equally well adapted for use either in stationary or portable fire-boxes. Side bars, A, are provided with openings C, located at any desired distance apart, within which openings are supported the opposite ends of the bearing-bars D. If the bearing-bars are designed to be stationary, their ends will be provided with flat bearings, to prevent any rocking movement of the bars or grate-sections while in use. If, on the other hand, it is desired to rock the bearing-bars and grate-sections secured thereto, the opposite ends of the bars will be made cylindrical or semi-cylindrical, to insure such manipulation of the grate.

Bearing-bars D are preferably constructed of inverted-U-shaped form, in order that ashes will be prevented from lodging on the upper surfaces of the same, and thus insure free and

open air-passages through all parts of the grate, while the depending flanges *c c'* dispose the metal in such a manner that a comparatively light bearing-bar will be of ample strength to resist the transverse strain brought to bear thereon by the weight of the bed of fuel.

E represents the renewable grate-sections, and are constructed with a central web, *F*, having the short transverse grate-bars *G* projecting laterally at right angles from opposite sides thereof. The upper surface of the central web, *F*, is formed with a channel or groove, *d*, with which intersect the series of ash channels or grooves *e*, formed in the upper surfaces of the several transverse grate-bars *G*. The outer ends of the bars *G* are provided with slightly-enlarged rounded ends *f*, within the upper ends of which are formed ash-pockets *g*. To the central web, *F*, is connected a shank, *H*, of angular form, which fits within a correspondingly-formed socket or perforation in the bearing-bar, and thus the grate-sections are prevented from rotating or becoming displaced. Shank *H* is furnished with a shoulder, *h*, which rests upon the upper surface of the bearing-bar, and thus supports the bed of burning fuel at a sufficient distance above the bearing-bar to effectually prevent the undue heating of the same.

The peculiar form of my improved grate-sections is of great importance in securing valuable and improved practical results. The short transverse bars project only a slight distance from the central web, with which they are connected, and thus are prevented from becoming warped or disarranged by the expansion and contraction of the metal, due to heat and cold. Should the heat be sufficiently great to warp the bars, they cannot bend sufficiently to clog or seriously impair the utility of the grate-surface, as the enlarged rounded ends of the bars, if forced in contact with one another, will preserve a free passage for air between the grate-bars and around their ends. The ash grooves or channels in the upper surfaces of the transverse grate-bars and central web allow of the deposit and retention of a protecting bed of ashes over the entire grate-surface, and this surface prevents the direct action of the heat on the bars and central web, and hence insures a much longer existence to the grate. Again, the comparatively sharp sides constituting the ash channels or grooves in the upper surface of the renewable grate-surface greatly facilitate the "slicing" of the fire, as the ashes and consumed portions of the fuel are readily detached by stirring the fuel.

The rounded ends of the transverse grate-bars not only increase the durability of the bars, as this form does away with sharp corners, which, if unprotected, are quickly attacked and burned away by the heat, but such rounded ends also facilitate the slicing of the fire, as the slicing-bar, when forced to and fro over the grate-surface, will be deflected laterally when the end thereof strikes one of the

rounded ends, and thus the slicing of the fire is rendered more complete and effectual without any corresponding increase of labor to the attendant.

In Fig. 1 of the drawings I have represented the bearing-bars as being each provided with four renewable grate-sections; but it is evident that a greater or less number of such sections may be attached to a single bearing-bar.

I have set forth some of the many advantages resulting from the employment of a grate constructed in accordance with my invention; but one of the prime objects and a valuable feature of my invention is, that the grate-sections may be readily renewed, and the entire grate preserved in complete working order at a small cost.

In all furnaces the different portions of the grate-surface are subjected to varying degrees of heat, and herein the main portion of the grate may be in good condition while a single portion is burned away. When grate-bars running the width or length of the fire-box are employed, it is often necessary to remove and throw away an entire bar, for the reason that one end or that some portion of the bar has been burned away. This is expensive, not only by reason of the great waste of material, but much time and labor is called for in the removal and replacement of the grate-bars now in use.

In my improved grate it is only necessary to remove that portion of the grate which has become impaired and unfit for use, and this is readily accomplished without disturbing the remaining portion of the grate-surface, and also effected without any undue waste or loss of material.

I do not limit myself to any particular method of attaching the renewable grate-sections to the bearing-bar, as they may be secured by means of a pin, *I*, extending through the shank below the bearing-bar; or the bearing-bar may be formed with arms *K*, and the grate-sections with a socket, *L*, which fits upon said arm, as illustrated in Fig. 6.

If desired, a counterbalance-weight, *M*, may be attached or cast solid with the bearing-bar, when the latter is designed to rotate as illustrated in Fig. 4, said weight serving to retain the grate-sections in a horizontal position.

Again, the grate-sections may be held in stable equilibrium by constructing the bearing-bars with crank-arms, and arranging the grate-sections so that the upper surfaces thereof will be below a horizontal plane cutting the axes of said crank-bearings.

Fig. 7 shows a modified construction of grate-sections, the ends of the transverse bars being perforated to admit of the passage of a current of air, and thus supply the bed of fuel with air-jets at the extreme ends of the bars, which will have the effect of keeping the ends from becoming heated to the point of fusion.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a bearing-bar, of detachable and renewable grate-bar sections, each consisting of a central web furnished with a series of short transverse grate-bars, the upper surfaces of the central web and transverse bars provided with intersecting ash channels or grooves, constructed and arranged substantially as set forth.

2. In a furnace-grate, the combination, with a bearing-bar, of renewable grate-bar sections, each constructed with a central web furnished with a series of short transverse grate-bars having rounded ends, the upper surfaces of the central web and transverse bars provided with intersecting ash channels or grooves, and the opposite ends of the bars provided with ash-pockets, substantially as set forth.

3. In a furnace-grate, the combination, with a bearing-bar provided with any suitable number of perforations or sockets, of renewable grate-sections, each constructed with a central web furnished with a series of short transverse grate-bars having ash channels or grooves in their upper surfaces, and provided with a

shouldered shank adapted to fit within one of the openings or sockets in the bearing-bar, substantially as set forth.

4. In a furnace-grate, the combination, with a bearing-bar provided with a depending counterbalance-weight, of renewable grate-bar sections, each constructed with a central web furnished with a series of short transverse grate-bars, the upper surfaces of said central web and transverse bars constructed with ash channels or grooves, substantially as set forth.

5. In a furnace-grate, the combination, with a series of bearing-bars, of a series of renewable grate-sections, each of the latter consisting of a central web furnished with short transverse grate-bars provided with enlarged rounded ends, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 1st day of April, 1879.

HENRY F. HAYDEN.

Witnesses:

F. O. McCLEARY,
A. W. BRIGHT.