

(No Model.)

6 Sheets—Sheet 1.

G. ALEXIS-GODILLOT.

FIRE GRATE.

No. 297,548.

Patented Apr. 22, 1884.

Fig. 1

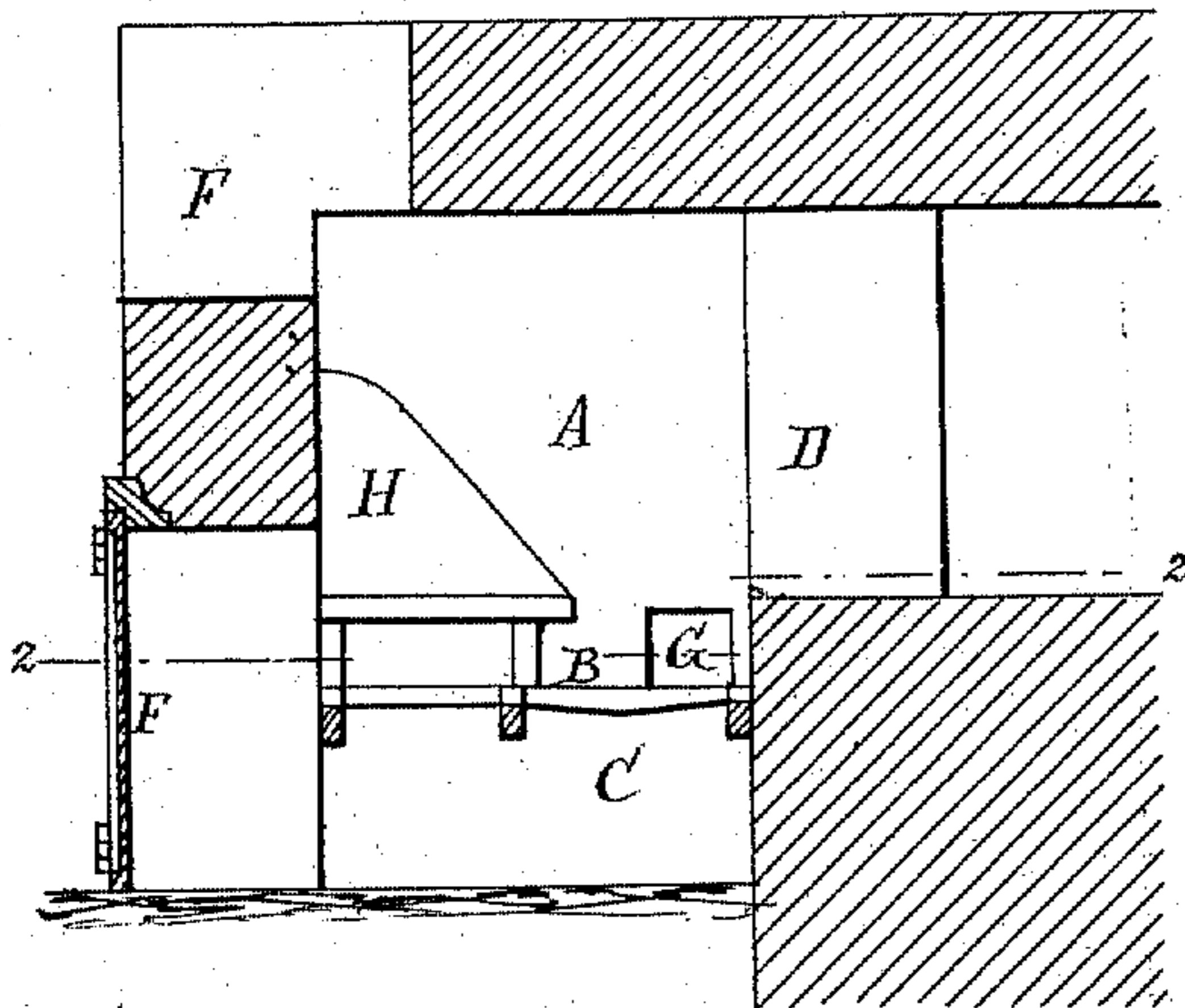


Fig. 3

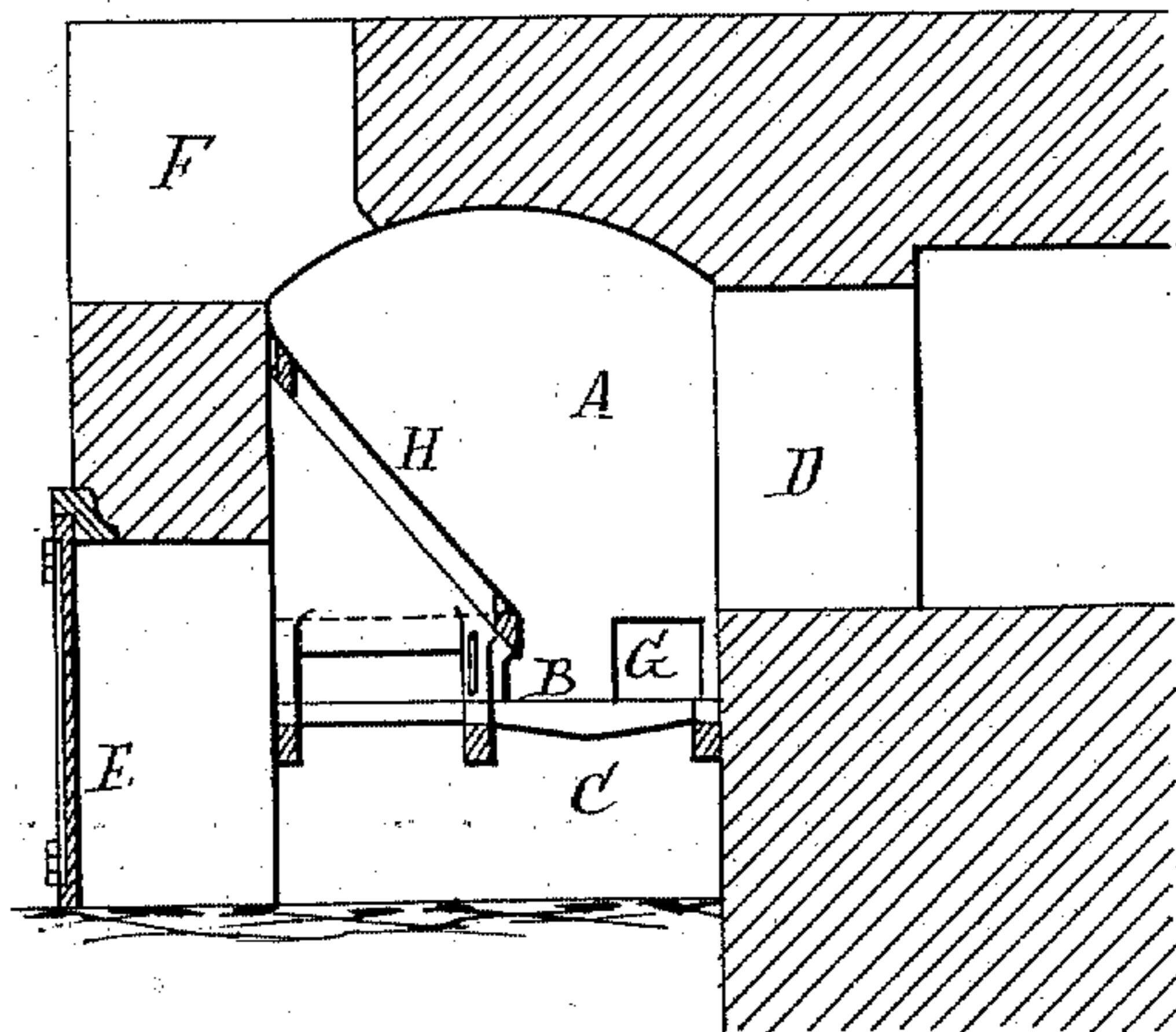


Fig. 2

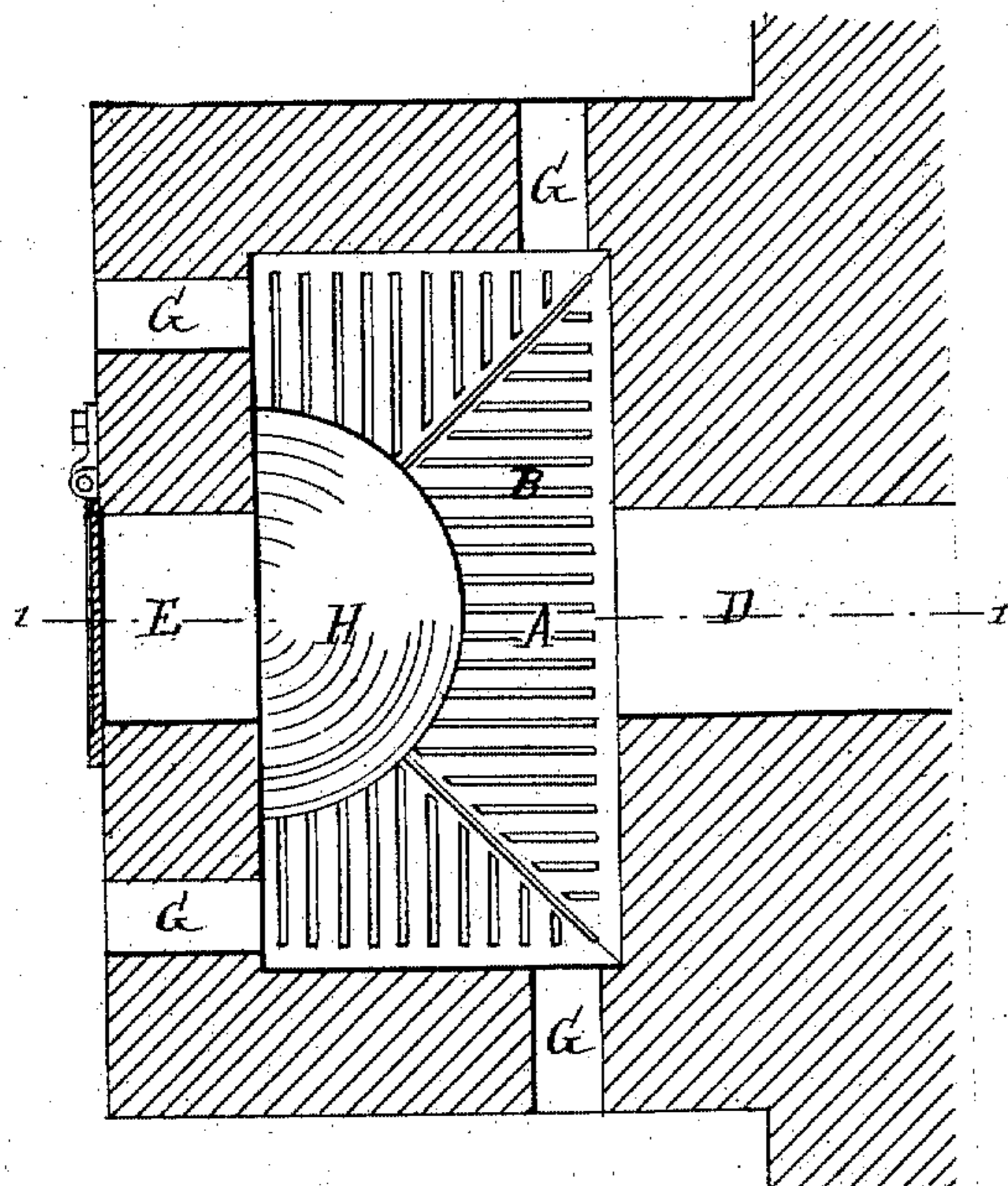
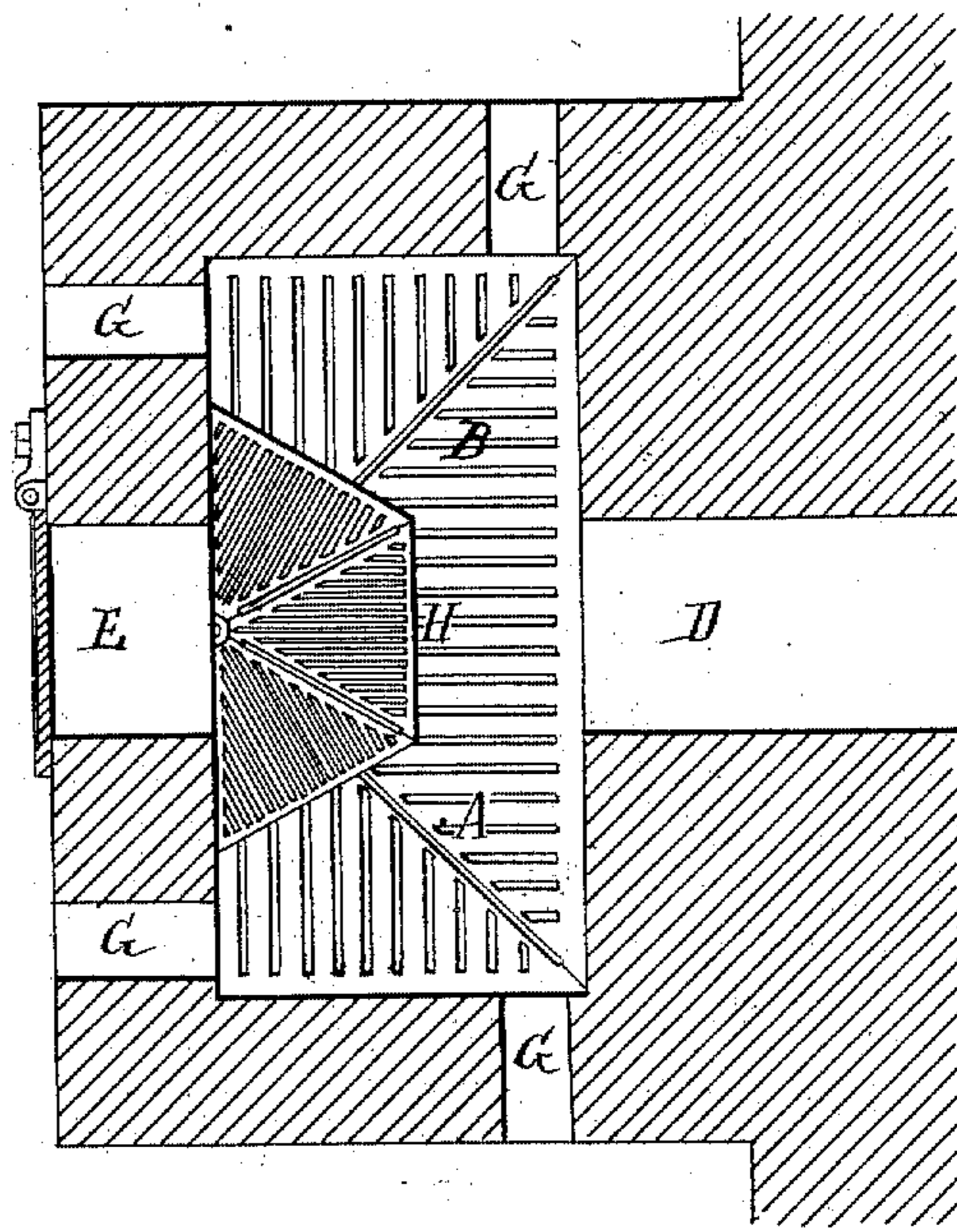


Fig. 4



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INVENTOR:

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By his Attorneys,

*Burke, Tracy & Company*

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Fig. 5

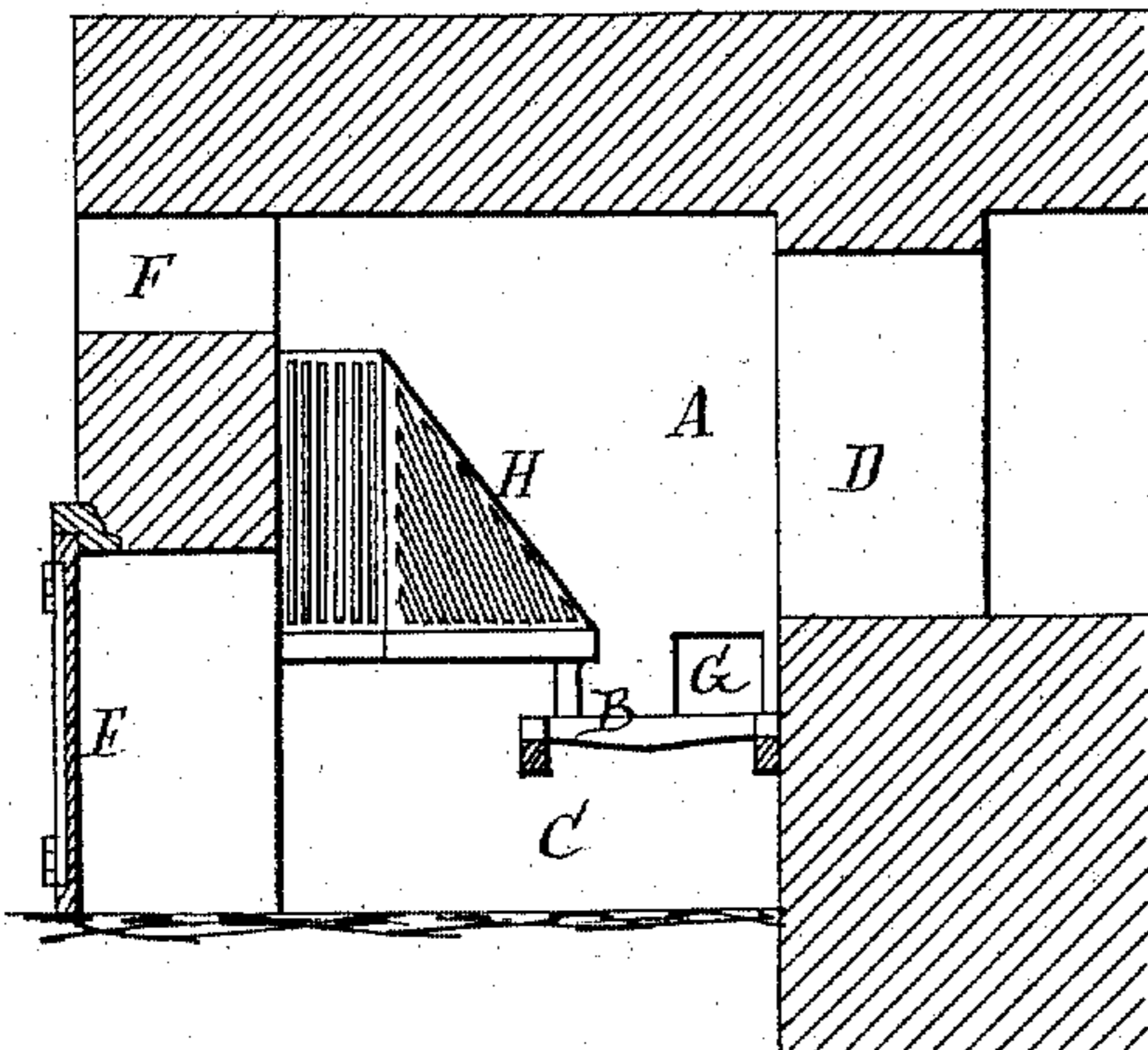


Fig. 7

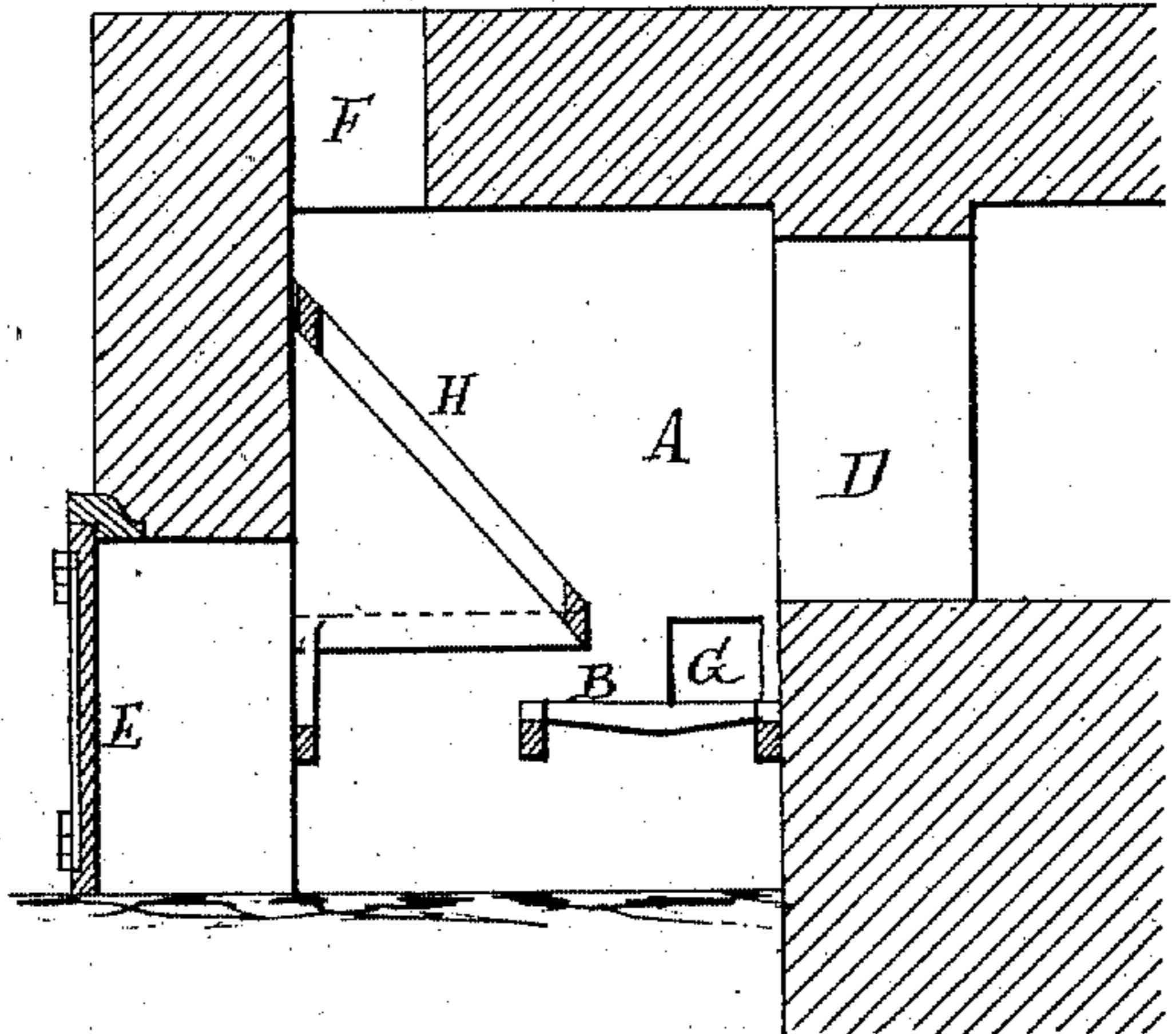


Fig. 6

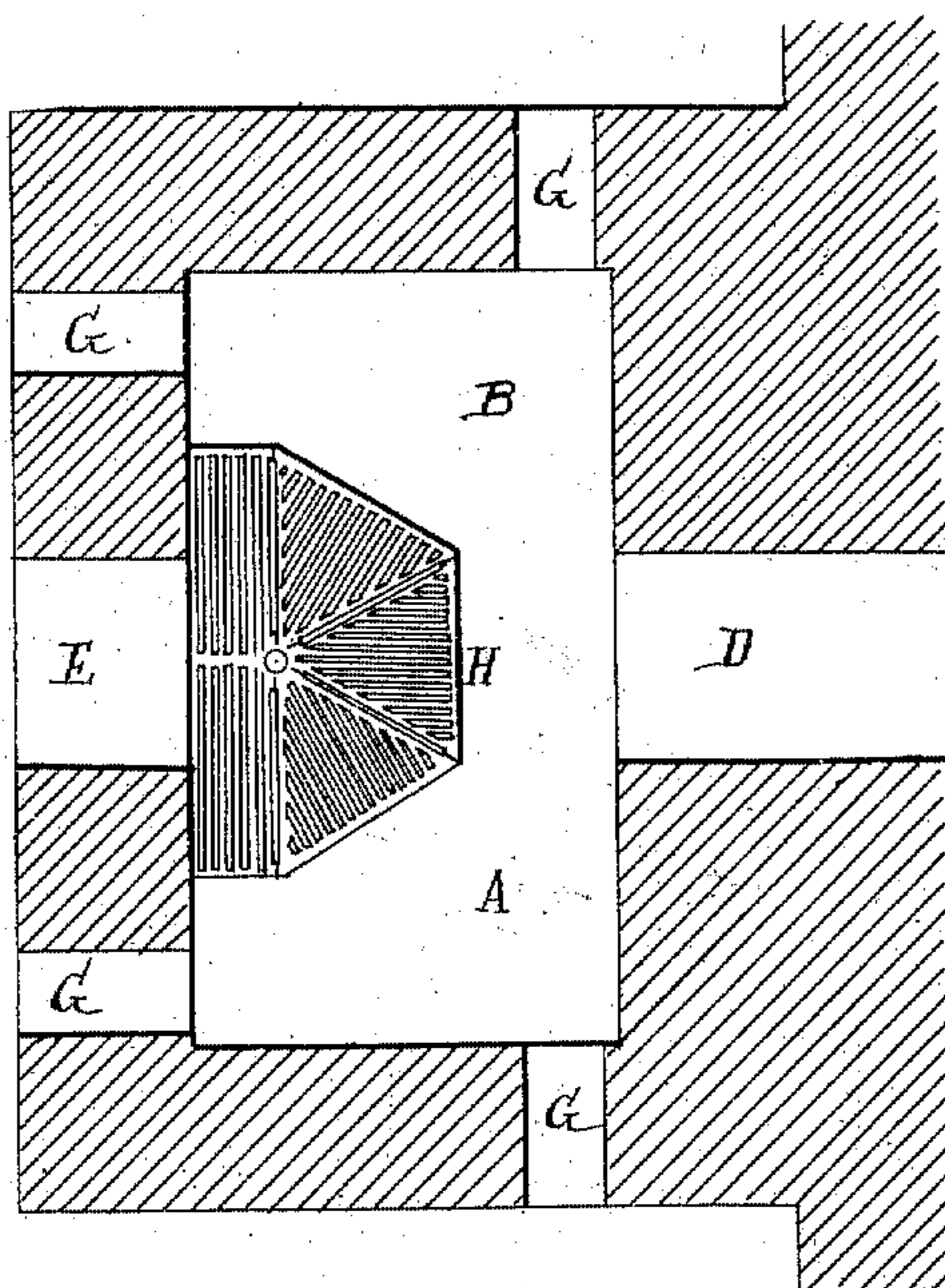
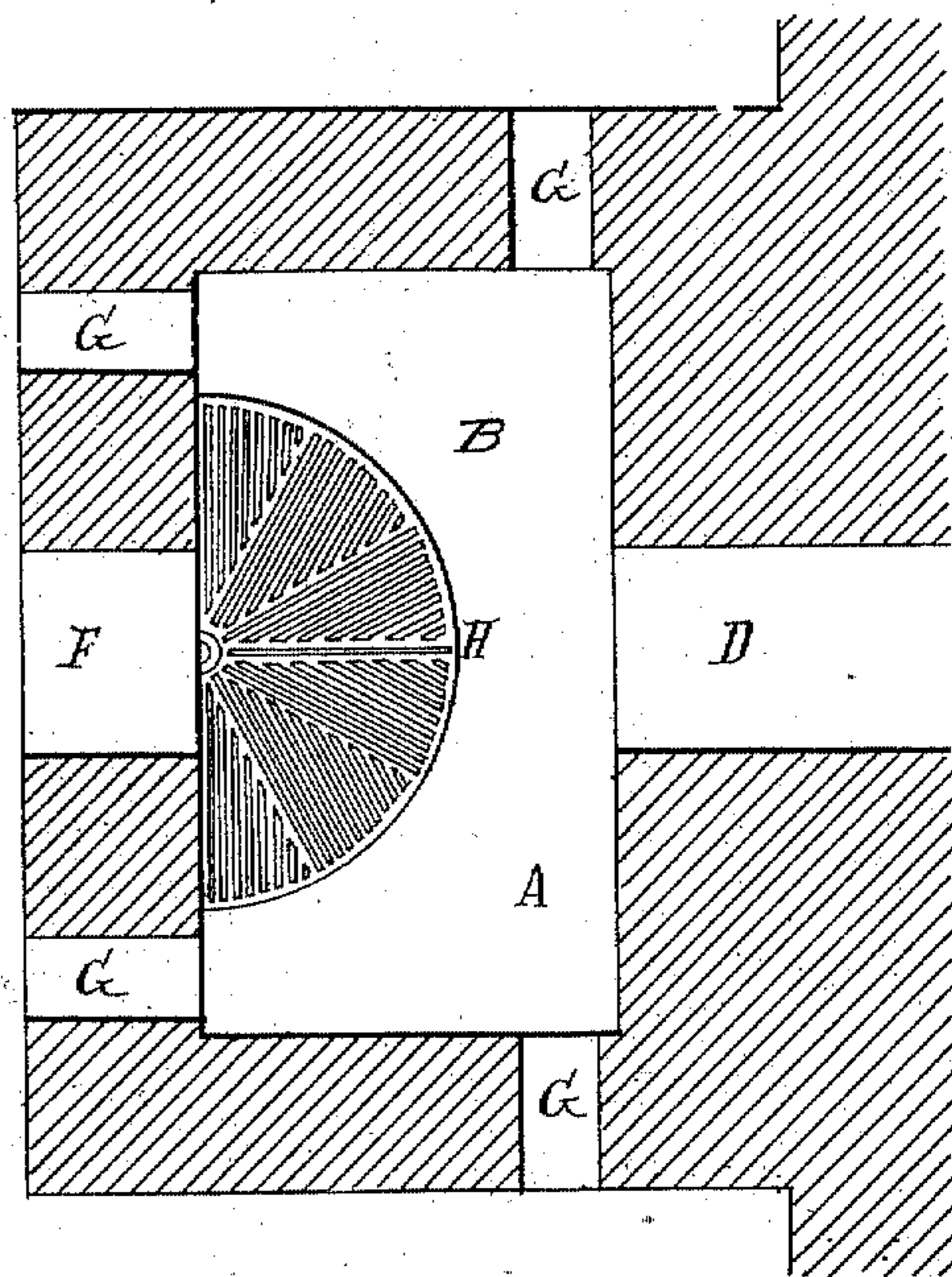


Fig. 8



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Patented Apr. 22, 1884.

Fig.9

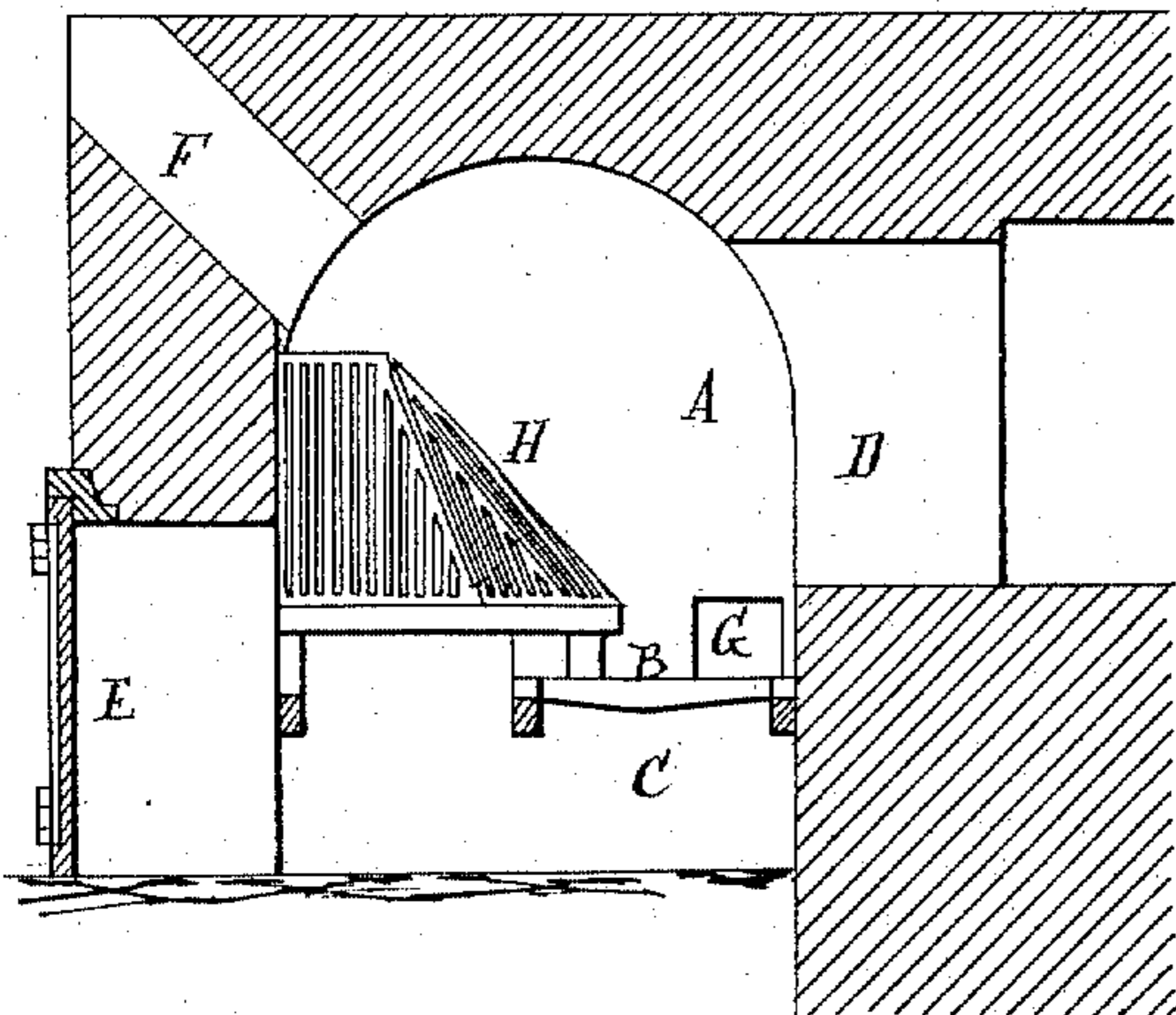


Fig.11

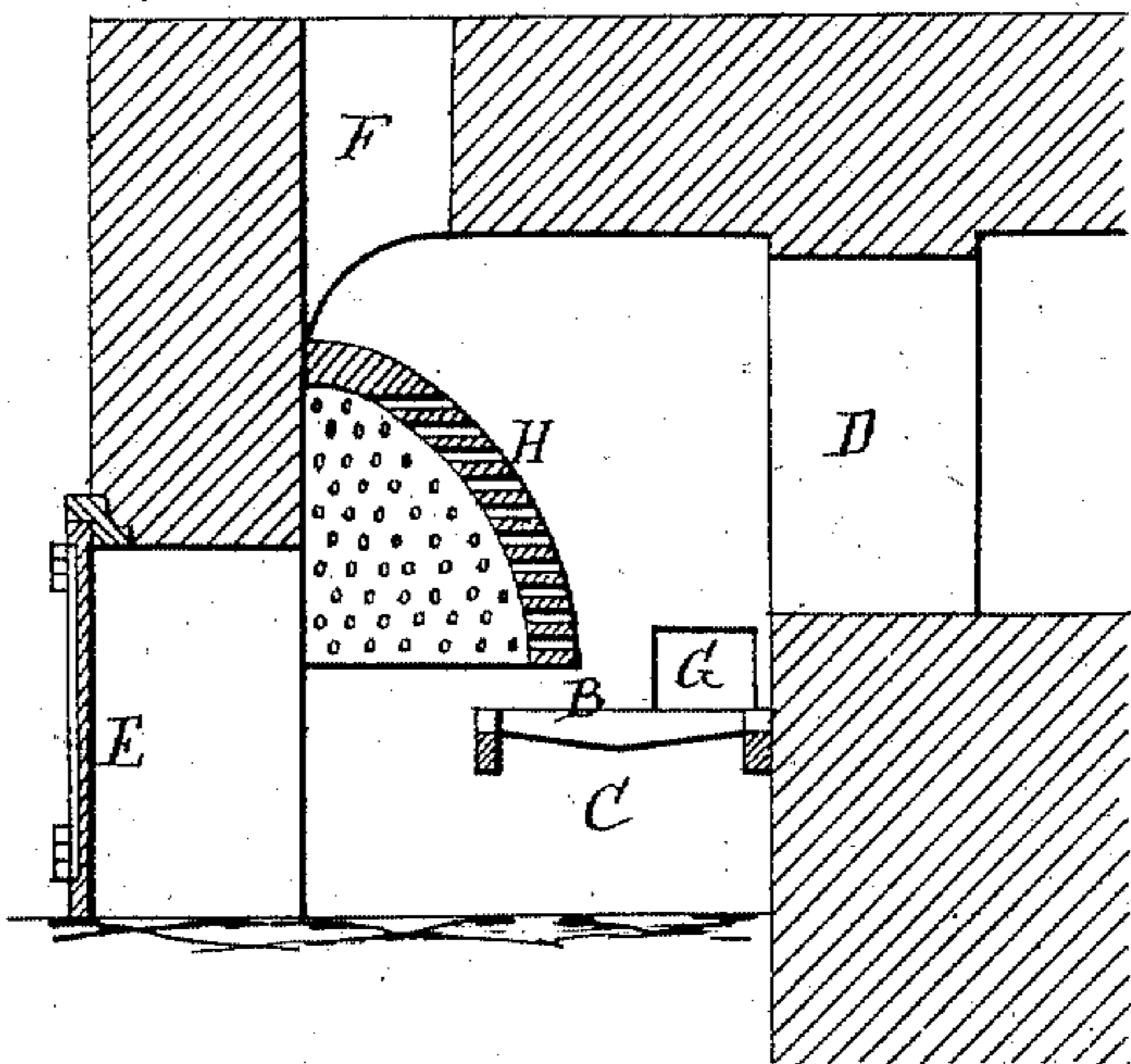


Fig.10

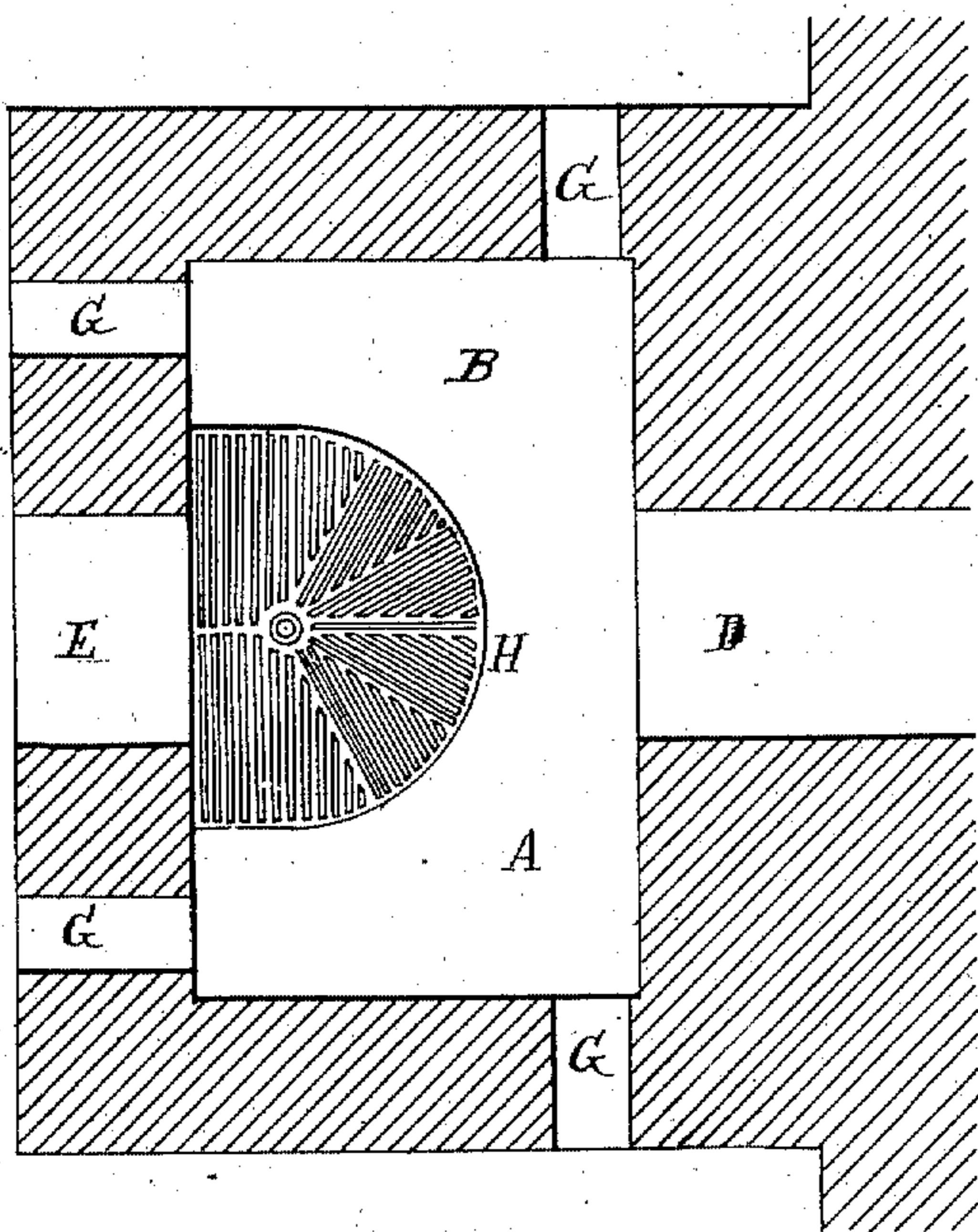
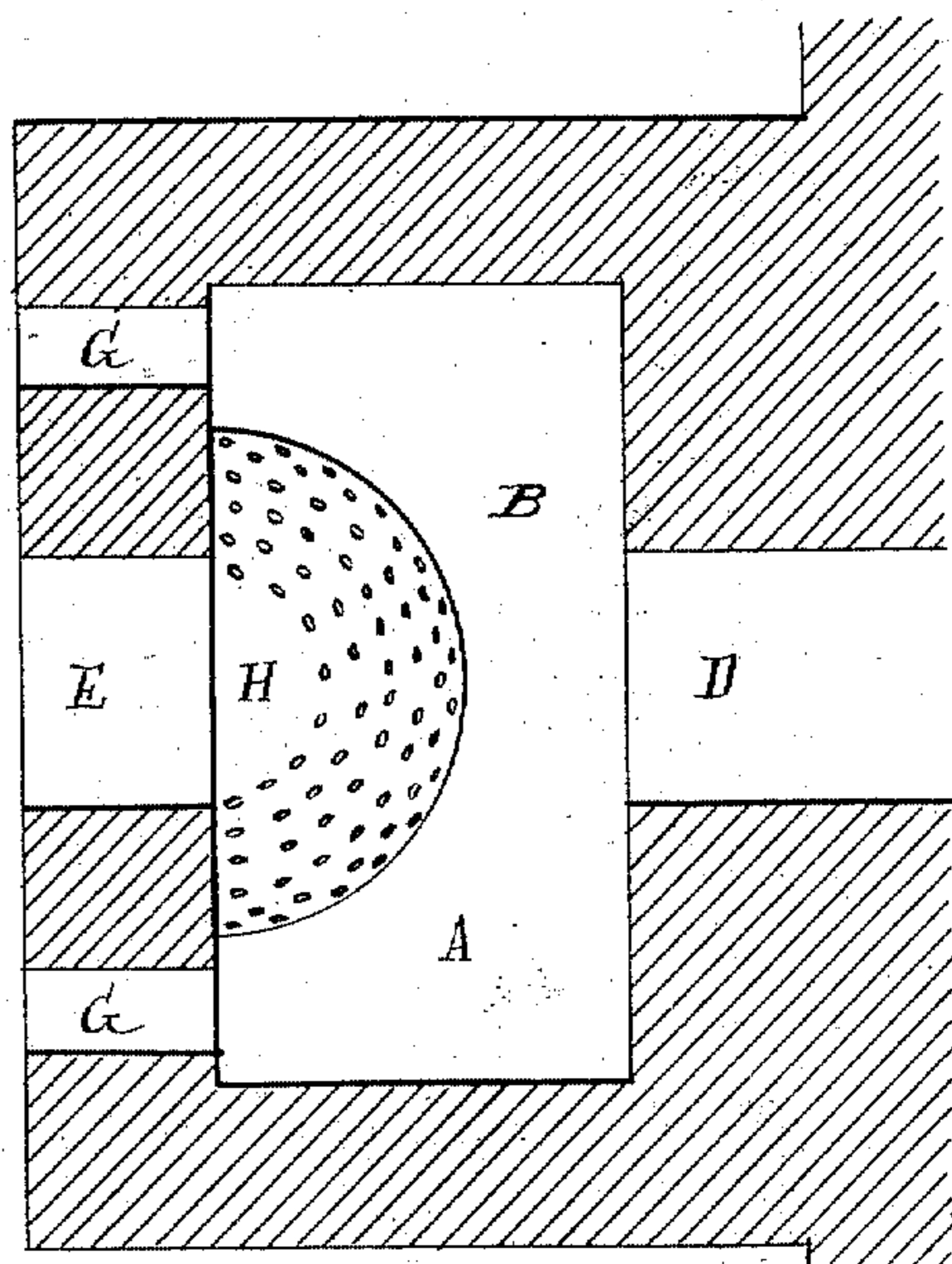


Fig.12



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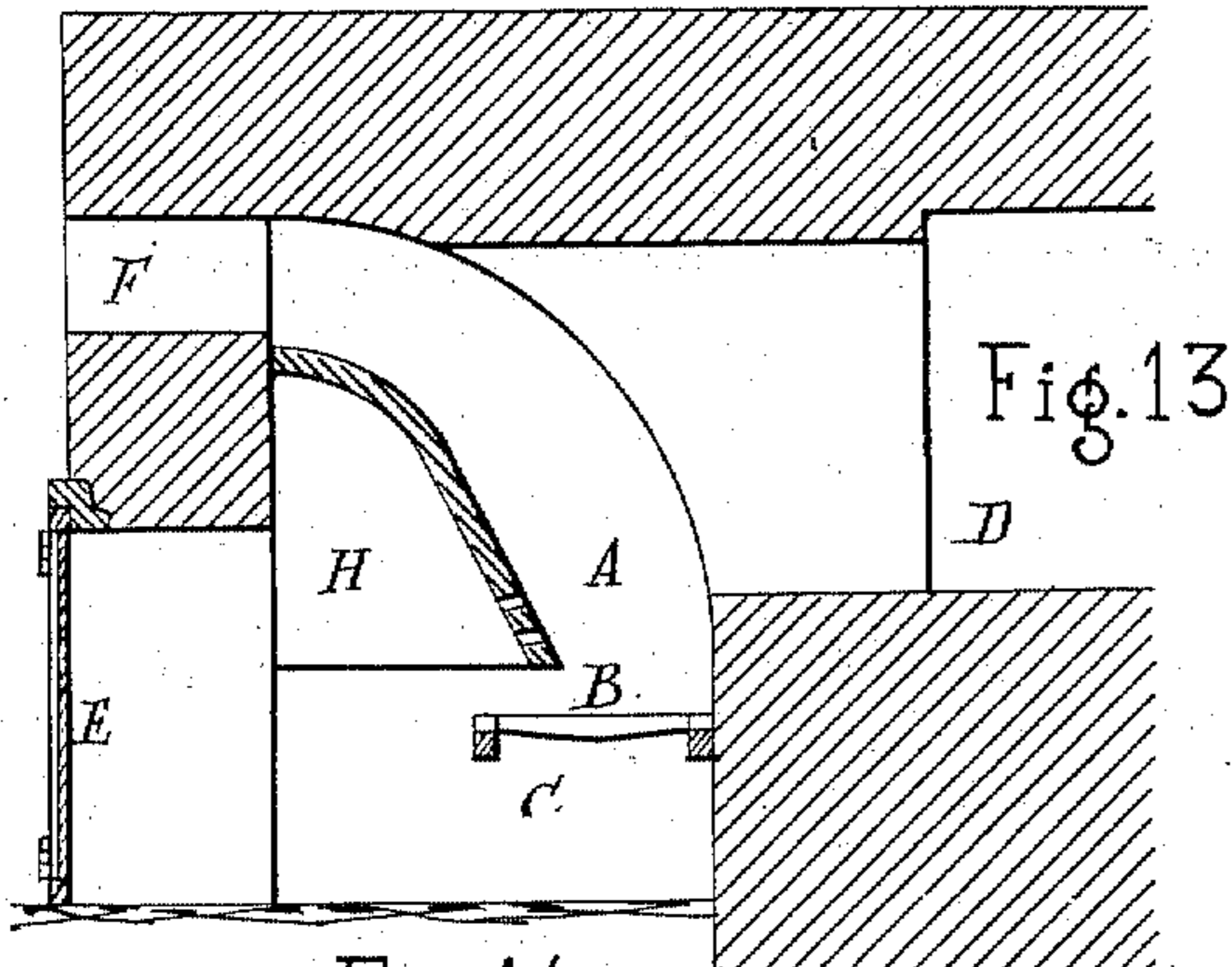


Fig. 13

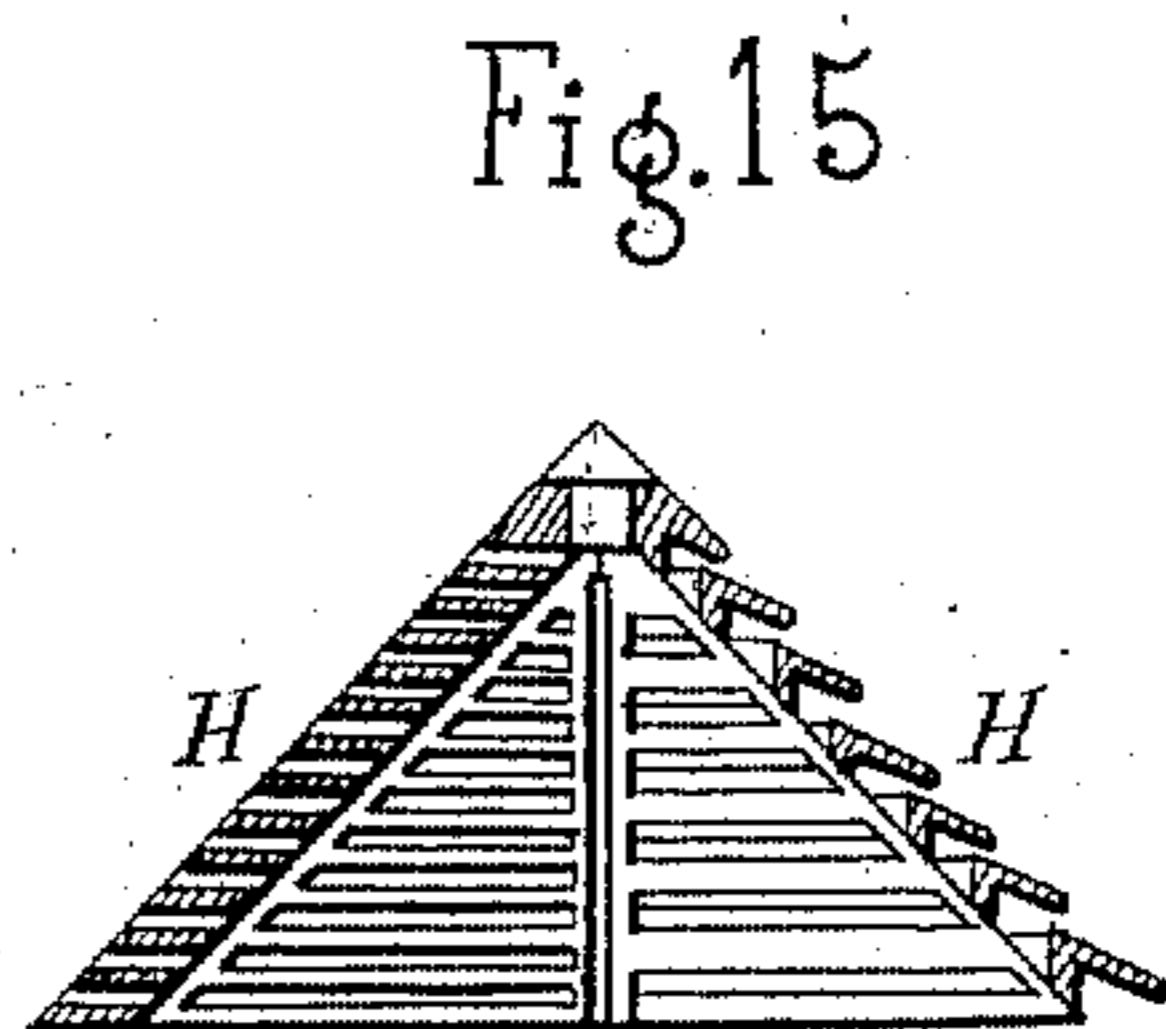


Fig. 15

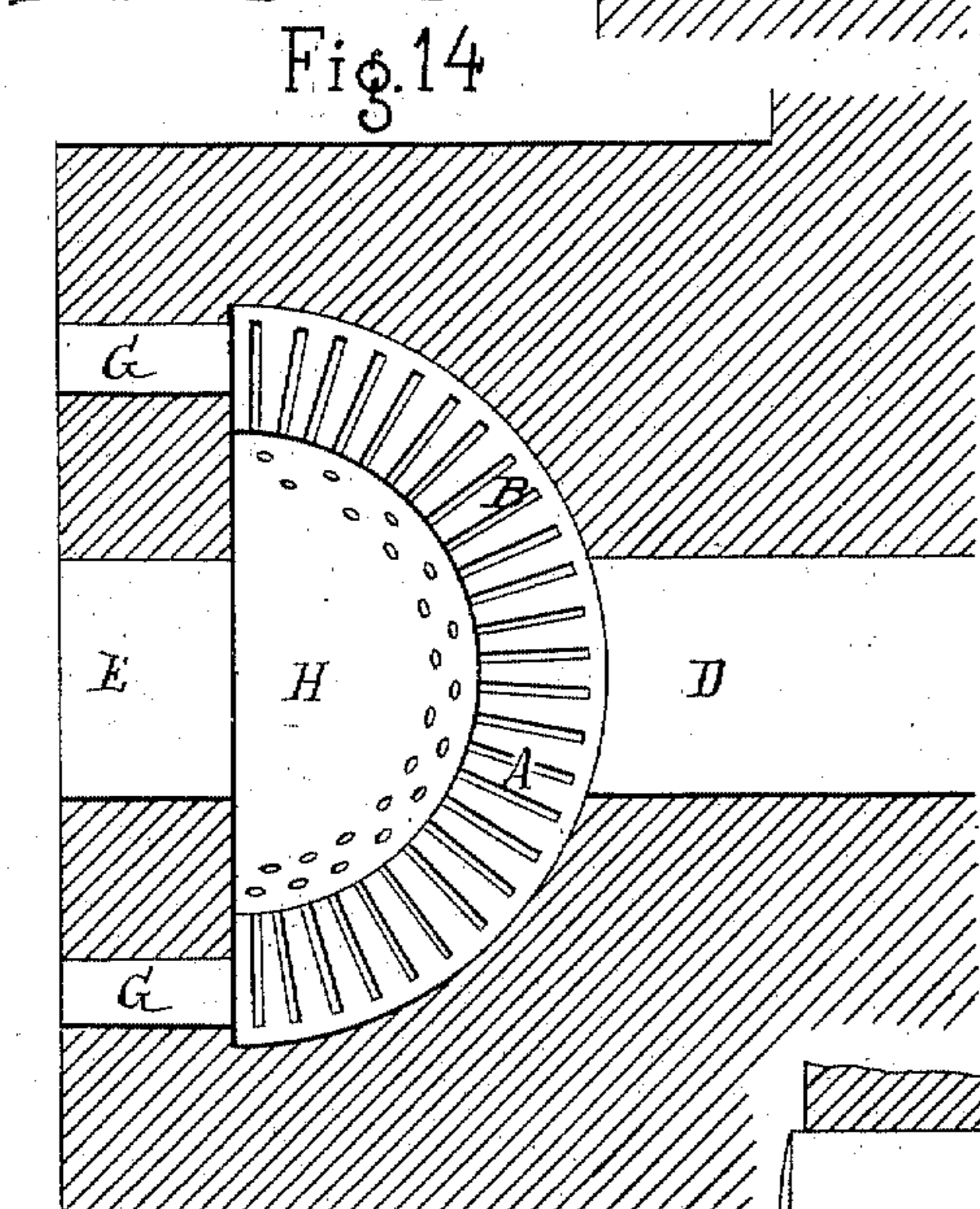


Fig. 14

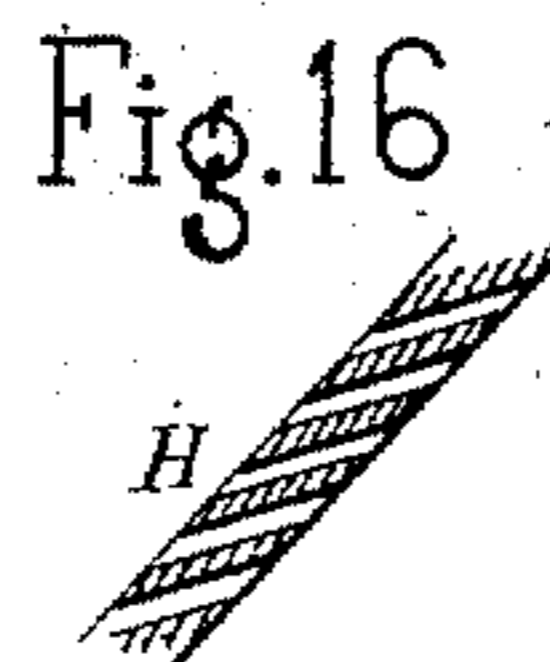


Fig. 16



Fig. 18

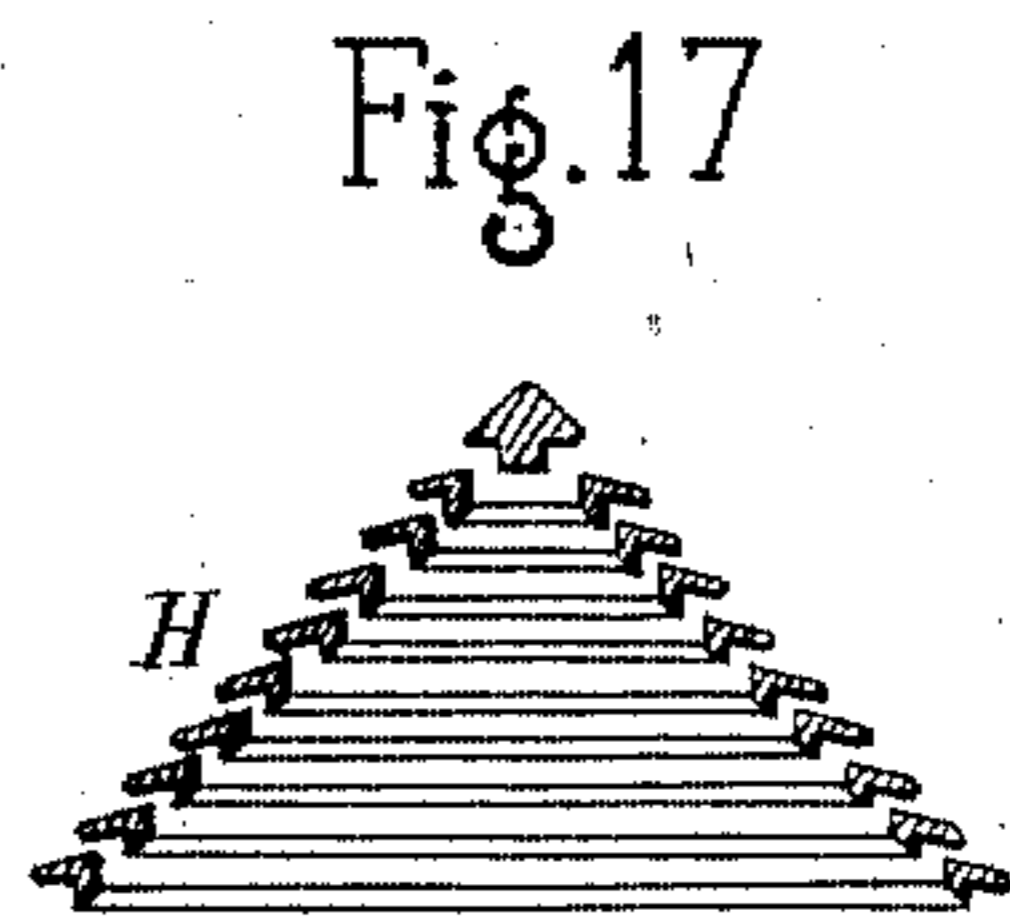
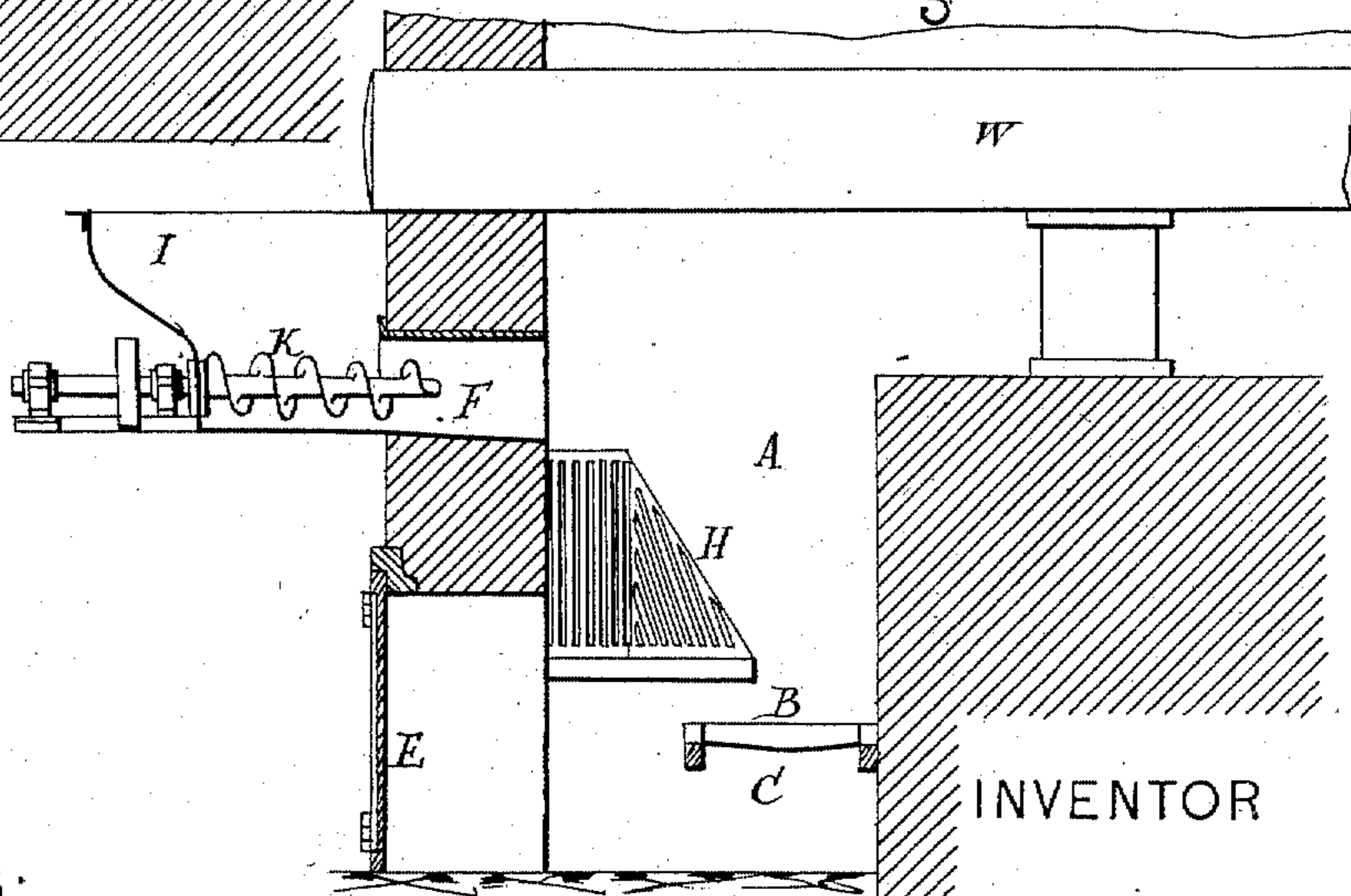


Fig. 17

Fig. 19



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G. ALEXIS-GODILLOT.

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Patented Apr. 22, 1884.

Fig. 20

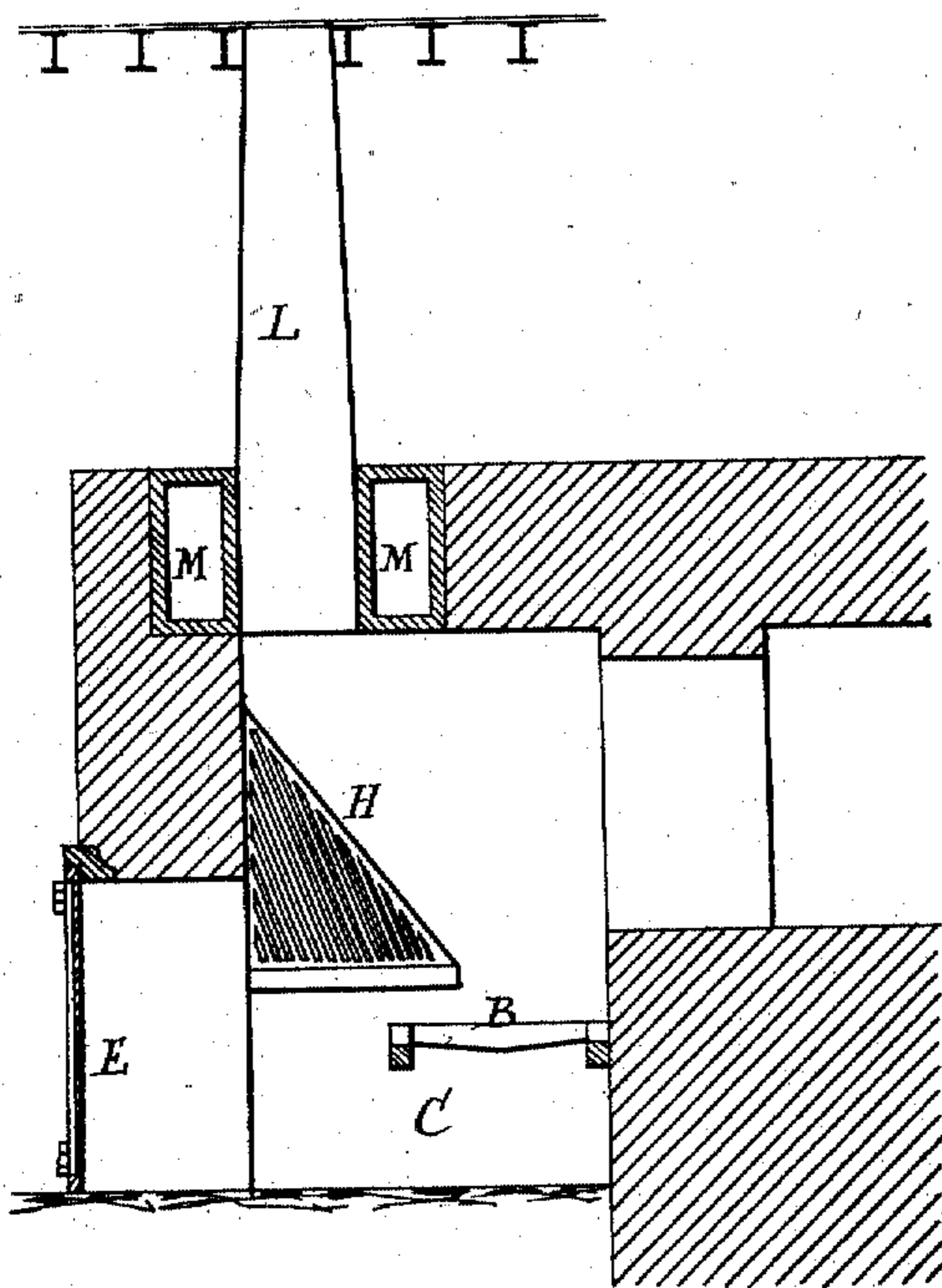


Fig. 21

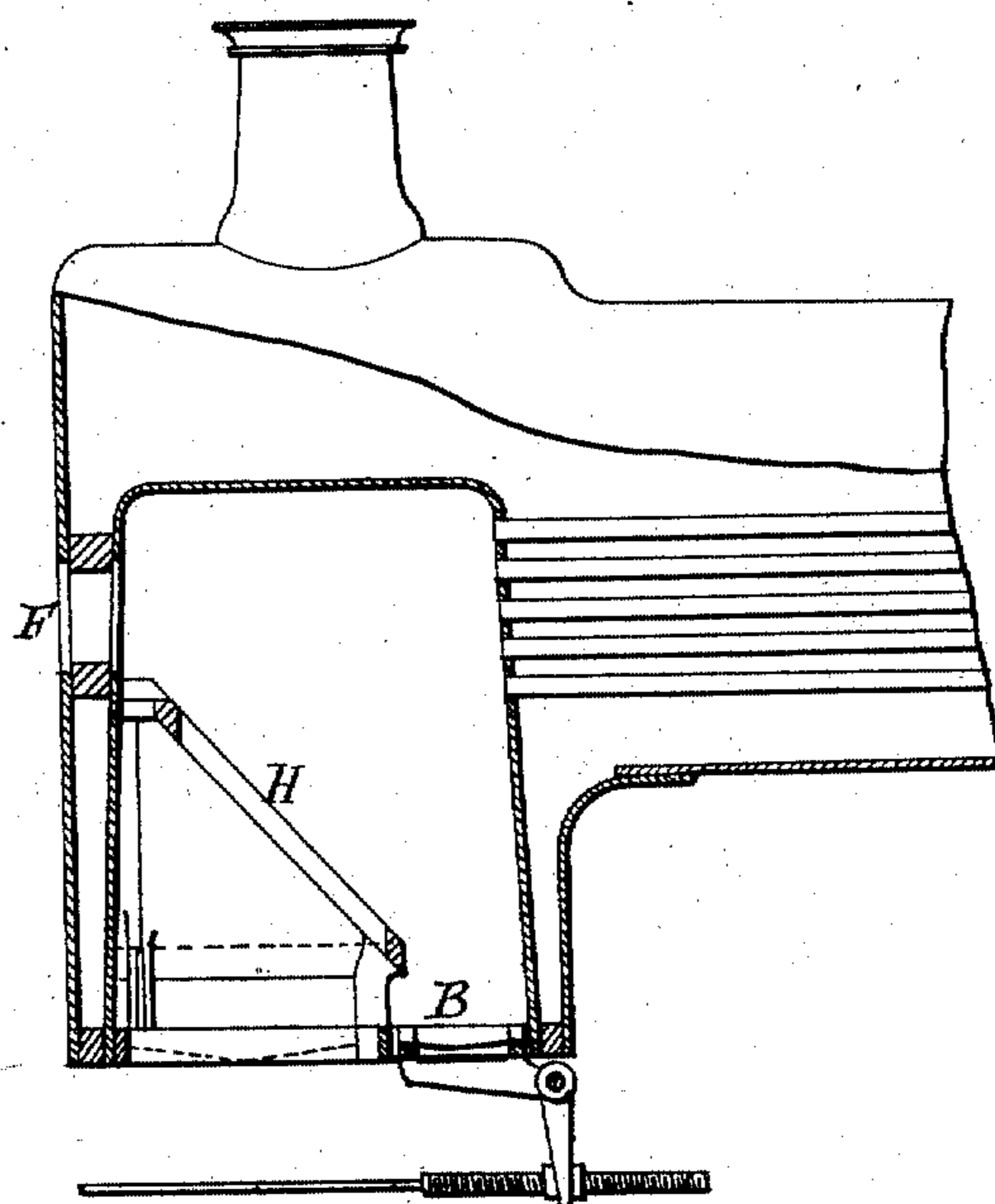
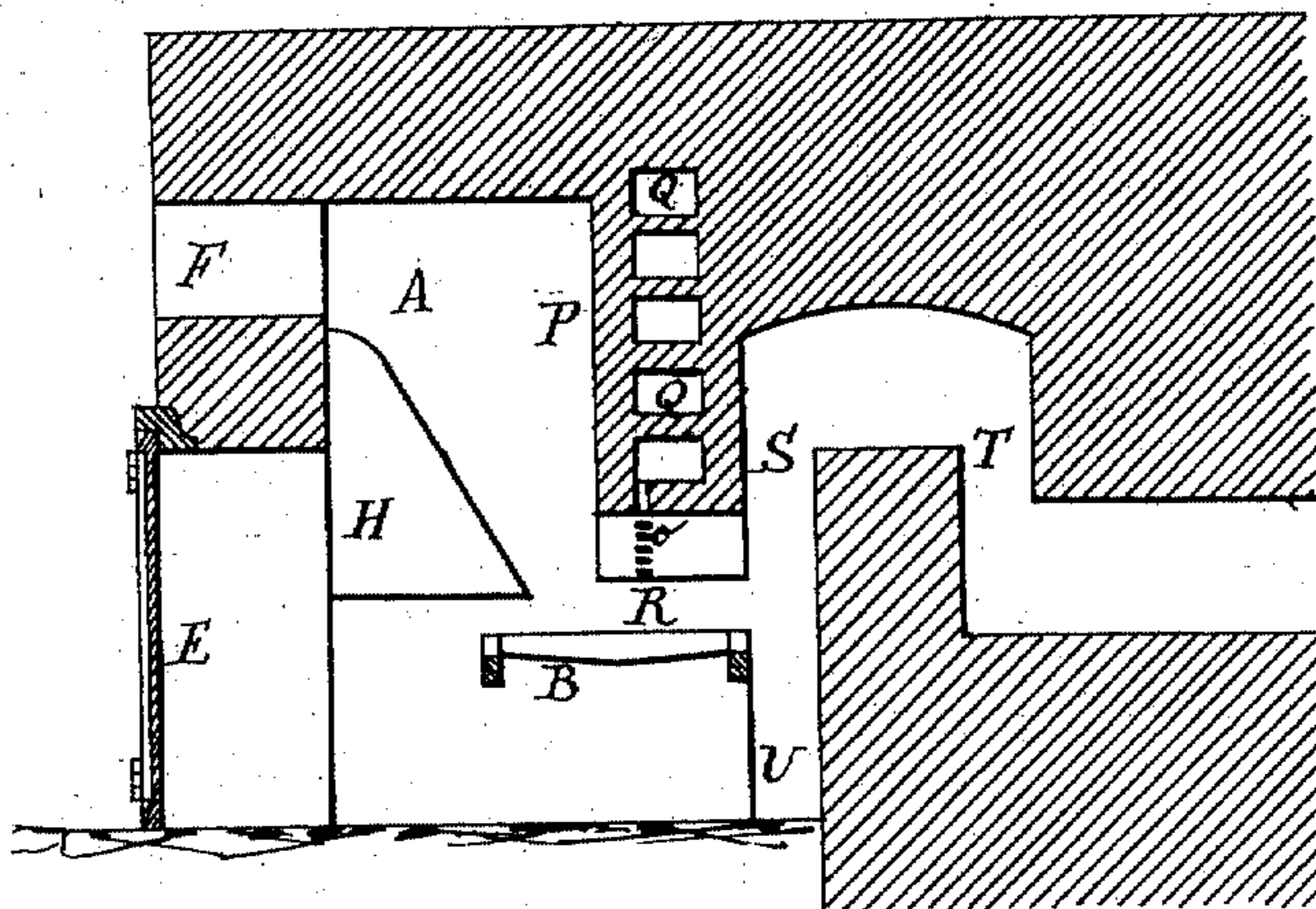


Fig. 22



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(No Model.)

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G. ALEXIS-GODILLOT.

FIRE GRATE.

No. 297,548.

Patented Apr. 22, 1884.

Fig. 23

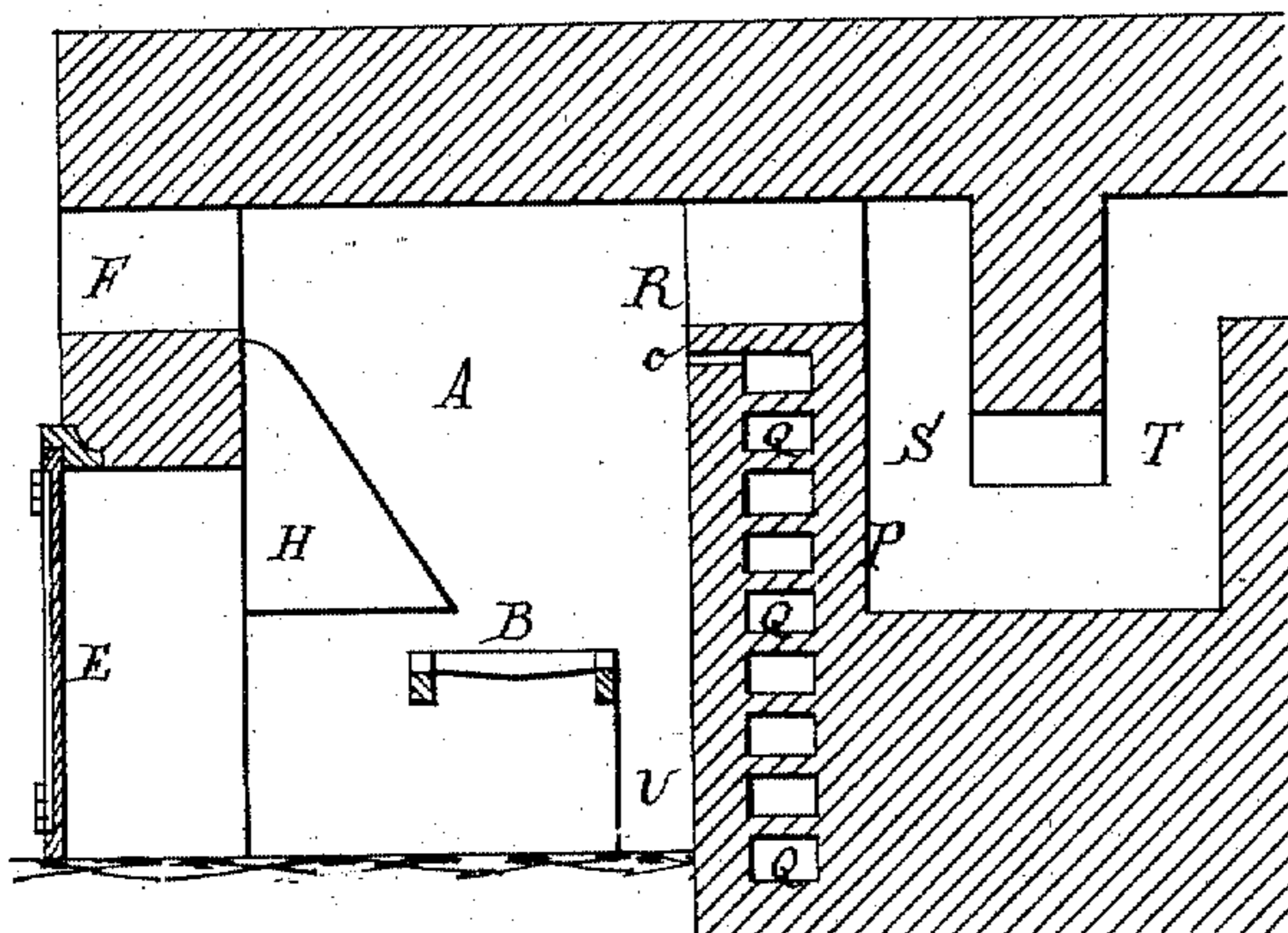


Fig. 24

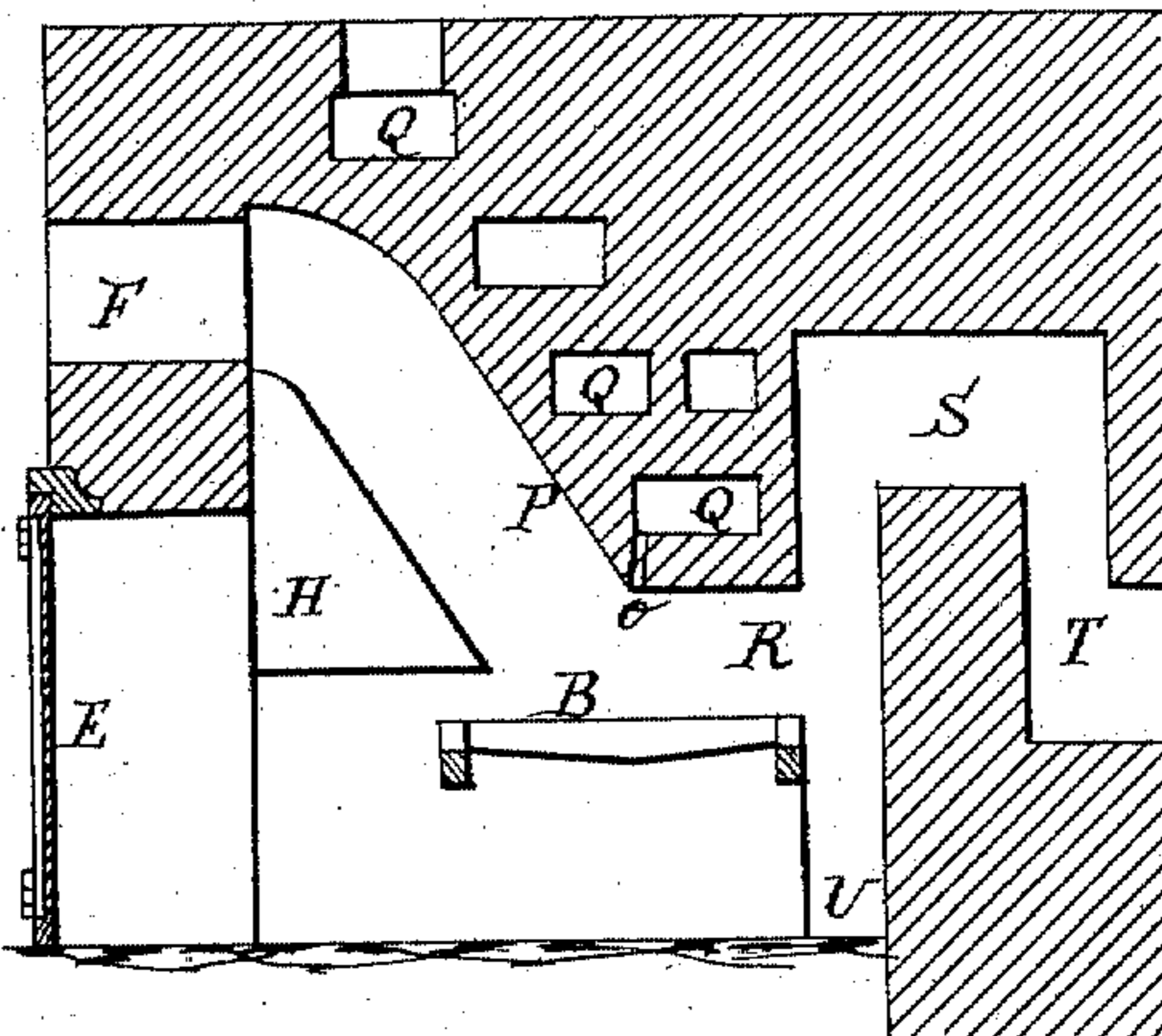
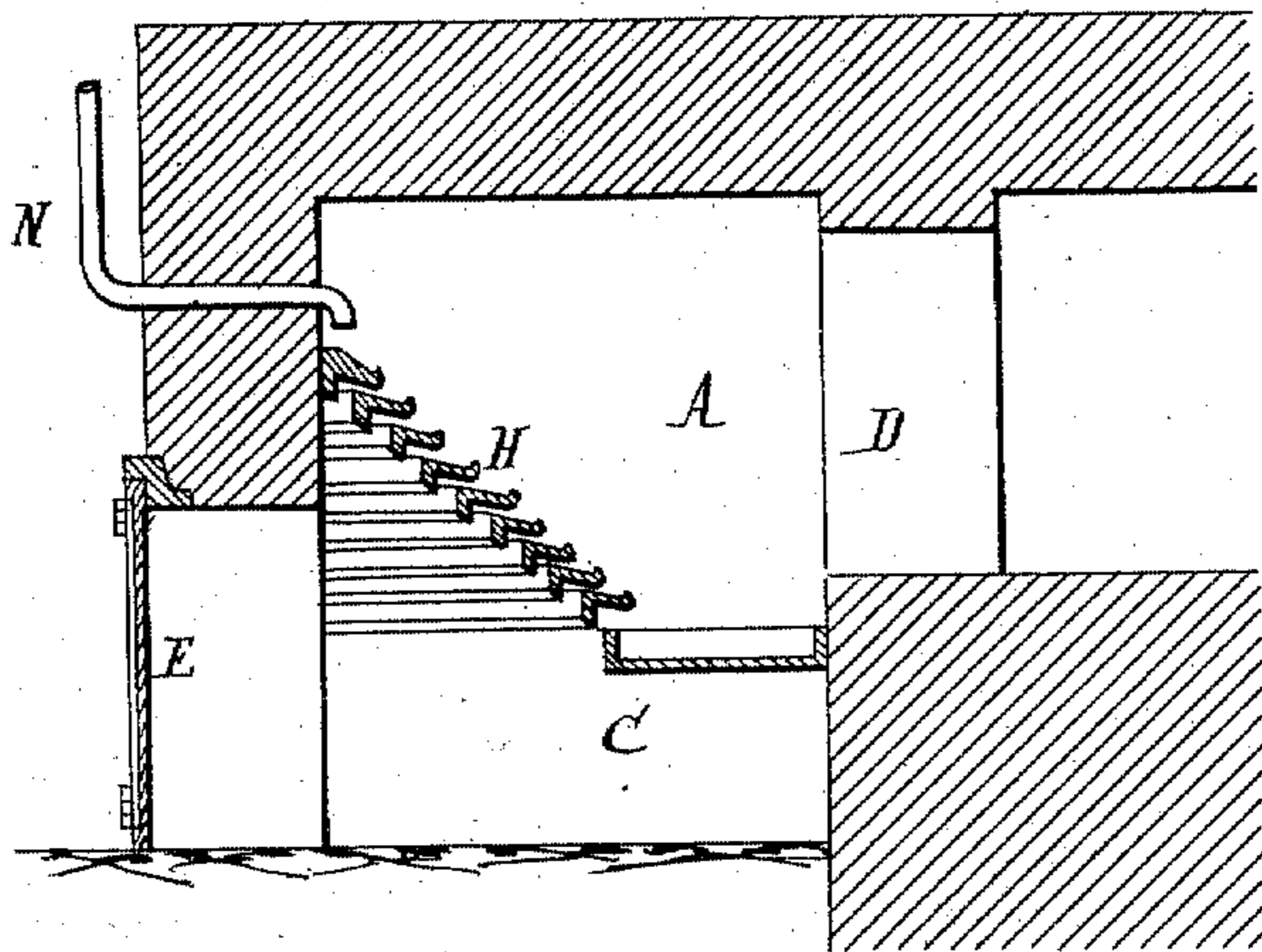


Fig. 25



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By his Attorneys,

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# UNITED STATES PATENT OFFICE.

GEORGES ALEXIS-GODILLOT, OF PARIS, FRANCE.

## FIRE-GRATE.

SPECIFICATION forming part of Letters Patent No. 297,548, dated April 22, 1884.

Application filed January 15, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGES ALEXIS-GODILLOT, a citizen of the French Republic, and a resident of Paris, France, have invented certain Improvements in Furnaces, of which the following is a specification.

My invention relates to that class of furnaces designed especially for burning wet fuel, and that which is finely pulverized, which are provided with a sloping grate on which the fuel is burned, and a horizontal grate surrounding the sloping grate, and arranged at a little distance below it. A furnace of this class may be seen in the Letters Patent of Alexis Godillot, No. 208,730, dated October 8, 1878. In this patent the fuel-receiving grate is in the form of a hexagonal pyramid set in the center of the furnace, and raised above the horizontal grate. The fuel enters at the top over the apex of the pyramidal grate.

In constructing my furnace I make the fire-bed upon which the fuel is burned somewhat in the form of half a bell or dome set against the wall of the furnace, and arrange the charging-opening at the apex of said fire-bed, either in the vertical wall of the furnace or in its roof. The inclined fire-bed may be plain and unperforated, as where it is designed for burning wet fuel, or partly perforated, especially near the base, or grated, either horizontally or vertically, or perforated throughout. I usually arrange an ordinary horizontal grate at the base of my bell-like fire-bed to receive the cinders, and also to receive such fuel as may not be entirely consumed on the bell-like fire-bed.

In order that my invention may be fully understood, I have shown it in various modified forms in the accompanying drawings, wherein like letters of reference designate like parts of the furnace in general.

Figure 1 is a vertical section on line 1 1 in Fig. 2, and Fig. 2 is a horizontal section through the walls only on line 2 2 in Fig. 1 of one form of my furnace. A is the fire-chamber or combustion-chamber. B is a horizontal grate to receive the cinders. D is the flue for the flames and gases. D is the door or opening which admits air to the furnace for combustion. F is the charging door or opening. G G are openings, arranged to suit the circum-

stances, for cleaning the furnace, and H is my semi-bell-like fire-bed, before referred to. This fire-bed is set with its back against the furnace-wall, and in these views is shown unperforated.

Figs. 3 and 4 are respectively a vertical and horizontal section, showing the fire-bed H, of a frusto-pyramidal form, with three plane faces, grated with bars running from the apex toward the base.

Figs. 5 and 6 illustrate a modification in which the fire-bed H is in the form of a semi-pyramid, in combination with a wedge, the five faces being grated with bars extending from the apex toward base.

Figs. 7 and 8 illustrate a modification in which the fire-bed H is a grated semi-cone, with the bars extending from the base up the side or face of the cone.

Figs. 9 and 10 illustrate a modification in which the fire-bed H is in the form of a semi-cone, in combination with a wedge, the sides or faces being grated, as in Figs. 5, 6, 7, and 8.

Figs. 11 and 12 illustrate a modification in which the fire-bed H is of semi-ovoid or dome form and perforated. This form is well adapted to the employment of ceramic materials in the construction.

Figs. 13 and 14 illustrate a modification wherein the fire-bed H is of a semi-bell form, perforated at the base only, and arranged in a furnace having the form of a quarter of a sphere.

Figs. 15, 16, 17, and 18 illustrate several several forms of grating for the fire-bed H.

Fig. 19 illustrates a means for automatically feeding the fuel to the furnace.

Fig. 20 illustrates a means of charging the furnace from above, and a means of keeping the charging-chute cool.

Fig. 21 illustrates the application of my furnace to a locomotive.

Figs. 22, 23, and 24 illustrate means of heating air and mixing it with the burning gases in a tortuous flue leading from the furnace.

Fig. 25 illustrates the construction when the furnace is designed for burning liquid fuels, as oil, &c.

In Figs. 7, 11, and 20 the charging-aperture is arranged in the roof of the furnace. In Figs. 1 and 9 it enters obliquely. In the re-

maining figures it is arranged in the furnace-wall.

The shape of the fire-bed H will vary somewhat with the fuel to be burned, and that shown in the drawings should not be accepted as a criterion.

Ordinarily the fuel will be consumed in passing down over the surface of H, and only cinders and ashes will fall on B; but it is obvious that some combustion will take place on B at times. The air admitted at E is free to pass up through the openings in both H and B to support combustion, and I prefer to arrange B a little below the level of the base of H, and so as to project under the latter a little, as shown in the various figures. The gas and flames pass off through D. The openings G are by preference arranged on a level with the grate B, so as to facilitate the removal of clinkers, &c., therefrom. The arrangement of the grate B a little below the base of H also facilitates the removal of cinders and clinkers from the said grate.

In cases where the fire-bed H is perforated or grated the size and character of the openings will be governed by the nature of the fuel. Where the particles of the fuel are large or coarse, the bed may be grated with the bars and slats extending from apex to base, as in Fig. 5, for example. If the fuel is pulverized or fine, in place of bringing the bars of the grate closer together it is preferable to arrange them horizontally, and give them some suitable form—as, for example, like those shown at the left in Fig. 15, or inclined, as shown in Fig. 16; or they may be given a "louver" form, with various inclinations, as shown at the right in Fig. 15, and in Figs. 17 and 18. In all of these constructions the air is permitted to pass freely; but even the finest particles of the fuel will not pass.

In lieu of grating the bed H, it may be perforated, as shown in Figs. 11 and 12, and the holes may be horizontal or inclined downward.

As the grate B serves only a secondary purpose, and usually performs only the part of a receiver for the cinders, I may sometimes replace it by a plain unperforated plate.

Where fuel is burned that must be previously dried—as wet tan-bark, for example—the fire-bed H serves admirably for a drier. In this case it may be wholly unperforated and the combustion effected on the grate B, or it may be perforated or grated only at the base.

In Fig. 20 I have shown a means for charging the furnace from above. This comprises a chute or tuyere, L, slightly tapered toward the top to prevent clogging. This chute may be provided with a water-jacket, M, at its base to prevent the temperature from getting high enough at that point to melt or cake the fuel, and thus choke the chute.

In Fig. 19 I have shown a mechanical feeder, which comprises a conveyer or screw, K, arranged to be rotated in the base of a hopper, I, and to force the fuel into the furnace through

aperture F. This screw may be rotated continuously by a pulley and belt.

The chamber A may have almost any form. I have found that shown in Figs. 13 and 14, where the internal contour of the chamber is substantially parallel to the exterior surface or contour of the fire-bed H, to produce excellent results.

Where the furnace is employed for heating steam-generators or the like, the furnace may be arranged directly under said generator, as shown in Fig. 19, wherein W represents the generator. Generally one furnace will be sufficient to heat a battery of several generators or boilers; but I may arrange a series of two or more fire-beds H side by side in one chamber A.

Fig. 25 illustrates the construction of the furnace when liquid fuel is to be burned—such as naphtha, crude oil, &c. The liquid is introduced through a pipe, N, and falls on the apex of the bed H, which in this case is constructed similar to that shown in Fig. 17. I may, however, provide ledges along the outer edges of the bars of the grate to form channels or basins, which collect the oil, which then overflows into the next below in a cascade. This serves in some measure as a retardant to prevent the liquid from flowing too fast, and spreads and diffuses it thoroughly. In this case the grate B is replaced by a shallow pan or tray to receive such small portions of the liquid as may escape from H unburned. This will burn in the pan.

In order to insure a more perfect combustion of the gases, I may employ the constructions shown in Figs. 22, 23, and 24, in which air is admitted through flues or passages Q, either in a partition-wall, P, as in Figs. 22 and 24, or in the bridge-wall, as in Fig. 23. The air is heated in its passage through Q, and is discharged through small apertures o o into the contracted gas-outlet R. The gases then pass through a tortuous passage, S T, in which they become thoroughly mixed and ignited. In Figs. 22, 23, and 24 I have also shown a recess or cavity, U, formed between the grate B and the bridge-wall, which facilitates the cleaning of said grate. This space or recess forms a sort of supplementary cinder and ashes receptacle.

My improved furnace being adapted to effect a continuous and uniform combustion of the fuel, it follows that the heat generated will be uniform, and no regulating-dampers will be required. The draft may be regulated once for all, and will not require to be changed.

The essential characteristic of my furnace is the fire-bed H, constructed in a semi-bell-like form, as shown, and placed with its back or vertical face against the furnace-wall. This should be constructed, as to the slope of its sides, according to the character of the fuel used, and should be such that the fuel will move gradually down the slope from apex to base, spreading and diffusing itself over the gradually-increasing area of grate-surface as it goes. Thus the maximum economy in

combustion is attained. I may make the fire-bed H of metal, fire-clay, or any suitable refractory material, and it may be simply set in place, so as to be readily removed when worn or burned out.

I have omitted the lines of the grating B in Figs. 6, 8, 10, and 12; but it will be understood that these are the same as fully shown in Figs. 2 and 4.

I have herein employed the phrases "semi-bell-like" and "semi-dome-like" to describe the form of my grate or fire-bed H; but these descriptive phrases are intended, also, to describe the various other forms shown, some of which are semi-pyramidal and semi-conical.

Having thus described my invention, I claim—

1. In a furnace, a fire-bed, H, constructed in the form of a semi dome, bell, cone, or pyramid, substantially as shown, and set with its

back or vertical side against the wall of the furnace, and said fire-bed arranged with relation to the flue D, as shown, and adapted to operate substantially as set forth.

2. The combination, with a furnace-chamber constructed, as shown, with a charging-opening at its upper part, of the fire-bed H, of the form shown and described, set with its back or vertical face against the furnace-wall, and arranged with relation to the flue D, as shown, and the horizontal grate B, all arranged substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

GEORGES ALEXIS-GODILLOT.

Witnesses:

ROBT. M. HOOPER,  
ARMENGAUD, Jeune.