

(No Model.)

2 Sheets—Sheet 1.

S. H. LA RUE.
HOT AIR HEATING APPARATUS.

No. 516,017.

Patented Mar. 6, 1894.

Fig 1.

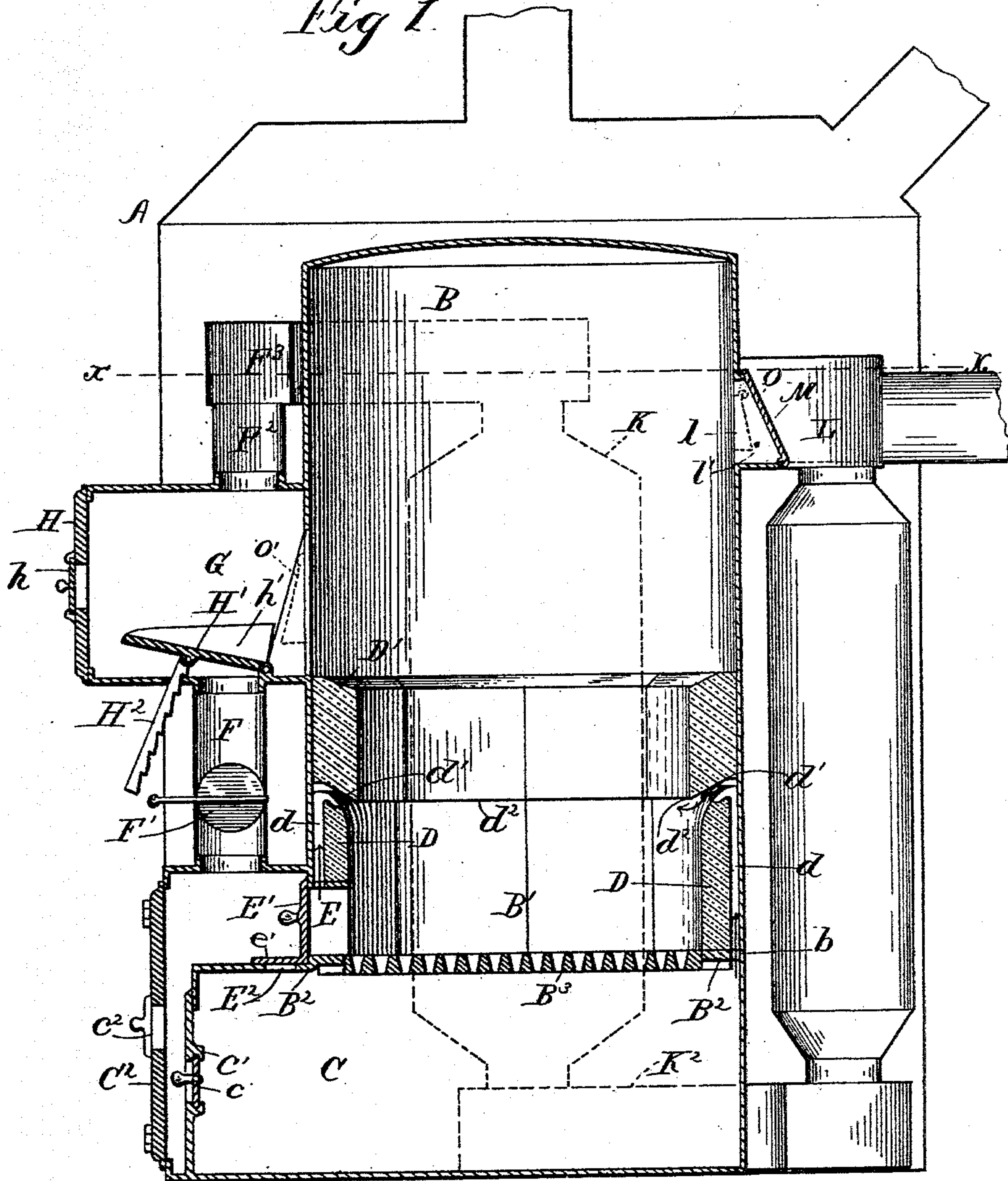
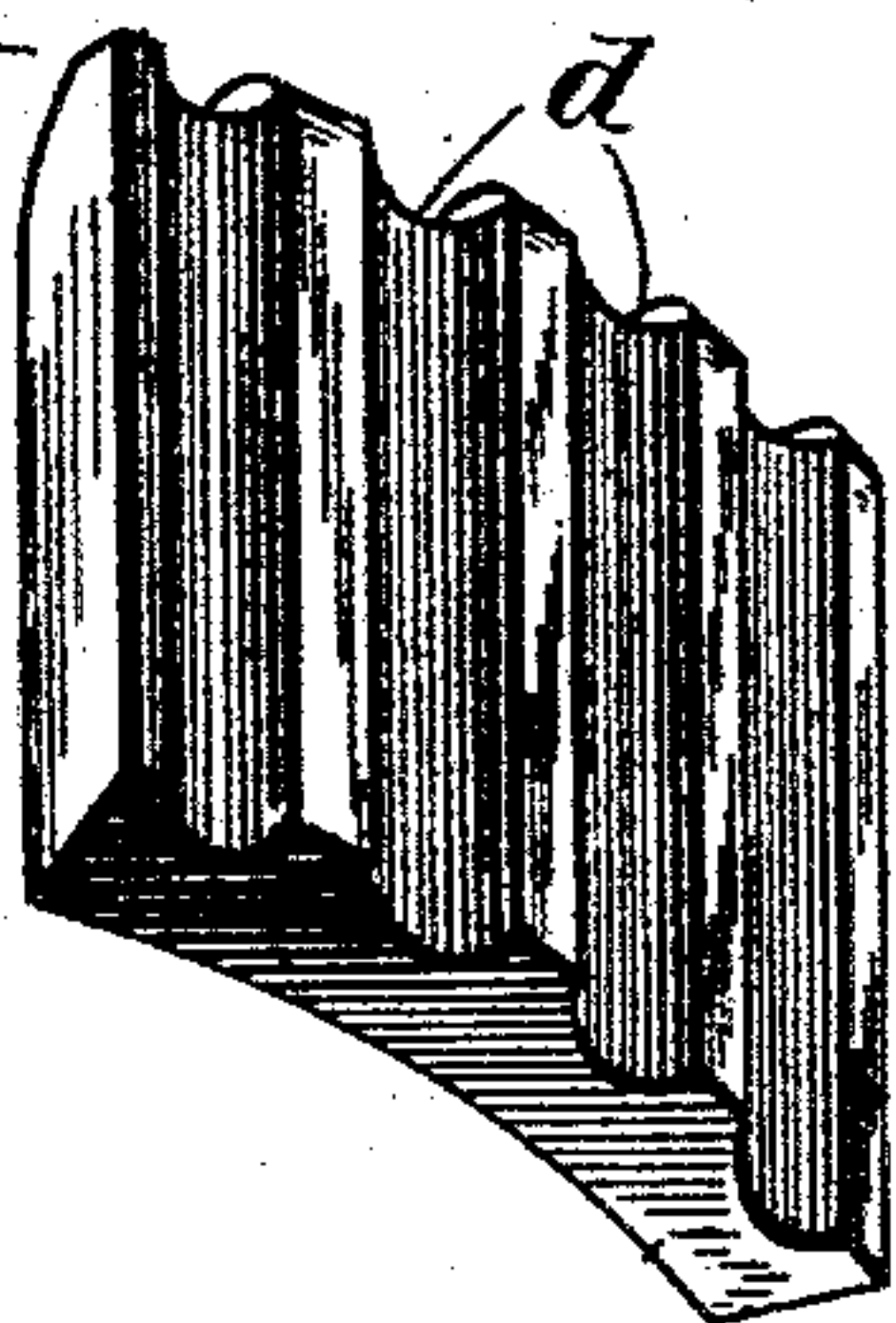


Fig 5
D



WITNESSES:

C. C. Burdick
Wm. DuVal Brown

INVENTOR

Silas H. La Rue
BY

A. S. Bacon & A. P. Steward,
his ATTORNEYS

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Fig 2

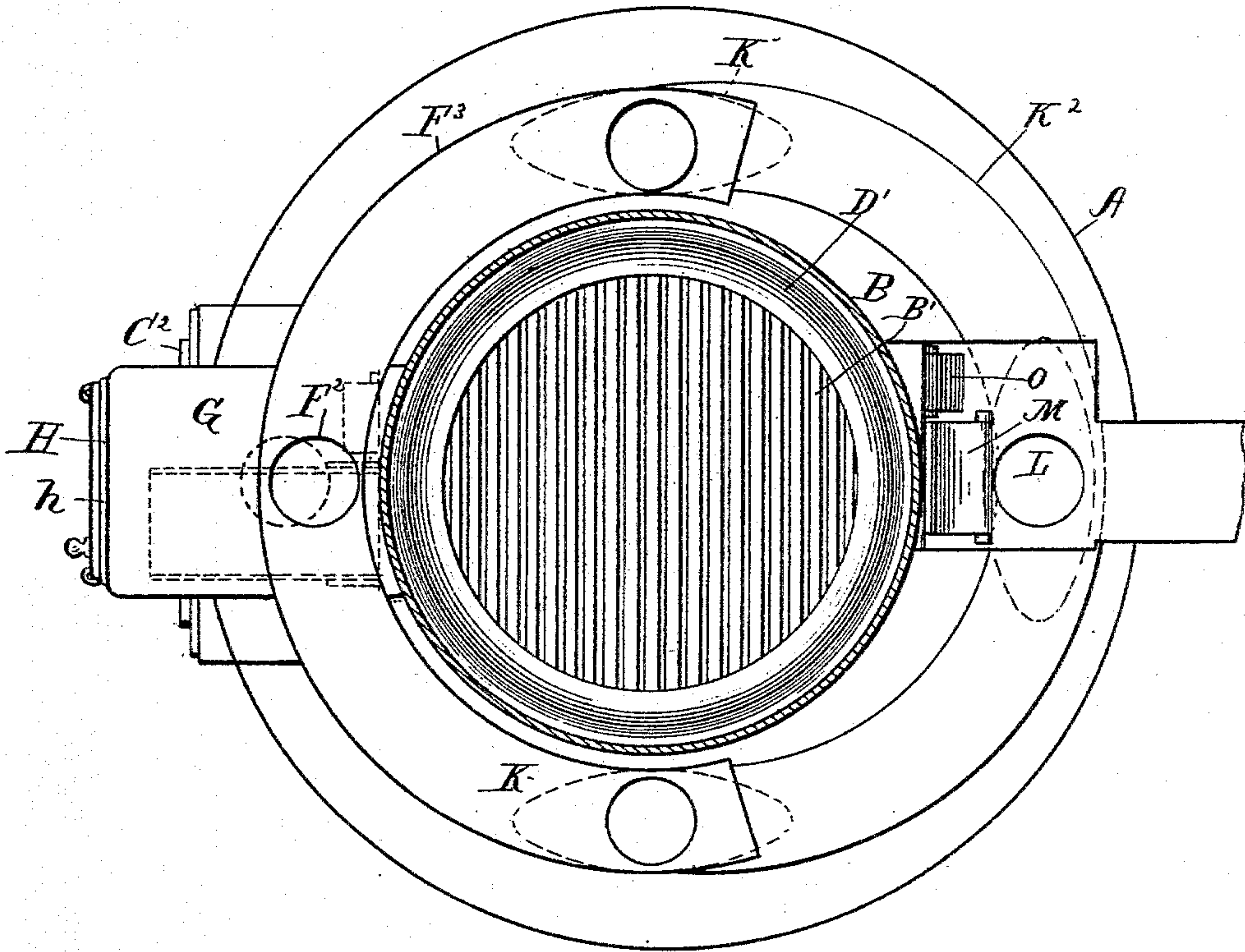


Fig 3

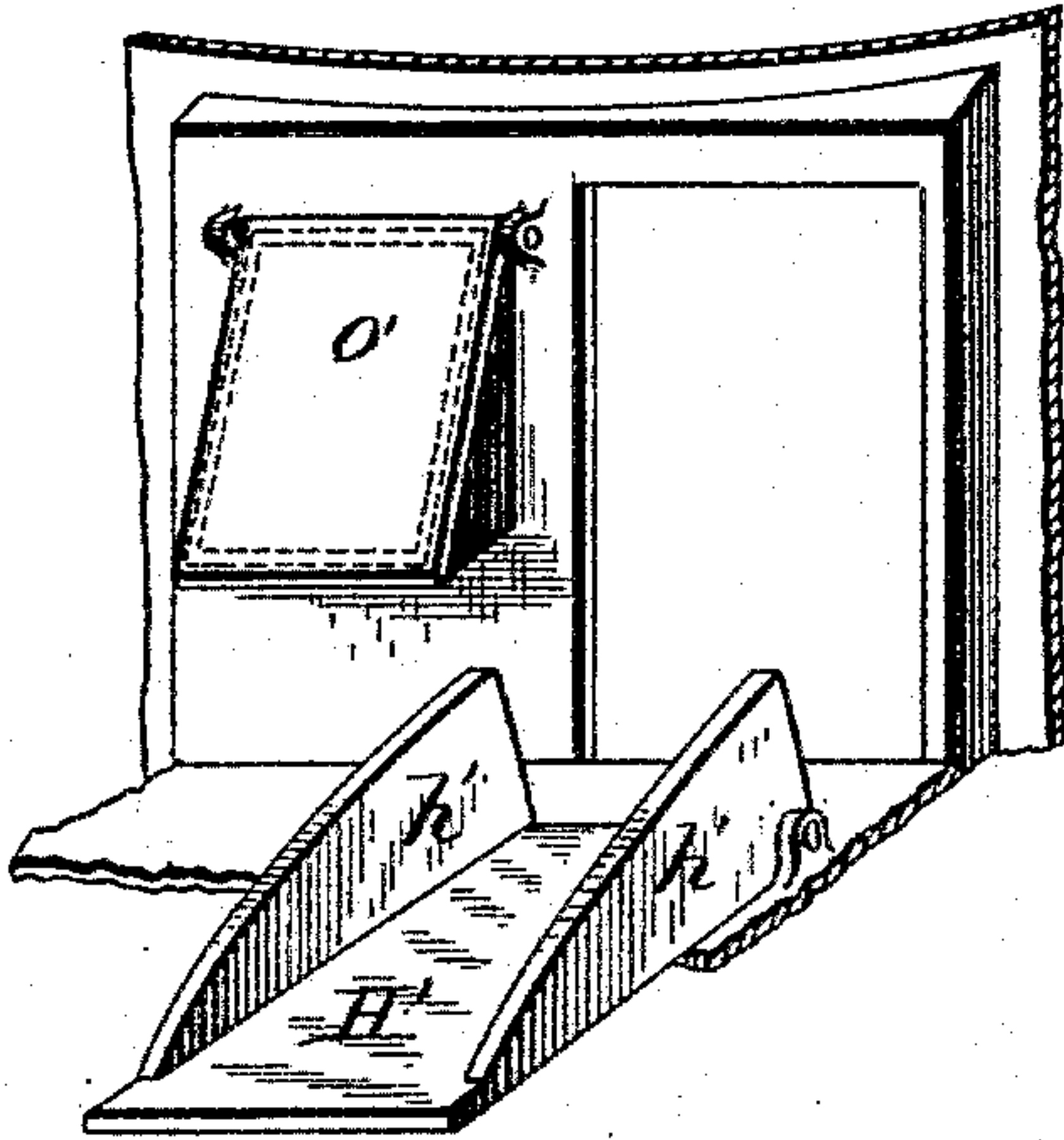


Fig 4

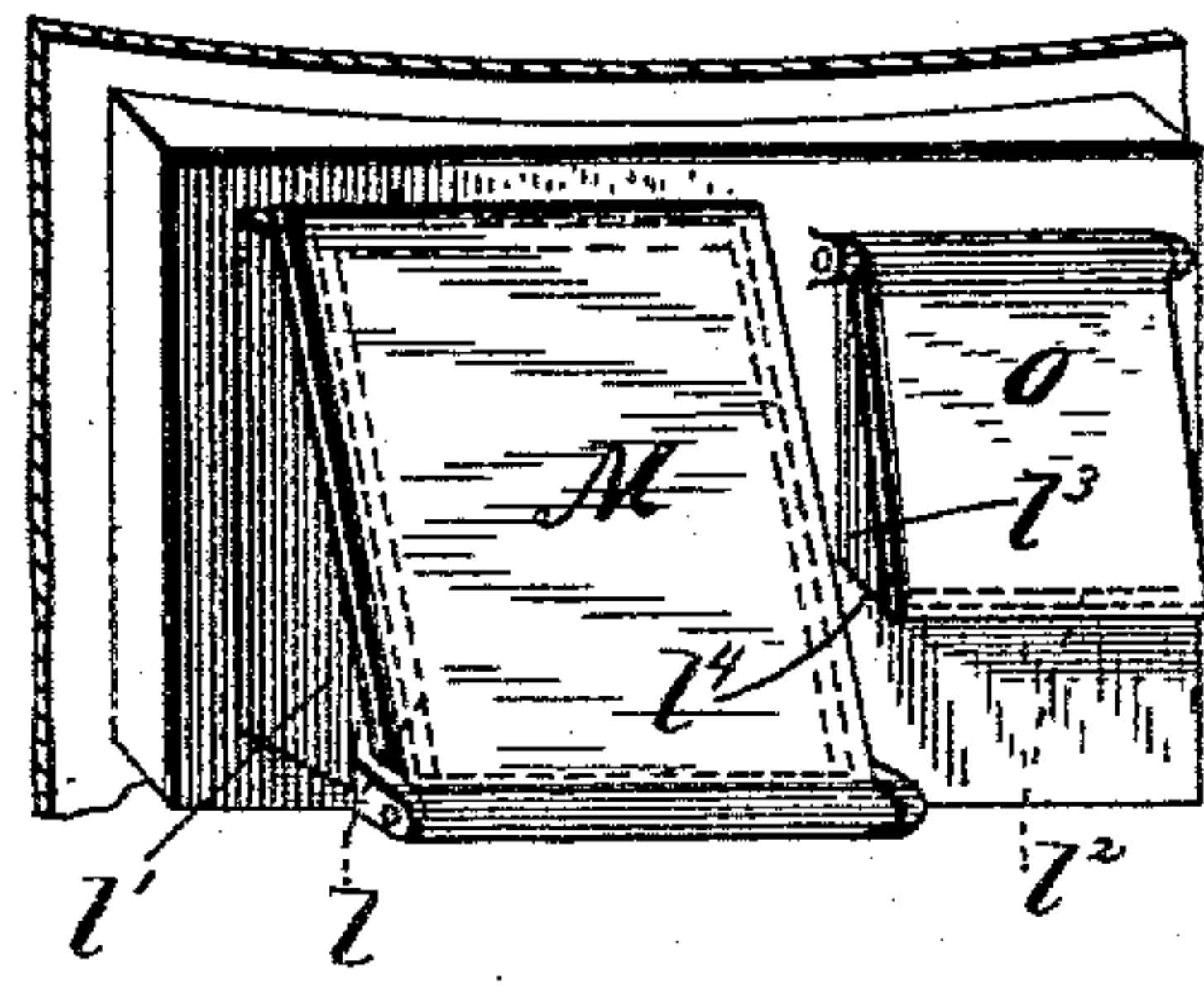
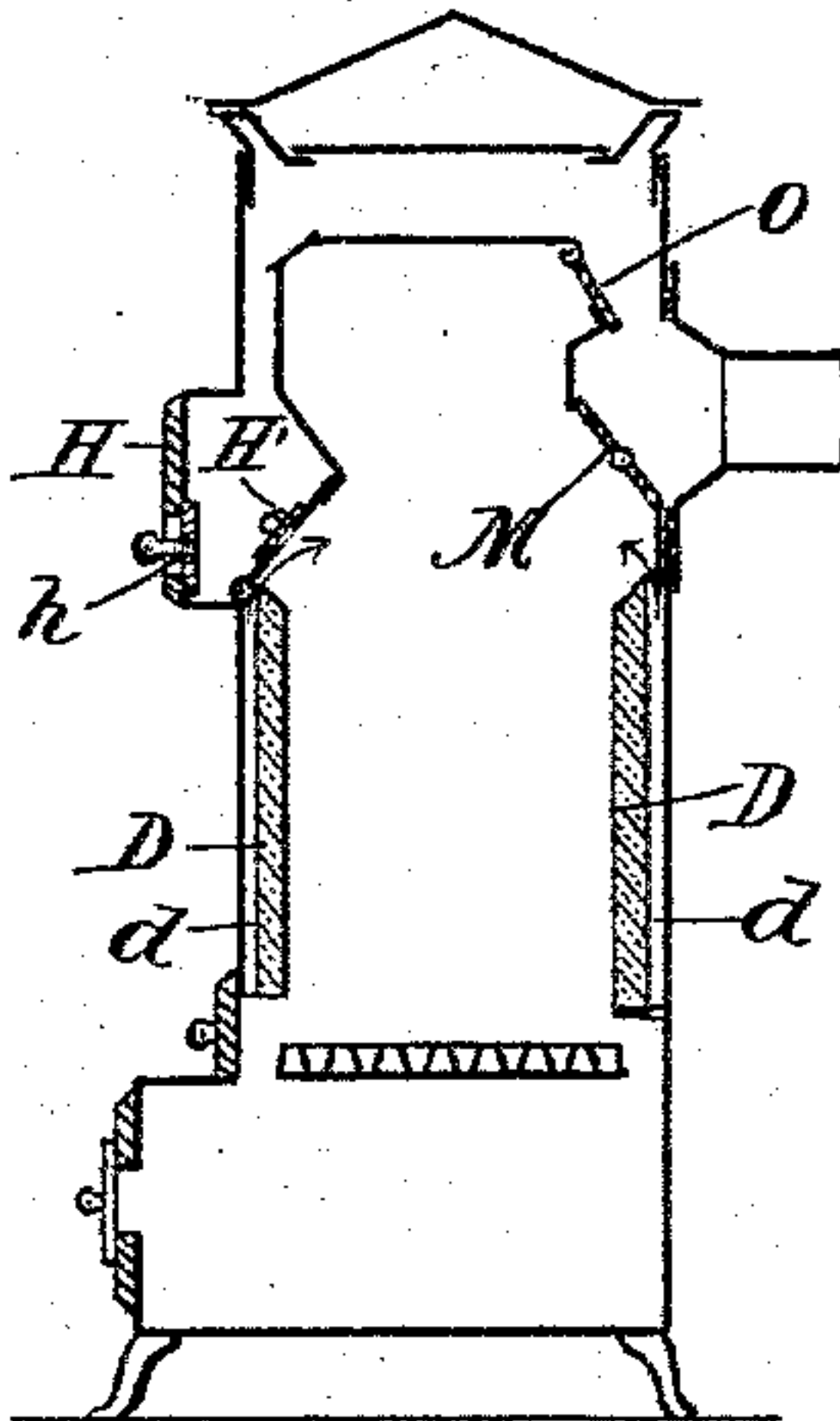


Fig 6



WITNESSES:

C. E. Burdine.
Wm. DuVal Brown

INVENTOR

Silas H. La Rue

BY

A. S. Bacon & A. P. Steward
ATTORNEYS'

UNITED STATES PATENT OFFICE.

SILAS HOFFMAN LA RUE, OF TRENTON, NEW JERSEY.

HOT-AIR HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 516,017, dated March 6, 1894.

Application filed April 22, 1893. Serial No. 471,374. (No model.)

To all whom it may concern:

Be it known that I, SILAS HOFFMAN LA RUE, a citizen of the United States, residing at Trenton, in the county of Mercer and State of New Jersey, have invented certain new and useful Improvements in Hot-Air Heating Apparatus; 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 appertains to make and use the same.

This invention relates to an improvement in hot air heating apparatus and it consists in the construction and arrangement of parts hereinafter described and definitely pointed out in the claims.

The aim and purpose of the invention are the provision of an improved apparatus designed more especially to eliminate the danger and annoyance of escaping gases, dust, smoke, &c., to simplify and perfect the regulation of the drafts and escapes for the products of combustions, and to so perfect and arrange certain features in detail as to produce and add to the perfect working and simplicity of the apparatus.

In the accompanying drawings wherein the apparatus is illustrated and in which like letters of reference indicate corresponding parts in the several views, Figure 1 is a central vertical section of a furnace. Fig. 2 is a horizontal section through line $x x$. Fig. 3 is a detail view of the safety valve for the indirect flue. Fig. 4 is a similar view of the safety valve for the direct flue. Fig. 5 is a detail perspective view of the lower fire brick, and Fig. 6 is a vertical sectional view of a modified form of apparatus.

In the drawings A represents the furnace sheath, B the furnace and C the ash pit formed with a door C' having a damper c therein. In front of the door C' is a supplemental door C² having damper c² therein. This door is located a short distance in advance of door C' thereby forming an intervening air space, for purposes hereinafter described.

At the base of the combustion chamber B' is a ring B² having a series of vertical perforations or openings b in its periphery. On this ring the grate B³ and the firebrick D rest, the former being of any desired con-

struction. To assist and render more perfect the combustion of the fuel, I form the lining of fire bricks which have a series of vertical channels d in their outer faces and a continuation d' of the channels across their upper edges. These channels register with the openings b of the ring B² so that air may pass up from the ash pit through the openings and be discharged at the upper ends of the firebrick into the zone of most intense combustion thus greatly assisting the combustion and adding materially to the heating power of the fuel at or near the surface of the fire. On the upper edge of the lower tier of brick D is a super-imposed brick lining D' of a thickness greater than the thickness of the lower tier. The lower inner edge of this upper lining is flanged or inclined downward as at d² to a point below and beyond the upper edge of the lower brick, thereby forming a shield for the channels preventing the clogging of the same by cinders, ashes or debris of any kind.

In the base of the combustion chamber is the usual clinker opening E having the door E' formed with a horizontal flange e' serving as a cover to the clinker opening E² formed in the top of the ash pit. Access is had to the clinker opening E through door C².

Leading out from the space directly above the forward end of the ash pit is a flue F, having a damper F' therein midway its length. This flue F extends up and terminates in the door way G of the furnace.

H is the outer furnace door having the damper h therein, and H' is a supplemental door at the inner end of the door way G. This door H' is hinged at its lower edge and provided at its sides with flanges h'. H² represents a rack bar pivoted to the door H' and extending to the outside of the furnace at which point it is provided with a suitable handle. The teeth of this rack engage a ledge or other suitable means, whereby the door H' may be adjusted to any desirable position and there held. By this means the door H' may be used as a damper and coal chute when fuel is being introduced into the furnace.

Leading out from the top of the door way G is a vertical flue F² forming a continuation of flue F and communicating at its upper end

with a semi-circular flue F^3 midway between the ends thereof. The flue F^3 extends horizontally around the front of the furnace and its ends terminate in vertically disposed heating drums K and K^2 , arranged diametrically opposite each other at the sides of the furnace. These drums extend down to, at, or near the base of the furnace and rest on and terminate respectively in the ends of a semi-circular flue K' extending horizontally around the rear and base of the furnace.

An opening is formed in the upper face and midway between the ends of the flue K' , located at the rear of the furnace, thereby connecting the flue with the drum K^3 which extends up to and communicates with the direct draft flue L , leading from the upper part of the combustion chamber into the chimney or pipe. The drums K K^2 are preferably elliptical in cross section for the purpose of economizing space. At the point of union between the drum K^3 and direct flue L is pivoted a swinging damper M , the size of which is sufficient to close the opening l in the wall of the combustion chamber, when the damper is turned up, and the mouth of the indirect flue or drum K^3 when swung down to a horizontal position. The damper M is held in its raised position by inclining the same forward, and to permit a perfect closure of the opening l being made I form inclined extensions l' on opposite sides of the opening l against which the damper rests. At one side of the opening l is a small opening l^2 having inclined extensions l^3 at the sides thereof and a horizontal extension l^4 at the base. This opening opens into the direct flue, and an automatic valve O is pivoted at the upper end thereof hanging downward, the valve resting on the extensions l^3 and l^4 . The inclinations of the extension l^3 are less than the inclination of the extension l' so that the automatic valve will require but slight internal pressure to move it, the same being normally held closed by gravity.

At the front of the furnace by the side of the door way G is placed an automatic valve, O' similar to the valve O . This valve G governs an opening leading from the combustion chamber into the indirect flue F^2 and acts as an auxiliary valve should the valve O become disarranged or inoperative. By placing valve O' near the door-way an automatic valve for the furnace is provided which is located at or near an opening where it can readily be reached and kept in operative condition. It is evident that these automatic valves may be placed in other positions, and that but one may be employed if desired.

In operation the fire being started the damper M is swung back closing the indirect flue and opening the direct flue. The dampers in the doors C' C^2 are opened and the door H' closed. When the fire is well ignited the damper M is raised closing the direct flue and opening the indirect flue. The door H' is then opened to the degree desired and the

damper F' in the flue F is closed. The draft will then be through the furnace doorway up flue F^2 through the horizontal flue F^3 down through the heating drums K out through the flue K' and up through drum K^2 from which the gases, &c., escape into the chimney through the direct flue. As the air passes into the ash pit it escapes into the combustion chamber through the grate, and through the channels d d' formed in the lining. As it passes up through these channels it is heated so that the combustion at the zone of most intense combustion is greatly increased, which in a measure assists in the consumption of the gases and smoke especially when soft coal is used as fuel. When the fire is banked or it is desired to check the same all the doors and dampers are closed except the damper F' in the flue F and the damper in the outer door C^2 both of which are opened. By this means the draft is completely cut off from the furnace and carried from the space between the doors C' C^2 into the indirect flue.

It will be seen that all openings from the combustion chamber and ash pit lead directly into the flues, thereby preventing any gas or dust from escaping into the heating cavity or room.

When the draft is carried directly up and through the indirect flue, there is a tendency to cool the drums K , K^2 and also to prevent the automatic valves from opening under slight pressure, the purpose of the latter being to permit the escape of gases when the dampers for the furnace are closed and the internal pressure is sufficient to force the same out, and overcome the force of gravity by which they are normally held closed.

The purpose of the flue F is four-fold when the damper F' is open; first it serves to carry off all gases which may escape through the ash pit when the dampers are closed, second as a dust flue, third as a draft check at a door H' when the latter is slightly open and for the automatic valves, and fourth a check on the draft at the base and for cooling off the drums.

By having the door way G communicating with the indirect flue and arranging the door H' in the position indicated, I am enabled to carry the products of combustion from the front to the rear of the furnace thereby greatly increasing the heating surface, and to regulate the draft by the said door. This door also acts as a chute and prevents fuel from entering the flue F , while being introduced into the furnace.

In Fig. 6 I have shown a modified form of the apparatus in the design of a stove in which case the space between the outer casing and the walls of the combustion chamber is used for the indirect flue. The door H' in this form has a regulator damper therein. The automatic valve O is located above the damper M and opens into the indirect flue.

It is evident that many minor changes in

the construction and arrangement of the parts of the apparatus can be made and substituted for those herein shown and described without in the least departing from the nature and principle of my invention.

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

1. In a furnace, the combination with a combustion chamber, of a direct and an indirect flue, dampers for the flues and an automatic valve mounted independent of the dampers and arranged between the chamber and a flue, substantially as described.

2. In a furnace, the combination with a combustion chamber, of a flue leading therefrom, an automatic valve for the chamber, and a fixed pivotal connection between the valve and the fixed wall of the chamber, substantially as described.

3. In a furnace, the combination with a combustion chamber, of a direct flue, an indirect flue and an automatic valve between the chamber and indirect flue, substantially as described.

4. In a furnace, the combination with a combustion chamber, of a direct flue, an indirect flue leading out from the front of the furnace and into the direct flue, an automatic valve at the front of the furnace and an automatic valve at the rear between the direct flue and chamber, substantially as described.

5. In a furnace, the combination with the combustion chamber and flue, of an automatic valve between the chamber and flue, having a pivotal connection at its top and fixed projections with which the valve directly engages, for normally holding the same at an incline, substantially as described.

6. In a furnace, the combination with a combustion chamber, of a direct flue, an indirect flue opening out from the doorway of the furnace, a door for the doorway, and a combined coal chute and damper, adjustably secured in the doorway, substantially as described.

7. In a furnace, the combination with a combustion chamber, of a direct flue, an indirect flue opening out from the doorway of the chamber and into the direct flue, a door for the chamber, and an auxiliary or inner chamber

door for governing the draft through the indirect flue, substantially as described.

8. In a furnace, the combination with the combustion chamber and ash pit of an inner and an outer door for the pit separated by an intervening space, a flue leading from said space, a damper on the flue and an indirect flue leading out from the combustion chamber and with which said other flue communicates, substantially as described.

9. In a furnace, the combination with an outer casing, of a combustion chamber, a direct flue, an indirect flue leading out from the front of the combustion chamber, an ash pit, a flue extending from the pit into the indirect flue, a door interposed between the pit and the flue leading therefrom, and an air controlling damper in the casing between the exterior thereof and the ash pit flue, substantially as described.

10. In a furnace, the combination with a combustion chamber, flue, and ash pit, of a door for the pit, a supplemental outer door for the pit having a damper therein, and arranged to form an intervening space and a flue extending from said space into the other flue, substantially as described.

11. In a furnace, the combination with a combustion chamber, of a door way therefor, an outer and an inner door for the way, a flue leading out from the way, and for which the inner door serves as a damper, a direct flue and a connection between the flues, substantially as described.

12. In a furnace, the combination with a combustion chamber, of a direct flue, an indirect flue consisting of a vertical flue a semicircular flue at the top heating drums oblong in cross-section and of a diameter greater than the diameter of the flues, arranged on opposite sides of the chamber a semicircular flue at the base and a drum at the rear communicating with the direct flue, and dampers for both flues, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

SILAS HOFFMAN LA RUE.

Witnesses:

WILLIAM W. HOWELL,
FREDERICK F. HOWELL.