

(No Model.)

3 Sheets—Sheet 1.

C. F. BUTTE CASPARI.

DRIER.

No. 374,520.

Patented Dec. 6, 1887.

FIG. 1.

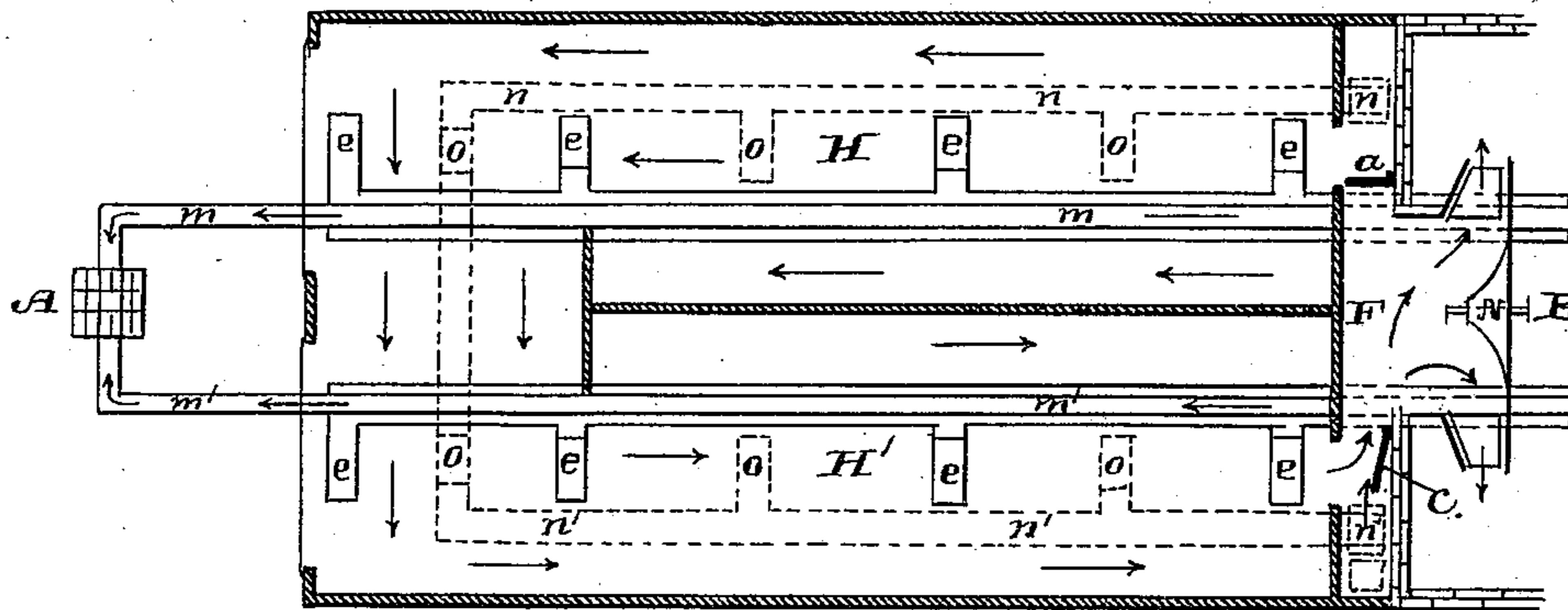


FIG. 2.

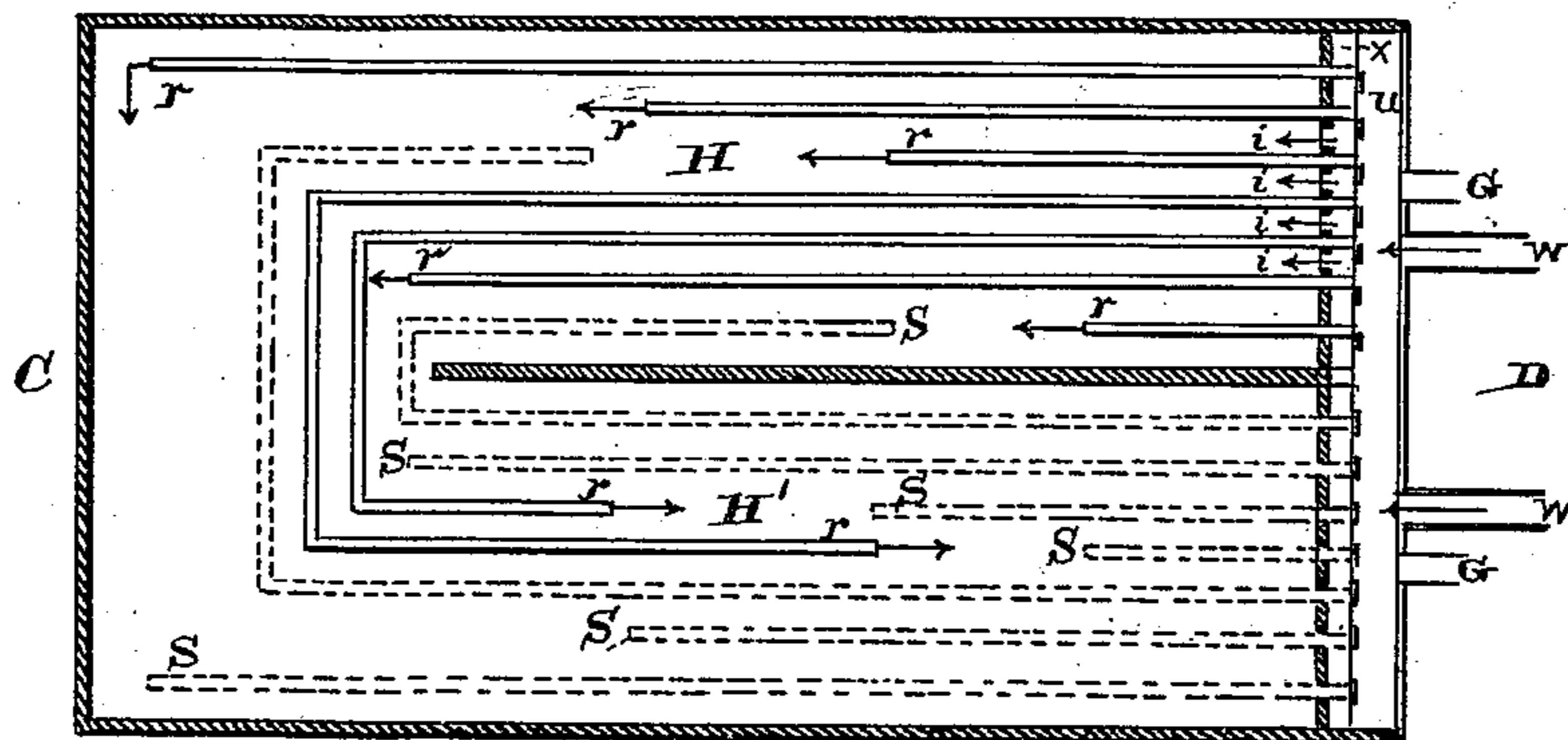
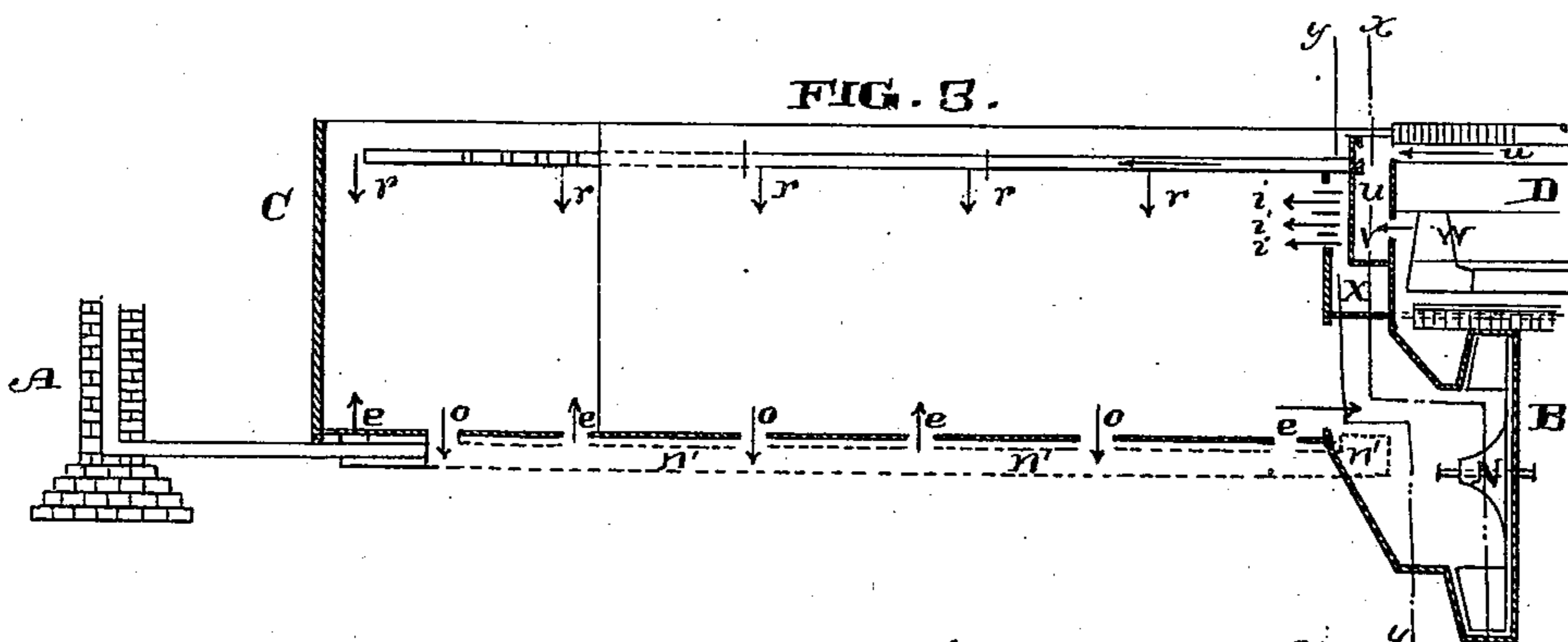


FIG. 3.



Witnesses,
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FIG. 4.

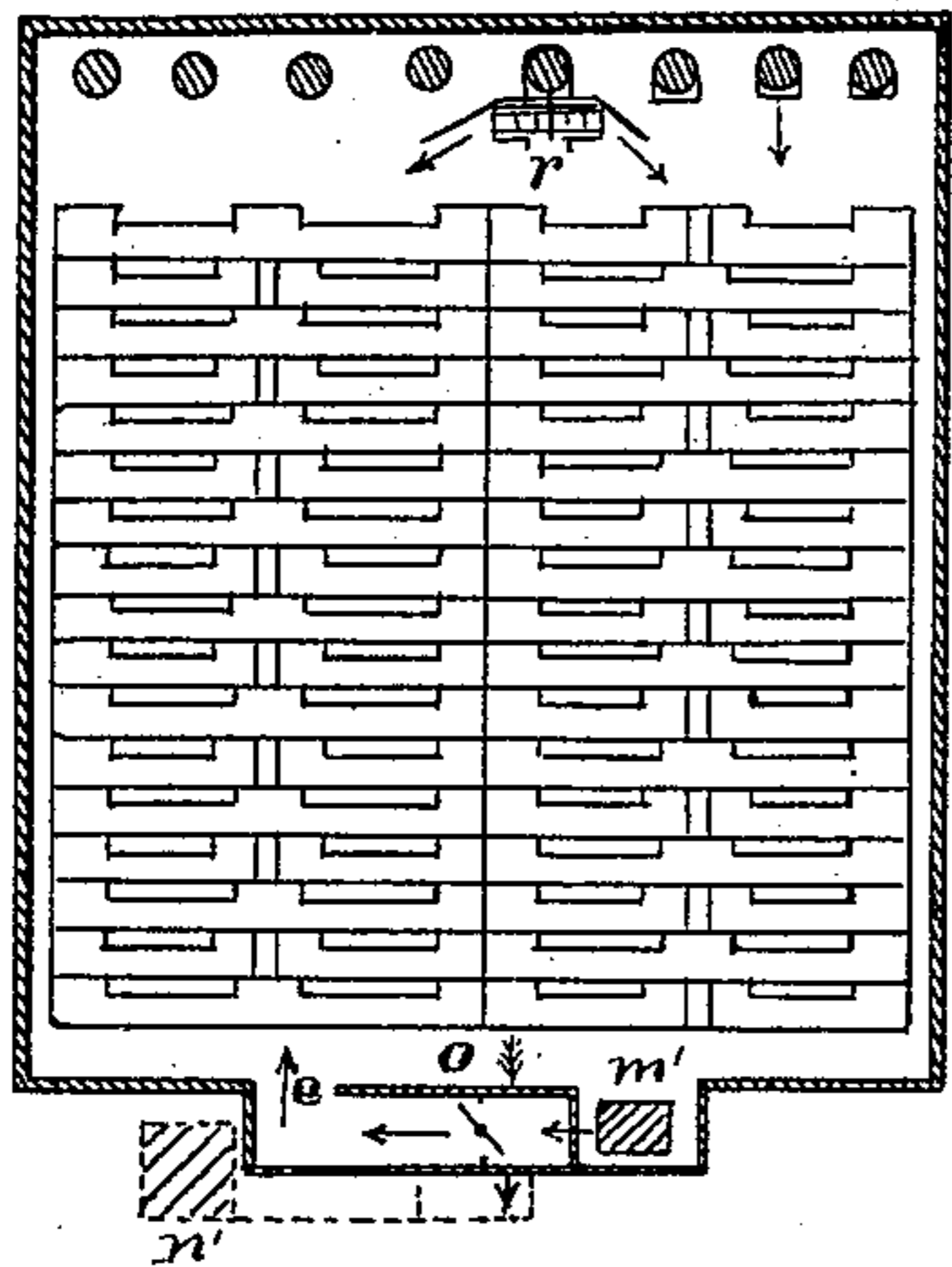


FIG. 5.

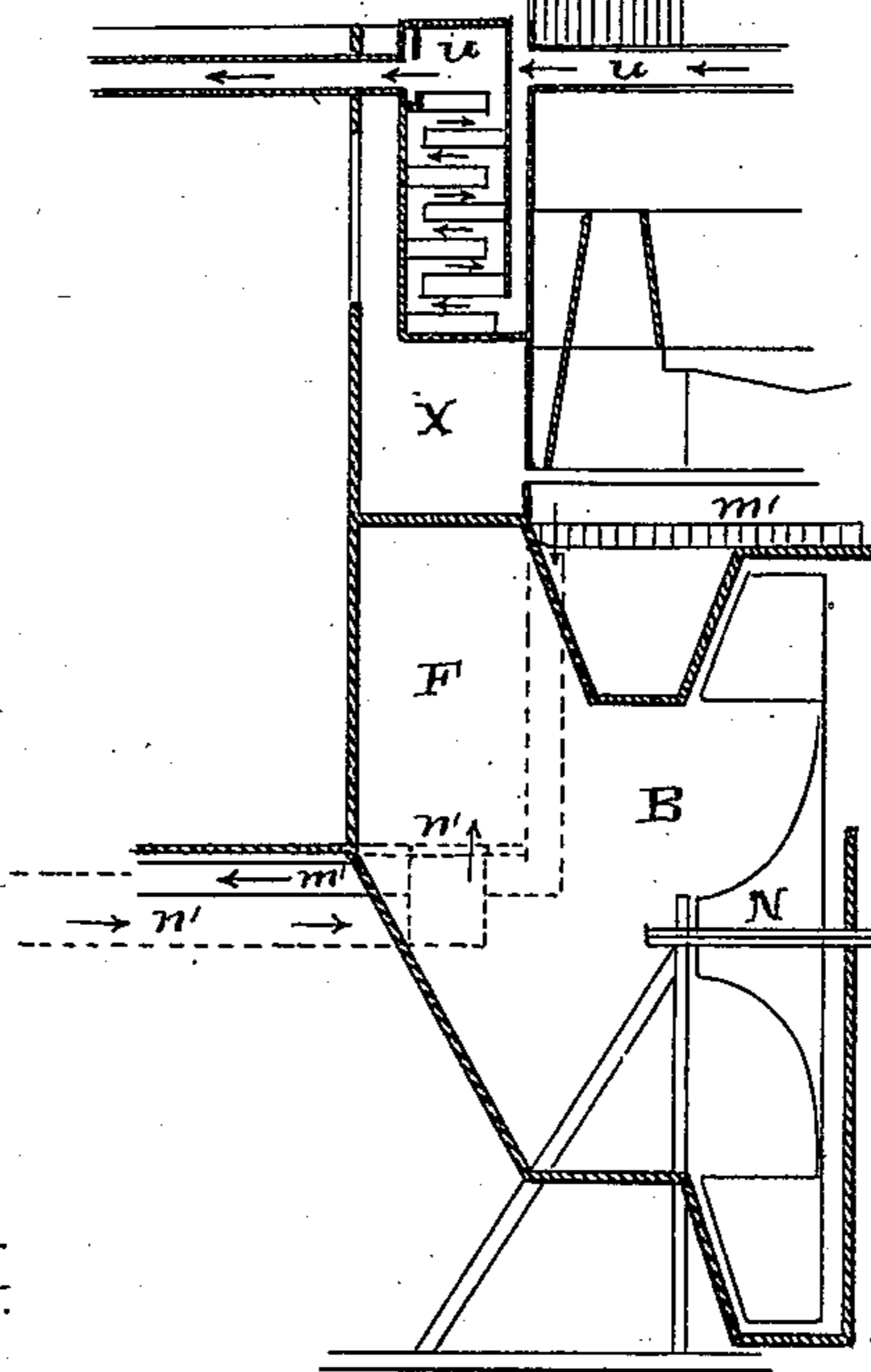


FIG. 9.

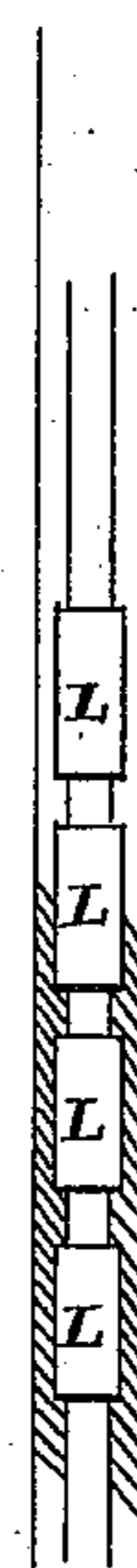


FIG. 6.

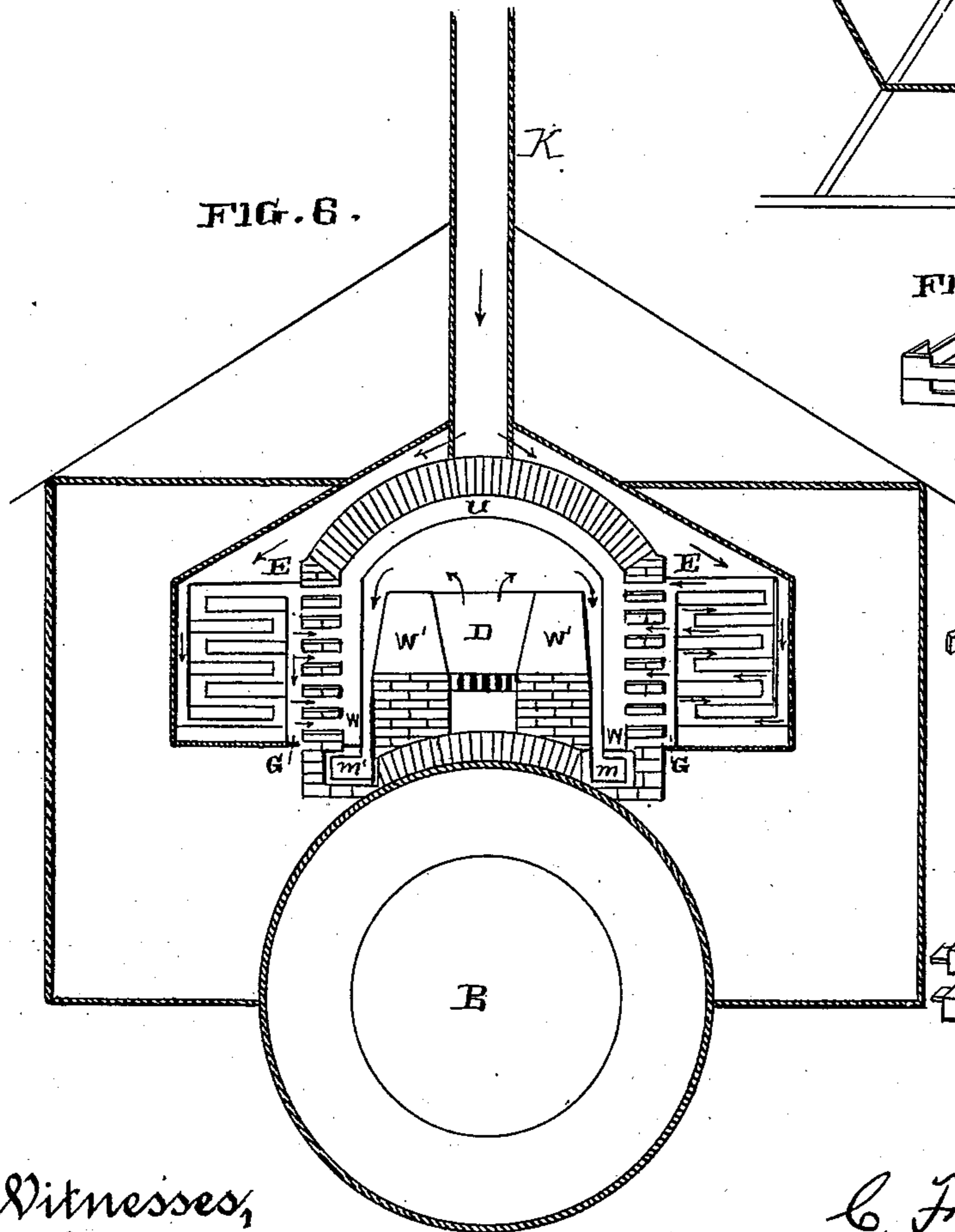


FIG. 7.

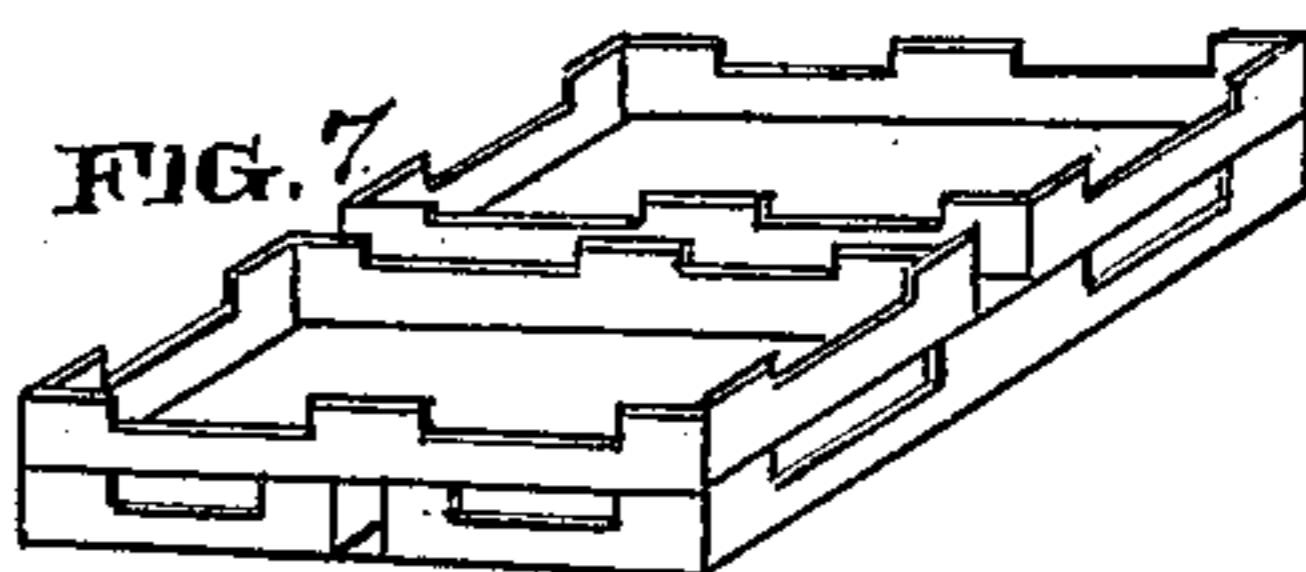
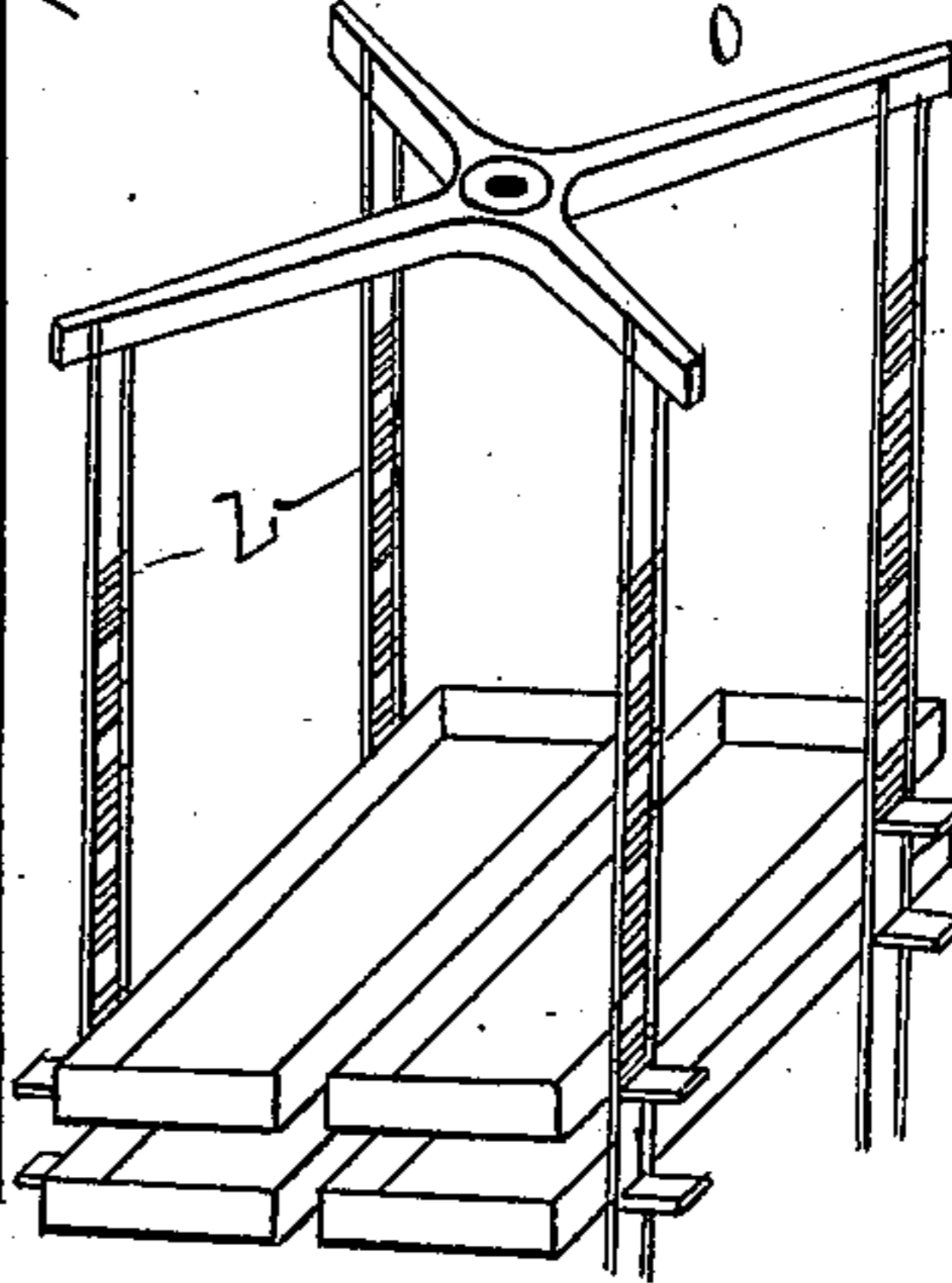


FIG. 8.



Witnesses,
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Fig. 10.

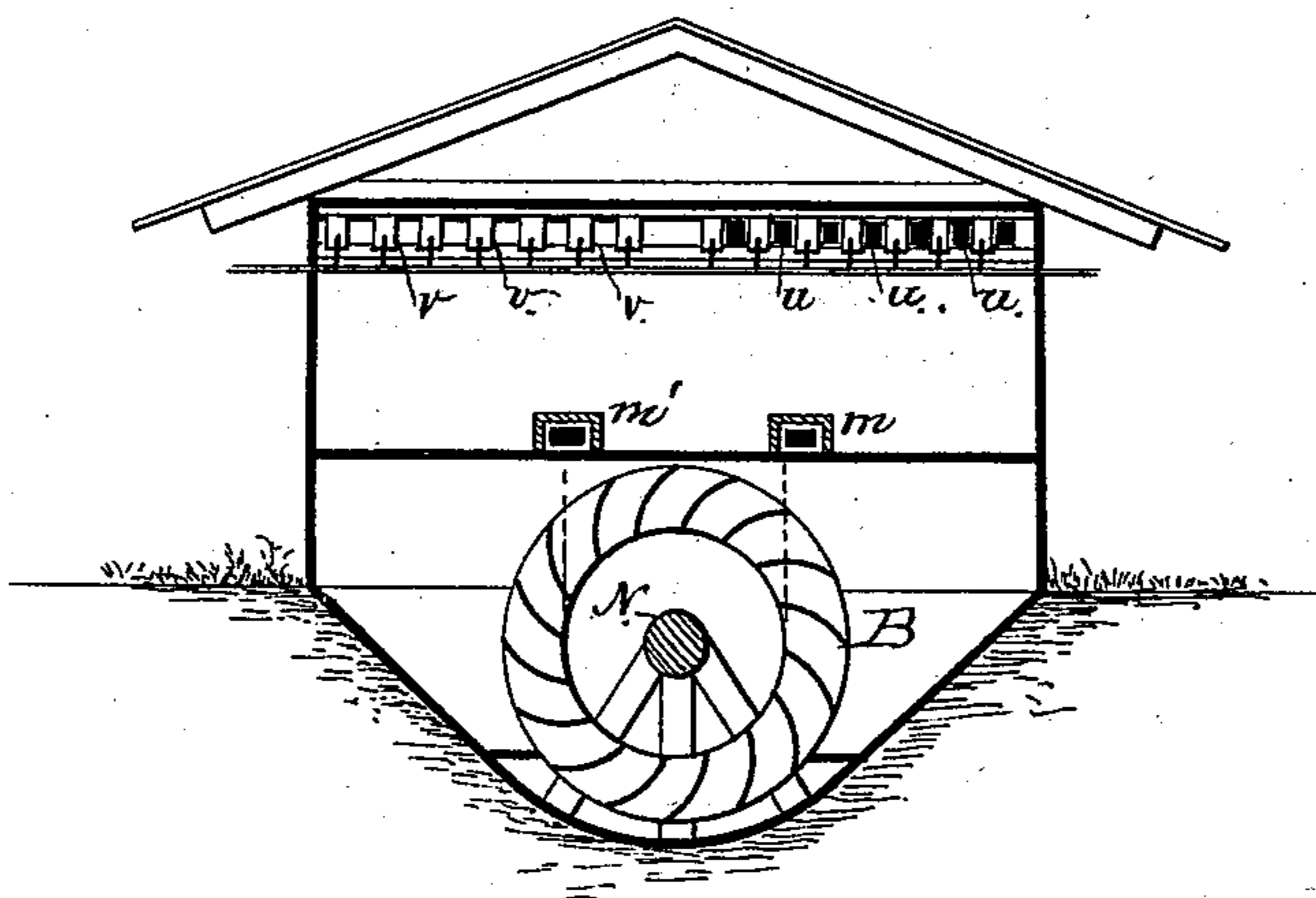
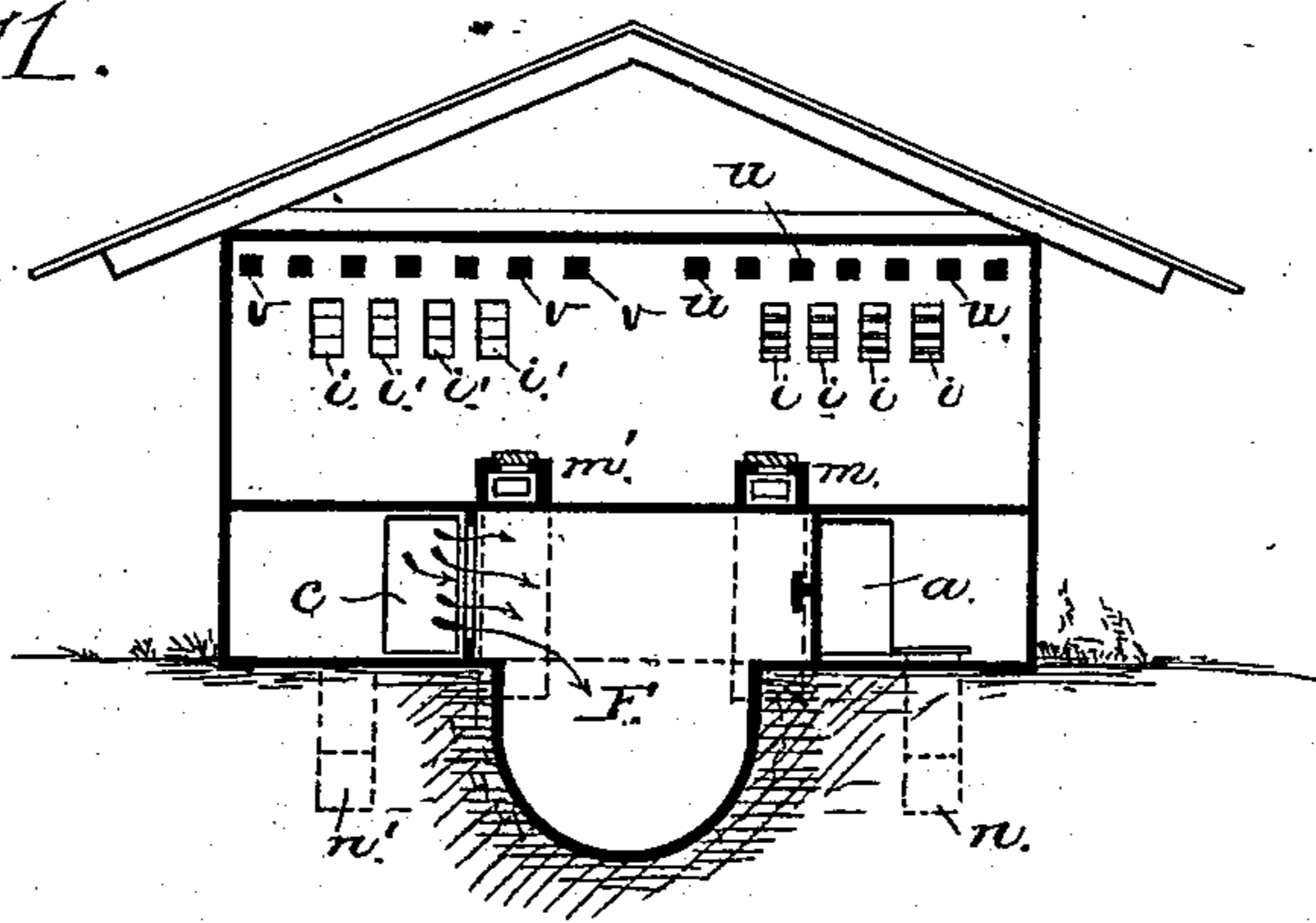


Fig. 11.



Witnesses

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UNITED STATES PATENT OFFICE.

CHARLES F. BUTTE CASPARI, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR
OF ONE-HALF TO SAMUEL L. THELLER, OF SAME PLACE.

DRIER.

SPECIFICATION forming part of Letters Patent No. 374,520, dated December 6, 1887.

Application filed July 7, 1885. Serial No. 170,914. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. BUTTE CASPARI, of the city and county of San Francisco, and State of California, have invented an Improvement in Driers; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to certain improvements in apparatus for drying and preserving fruit, food, or other materials, and depriving the exposed material of moisture by means of currents of air, warmed, desiccated, or impregnated with anti-putrescent or other substances.

My invention consists, essentially, of a pair of drying-chambers arranged side by side, but separated from each other except at one end, a heating-chamber at the other end communicating with each of said chambers through valved induction or inlet passages, and passages in each of the chambers communicating with exhaust-chambers and provided with valves whereby the exhaust may be drawn in either direction at the will of the operator, the chambers and the passages being so arranged that the exhaust is drawn through one chamber across into the next, and then in the opposite direction through the other chamber, or the reverse, the draft being continuous through both chambers in either direction. This construction provides a compact chamber without any intermediate heating-chamber between the drying-chambers, and gives all the advantages of reversed current, uniform drying, and simplicity of action.

My invention consists, further, of the chambers arranged side by side, but separated except at one end, as above described, with induction-pipes for admitting the air to different parts of the chamber, and discharge-pipes with their openings opposite those of the induction-pipes, and with means for maintaining a current longitudinally throughout the two chambers, whereby a transverse current is established, together with a longitudinal general current.

My invention also consists of details of construction, as hereinafter explained.

Referring to the accompanying drawings for a complete explanation of my invention, Figure 1 is a horizontal section showing the ground plan of the exhaust-chamber and air-channels

and other parts. Fig. 2 is a horizontal section taken so as to show the arrangement of the distributing-pipes in or near the ceiling and other details. Fig. 3 is a vertical section taken through the drying-chamber, stove, and draft apparatus or fan. Fig. 4 is an enlarged transverse section showing the mouth of the distributing-pipes and wheel. Fig. 5 is a vertical section of the stove, the hot-air chambers, and exhaust-chamber, with the fan-wheel N. Fig. 6 is an enlarged transverse vertical section of the stove or heater, showing the desiccators and other parts. Figs. 7, 8, and 9 show the manner of supporting the trays within the chambers, with the turning apparatus on the ceiling. Fig. 10 is a cross-sectional view on line *xx* of Fig. 3. Fig. 11 is a cross sectional view on line *yy* of Fig. 3.

In the drawings, *H H'* is a chamber having any desired length and direction; but it should return upon itself, so that the ends are side by side, or near each other. The chamber may be provided with transverse diaphragms, by which any portion of the length may be cut off, so as to reduce the size of the chamber when a small quantity of work is to be done.

At one end of the apparatus is a stove or heater, *D*, into which the atmospheric air is drawn through a chimney or flue, *K*, (see Fig. 6,) of considerable height, so as to insure its being pure. This air may pass over the trays *E* upon each side of the heater containing any material by which the air may be deprived of its moisture. After passing over these trays, the air passes in through numerous small openings or pipes, *l*, Fig. 6, into the spaces around the heater, and from these the heated air passes out into a chamber, *u u v v*, from which it is led through pipes *r* and *s* along the upper part, near the ceiling of the drying-chamber. Outside of this chamber *u*, and next to the drying-chamber, is another chamber, *X*, where the air which is warmed by radiation from the heater and the chamber *u v* is stored, and from which it passes directly into the drying-chamber through shutter-openings *i*, Fig. 1. The two sets of inlet-pipes *rr ss*, (the latter shown in dotted lines in Fig. 2,) passing along the upper part of the chamber, are of different lengths, with outlets equally divided, through which the heated air may be discharged down-

ward into the upper part of the chamber. Each set has its discharge-openings on both sides of the central partition, so that air drawn from one set is discharged into both sides; but the general current is in one direction when one set is used and in the other direction when the other set is used.

Below the stove or heater is a rotary fan or suction-wheel, N, revolving in a chamber or passage, F, which communicates with the drying-chambers H H' by means of the valved ports *a* and *c* and of the channels *n* and *n'*, which extend along beneath the floors of the chamber and have openings or passages *o* leading from the chambers H H' into them at intervals from one end to the other. These channels *n n'* are arranged on the same principle involved in the arrangements of the systems of pipes *r* and *s*. When the port *a* is closed, the suction is through openings leading to both pipes *n n'* on both sides of the partition and in both chambers H and H', and when the position of the valves is reversed and the current sets the other way the induction of the current is down through the openings on both sides in the same manner.

When the fan N is in operation, a draft is produced through the channels *n n'* and the pipes *r* or *s*, and this causes the atmospheric air to be drawn down the entrance-shaft, passing through the desiccators E E around the heating-space of the stove D. The partly desiccated and heated air collects in the chamber *u u v v* and passes through the distributing-pipes along the ceiling into the drying-chamber, circulating downward through the exposed material, absorbing as much moisture as possible, and forming deposits of the chemicals it contains. The partly-saturated air enters the openings *o o* in the channels *n n'*, passing through these channels to the exhaust-chamber, from which it is discharged at the periphery of the rotary fan into the open air. It will be seen that by this method of drawing the air downward, instead of allowing it to rise upward, as is usual in driers, the descending current carries with it all impregnating matter and divides it equally over the whole drying-chamber.

Underneath the chambers are channels in which are located the smoke-flues *m* and *m'*, leading from the furnace to the chimney A. These channels are larger than the flues, and in the space around the flues air is warmed and discharged upward through openings *e* into the chambers H and H'. The rising warm air from the flues *m* and *m'* meets the descending draft. The velocity of the latter is retarded, the resistance partly overcome, and almost perfect intermixture takes place. Time is allowed and there is a very heavy percentage of saturation equally over the exposed material, and all partial currents, and consequent stagnations and imperfect circulation, are successfully regulated.

The passages which lead from the drying-

chambers H H' into the exhaust-chamber F are provided with ports or gates *a* and *c*, which may be closed by hand, or may be so connected that when one is closed the other is opened. The ports may be mechanically connected with the slide-valves over the openings of the distributing-pipes and the openings *i i* below them.

The rotary fan is steadily at work, unaltered and uninfluenced. It produces a powerful suction and draws the atmospheric air through the air-shaft, desiccator, and through the stove, and deposits heated desiccated air into the hot-air reservoir or chamber *u u v v*. The port *c* being opened, the hot air is discharged near the ceiling and hurled over the whole width of the chambers H H' by the pipes *r r r*. The descending current of warm desiccated air circulates through the material exposed, and within one-half minute it is passing partly-saturated air through openings *o o* into the channels *n n'*, and through the port *c* into the suction of the fan, the general current being from the side of the valved port *a* around the chambers to the port *c*. If the port *c* is closed, the pipes *s* and openings *i* on that side are open. The port *a* is opened and the pipes *r* on that side and openings *i* beneath them are closed. The hot-air reservoir discharges now into the dotted pipes *s s s*. The descending current again performs its work and passes the saturated air into pipes *o o o* and channels *n n'* through port *a* into the suction of the fan. This time the general current of the fan has been from the side of the valved port *c* around the chamber to *a* in the reverse direction of the arrows in the plans.

By the construction described all the heat is utilized, the hot air is thoroughly circulated in the drying-chambers, and while it is thrown vertically it also has a longitudinal and reversible circulation, rendering the drying uniform throughout the chambers. The trays are made of galvanized iron, upon which the fruit or material to be dried is placed, and are supported in any suitable or desirable manner. In the present case I have shown them about seven feet long and three feet four inches wide, and as having bars placed between them projecting from their sides, which enter spaces between blocks L L, which are fixed in ropes suspended from crosses O in the upper part of the chamber; or the trays may be supported in any other suitable or desirable manner, so that each pile can be turned. The smoke-flues of the stove or heater are carried, preferably, beneath the surface of the ground to a chimney which is situated at the opposite end of the apparatus.

I do not claim in this application the particular construction of the drying-chamber, the means for producing currents transversely from top to bottom through the chamber, nor the means for preparing the air to be used in the chamber, as these features form the subject-matter of my application, Serial No. 195,031, filed March 12, 1886.

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

5 1. In combination, a pair of drying-chambers arranged side by side, but separated from each other except at one end, a heating-chamber at the other end communicating independently with each of said chambers through
10 valved inlet-passages, exit-passages in each of said chambers at the same end at which the inlet-passages are placed, and provided with valves, and an air-forcing apparatus arranged to force air through both chambers in either direction, substantially as described.

15 2. In combination, a pair of drying-chambers arranged side by side, but separated from each other except at one end, a heating-chamber at the other end with valved passages leading from the heating-chamber to inlet-pipes,
20 each being arranged to admit the air at various points throughout both chambers, and an exhaust-passage in each chamber, leading to valved openings into an exhaust-chamber, all substantially as described.

3. In combination, drying-chambers ar- 25
ranged side by side, but separated except at one end, a heating-chamber at the other end, with valved communication from the heating-chamber on each side, leading independently
30 into different parts of both chambers, and an exhaust-passage from each chamber, with openings from the various parts of both chambers, leading through a valved opening into a common exhaust-chamber, the openings of the ex-
35 haust in the chambers being opposite those of the inlet-pipes, whereby the current of air may be discharged across the chamber and drawn lengthwise of both in either direction, substantially as described.

In witness whereof I have hereunto set my 40
hand.

CHARLES F. BUTTE CASPARI.

Witnesses:

S. H. NOURSE,
H. C. LEE.