

(No Model.)

7 Sheets—Sheet 1.

L. S. DANIELS.  
HEATER.

No. 551,528.

Patented Dec. 17, 1895.

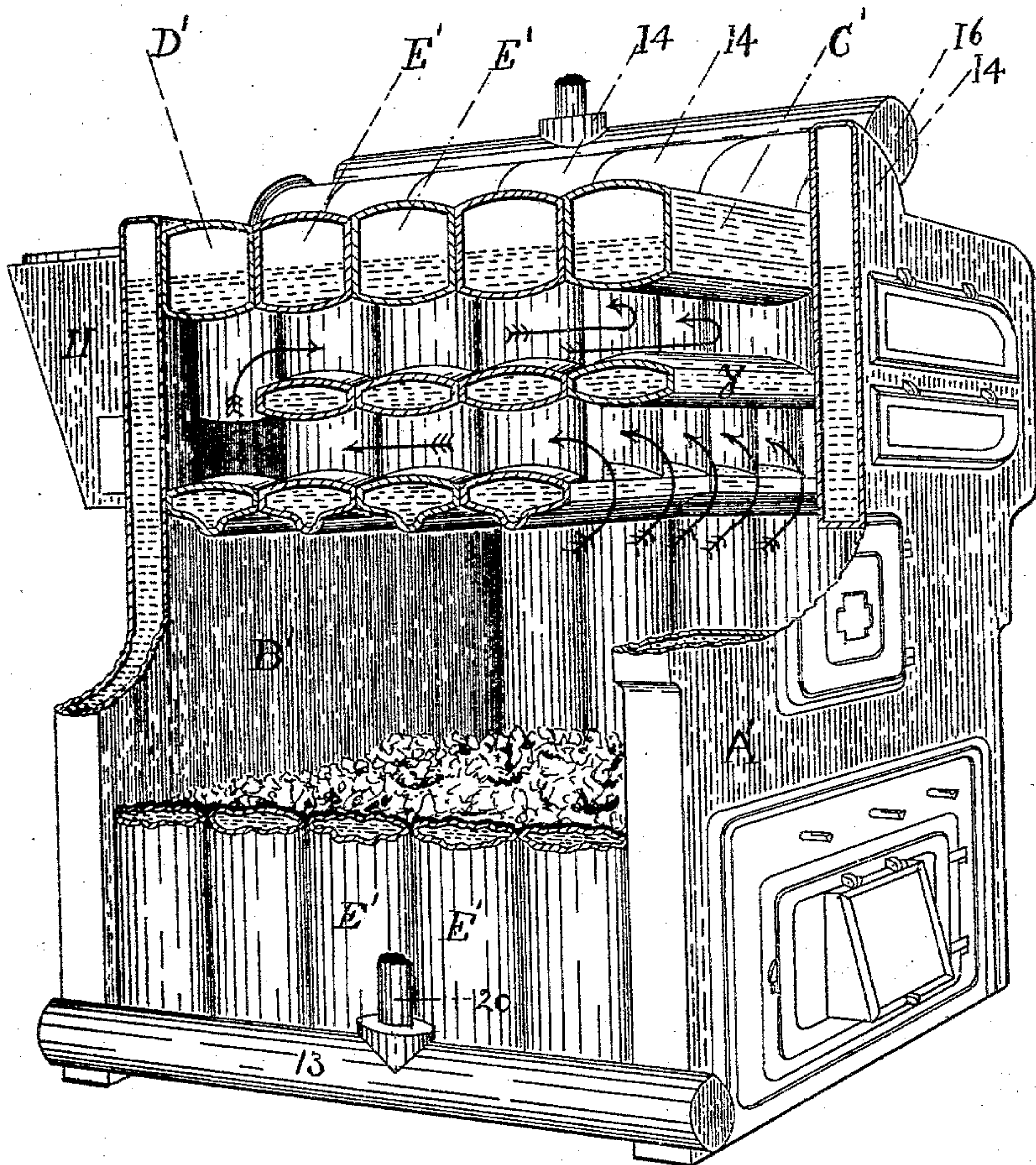


Fig. 1

WITNESSES

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*H. C. Daniels*

INVENTOR

*Louis S. Daniels*

BY

*Hurley, Robinson & Love*  
ATTORNEYS

(No Model.)

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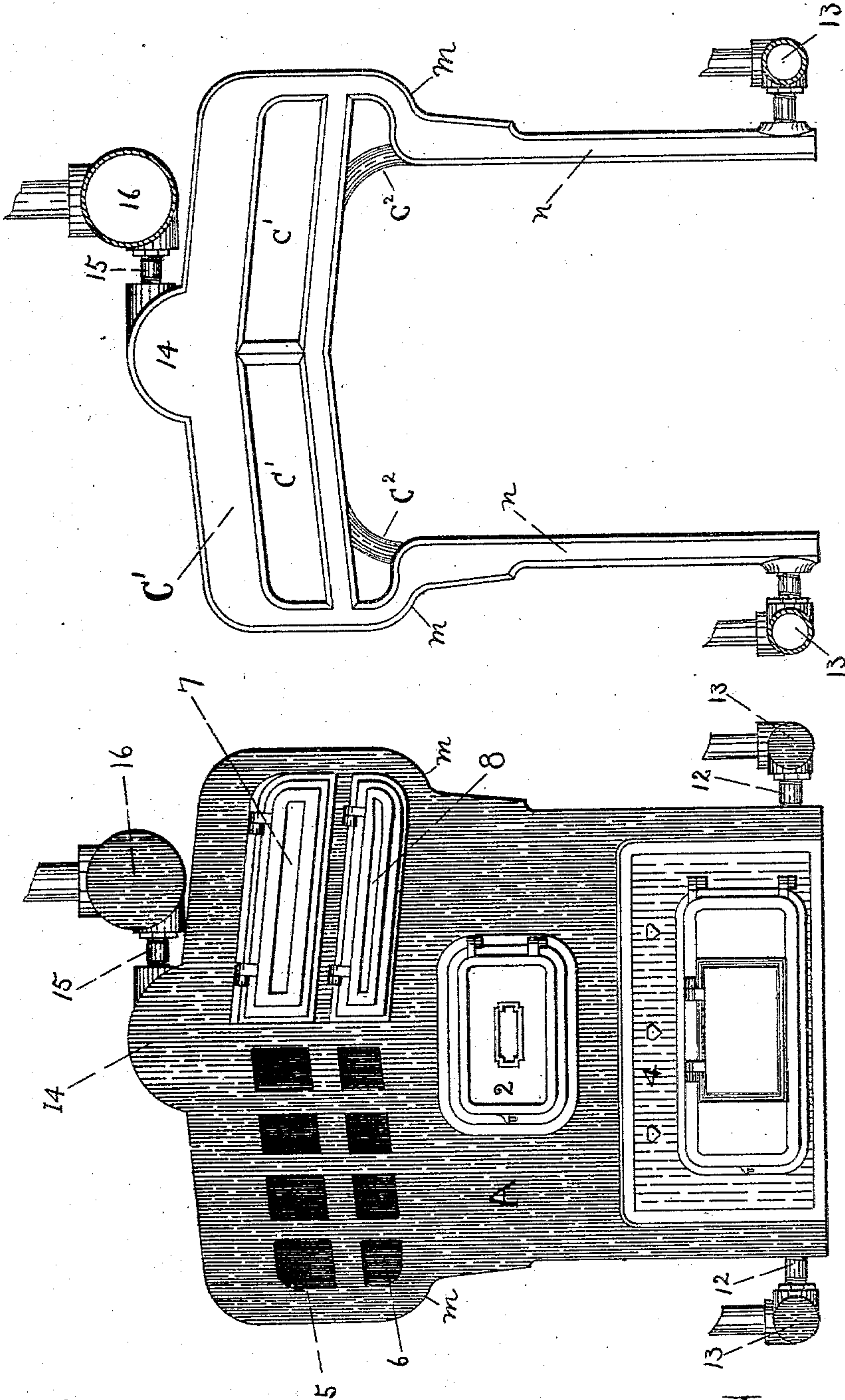


Fig 3

Fig. 2.

Witnesses:  
Chas. W. Parker.  
Hubert C. Peck

Inventor:  
Lewis S. Daniels  
by Henry Calver  
Esq. Atty.



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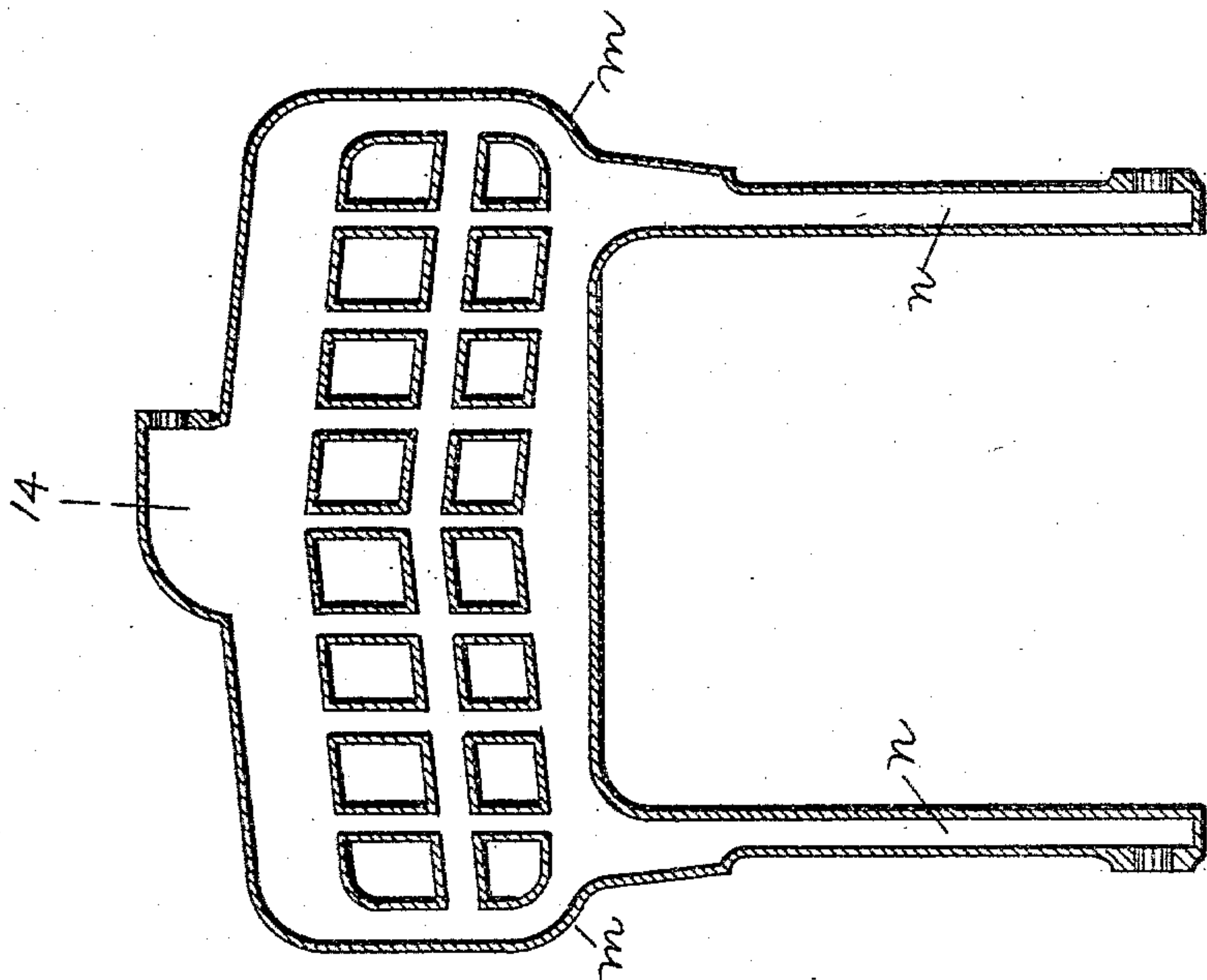


Fig. 5.

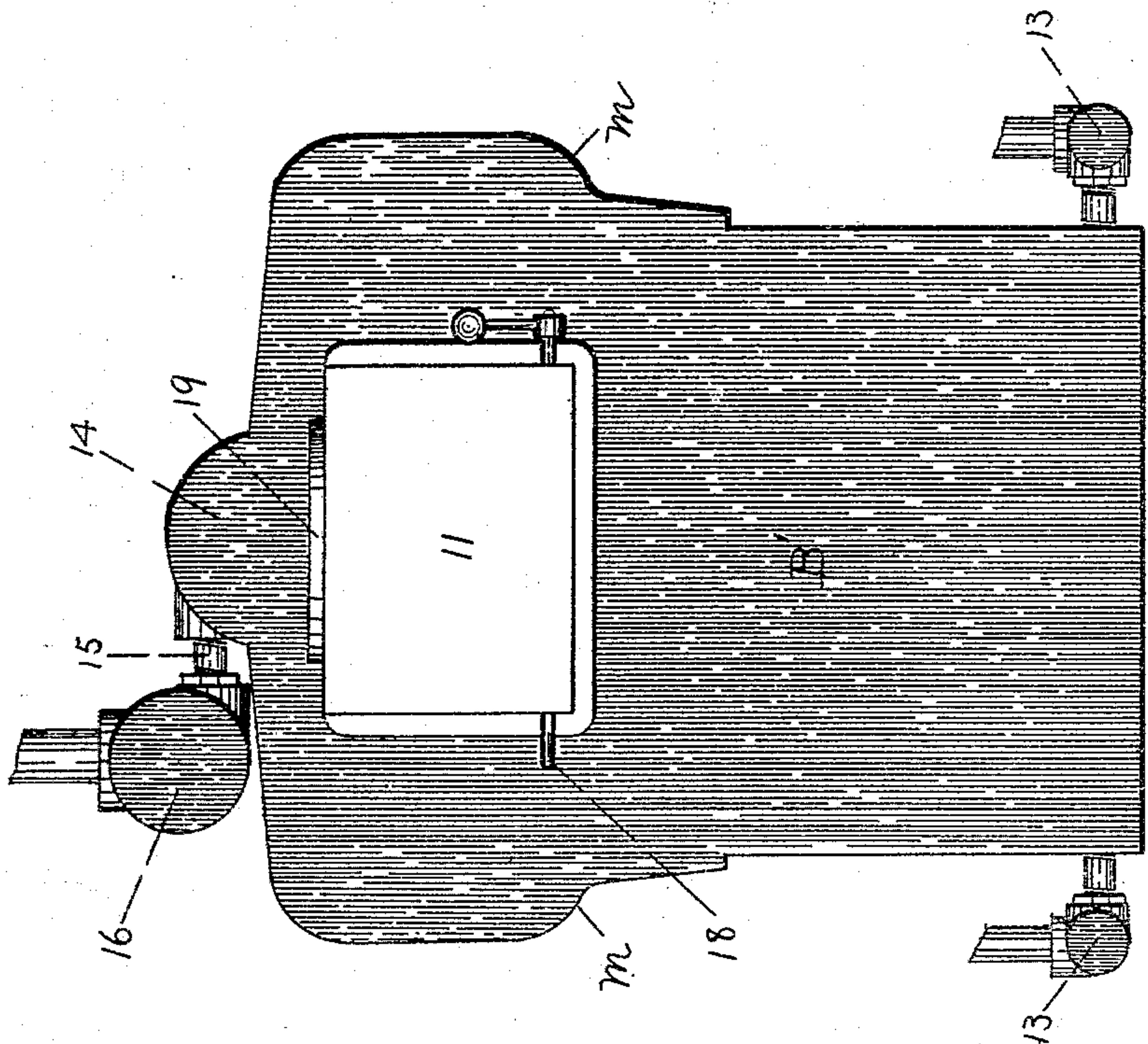


Fig. 4.

Witnesses:  
Chas W. Parker.  
Herbert D. Peck

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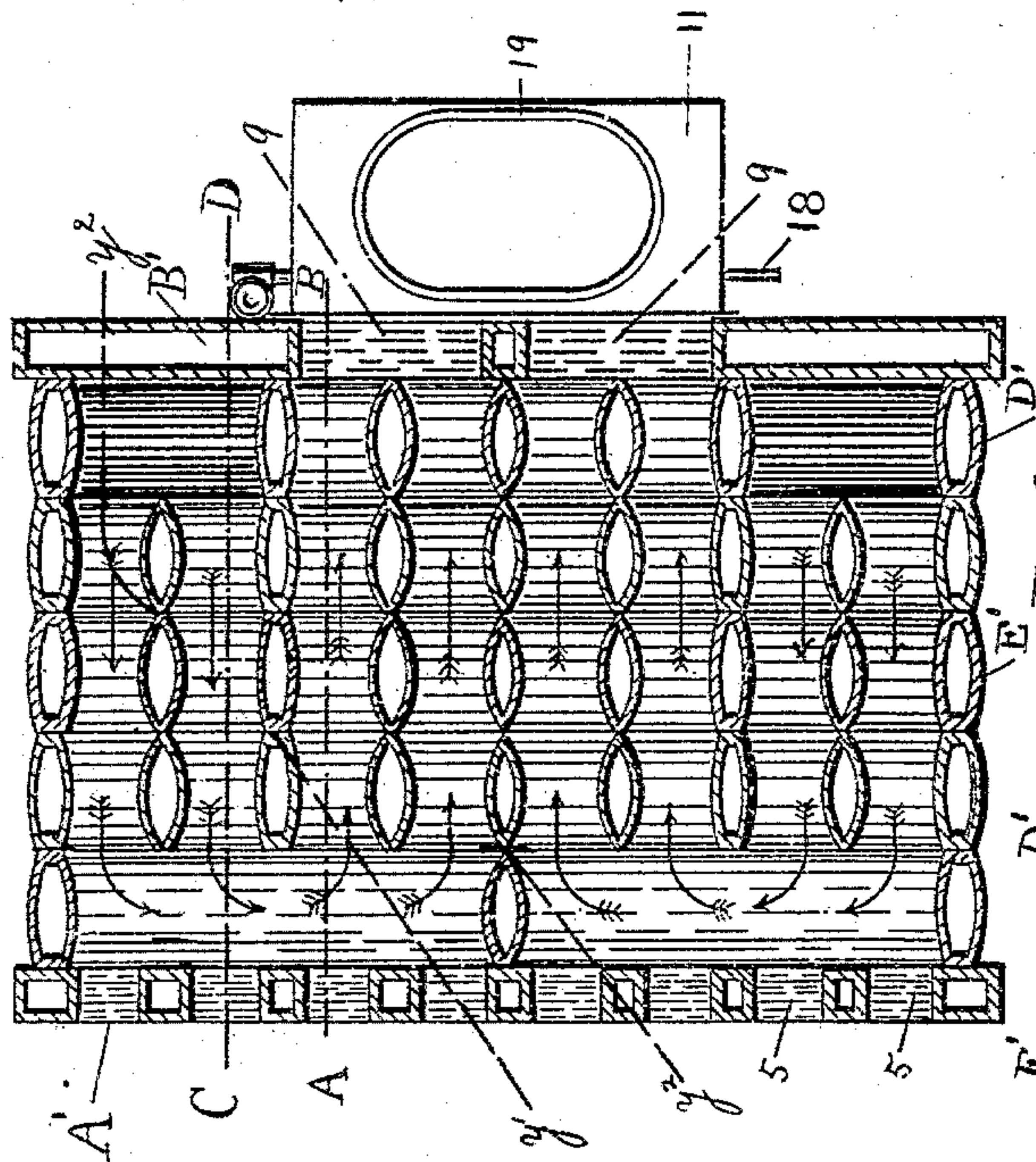


Fig. 8.

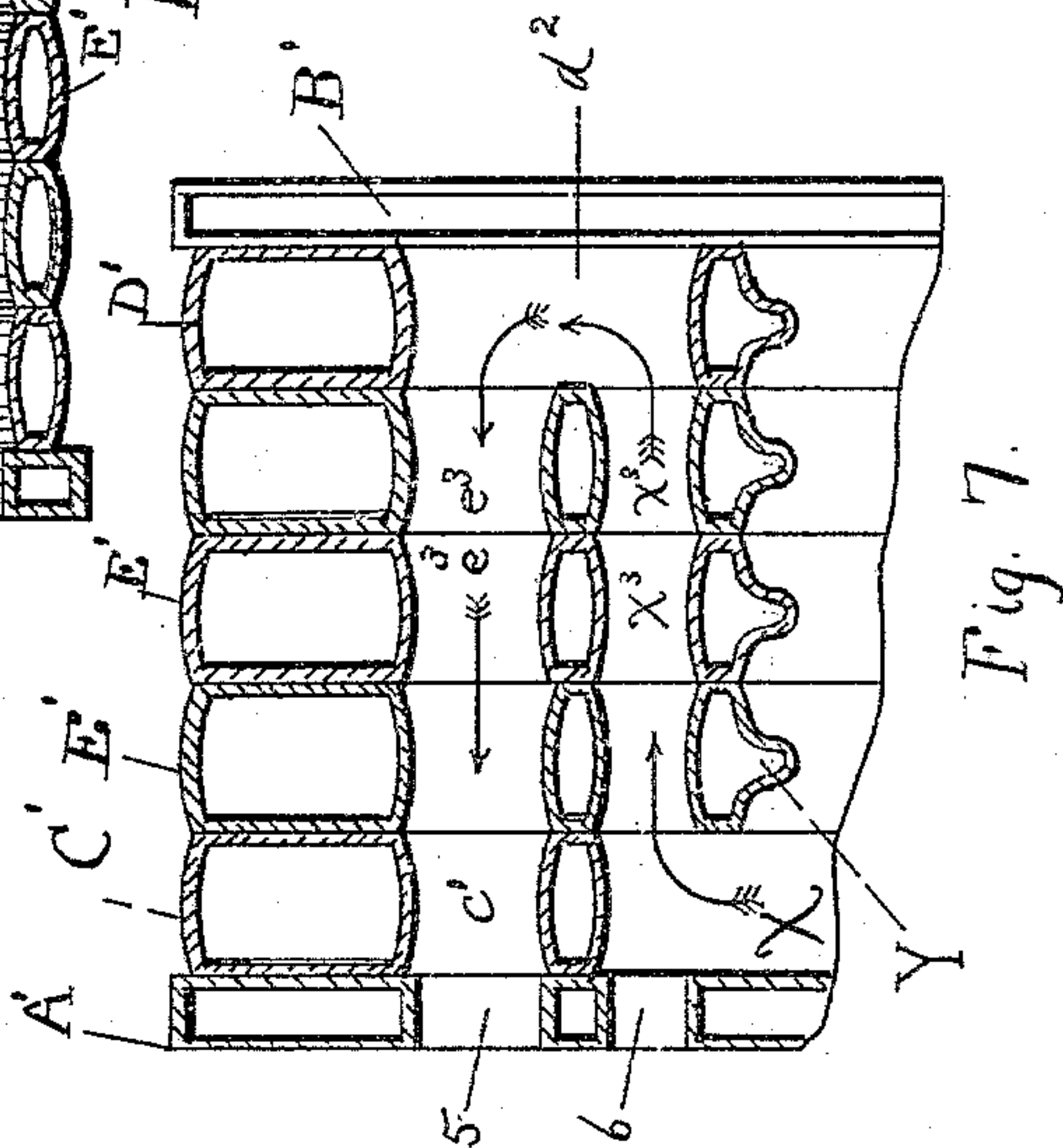


Fig. 7.

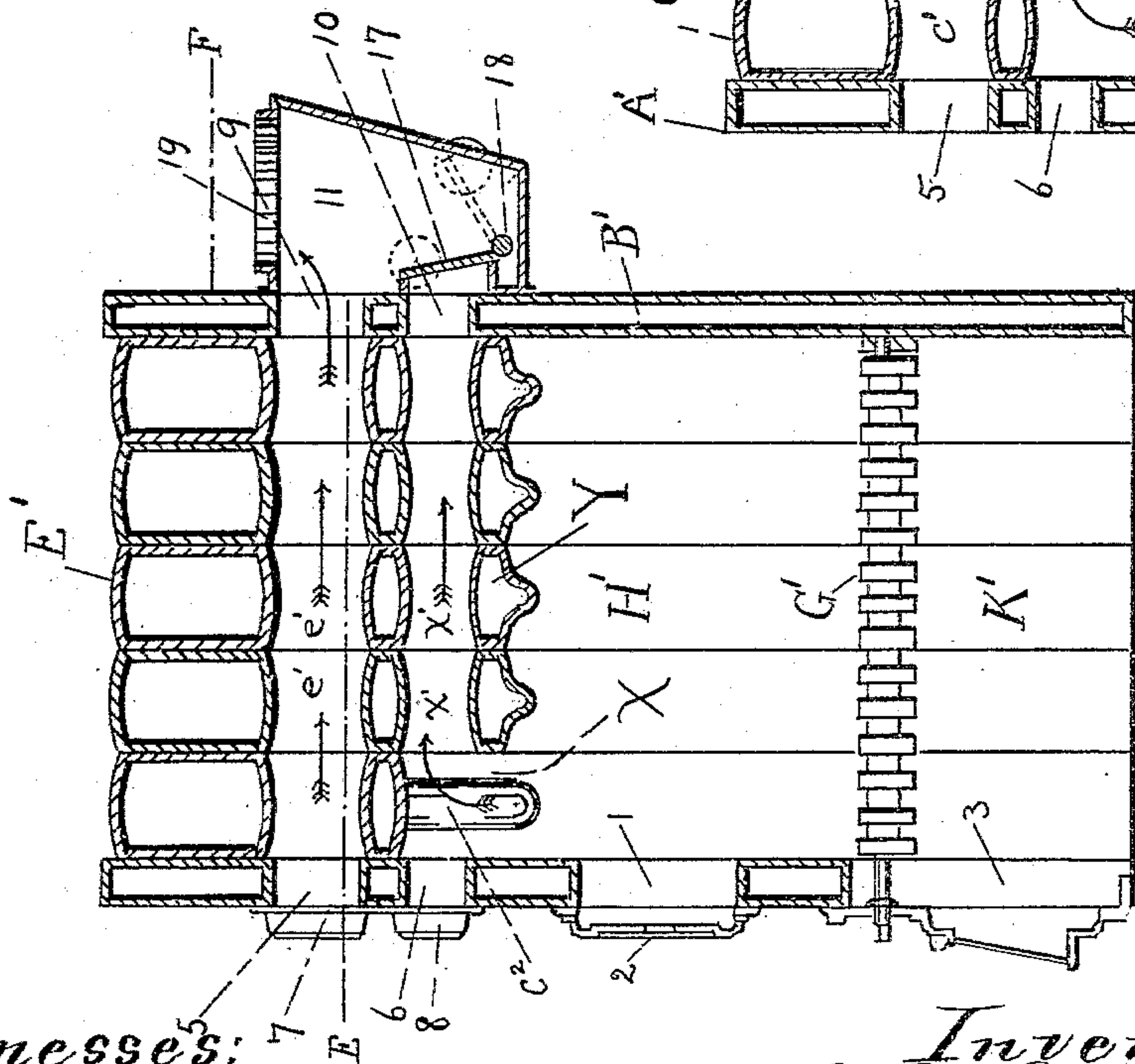


Fig. 6.

Witnesses:  
Chas. W. Parker  
Hubert E. Peck

Inventor:  
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by Henry Baker  
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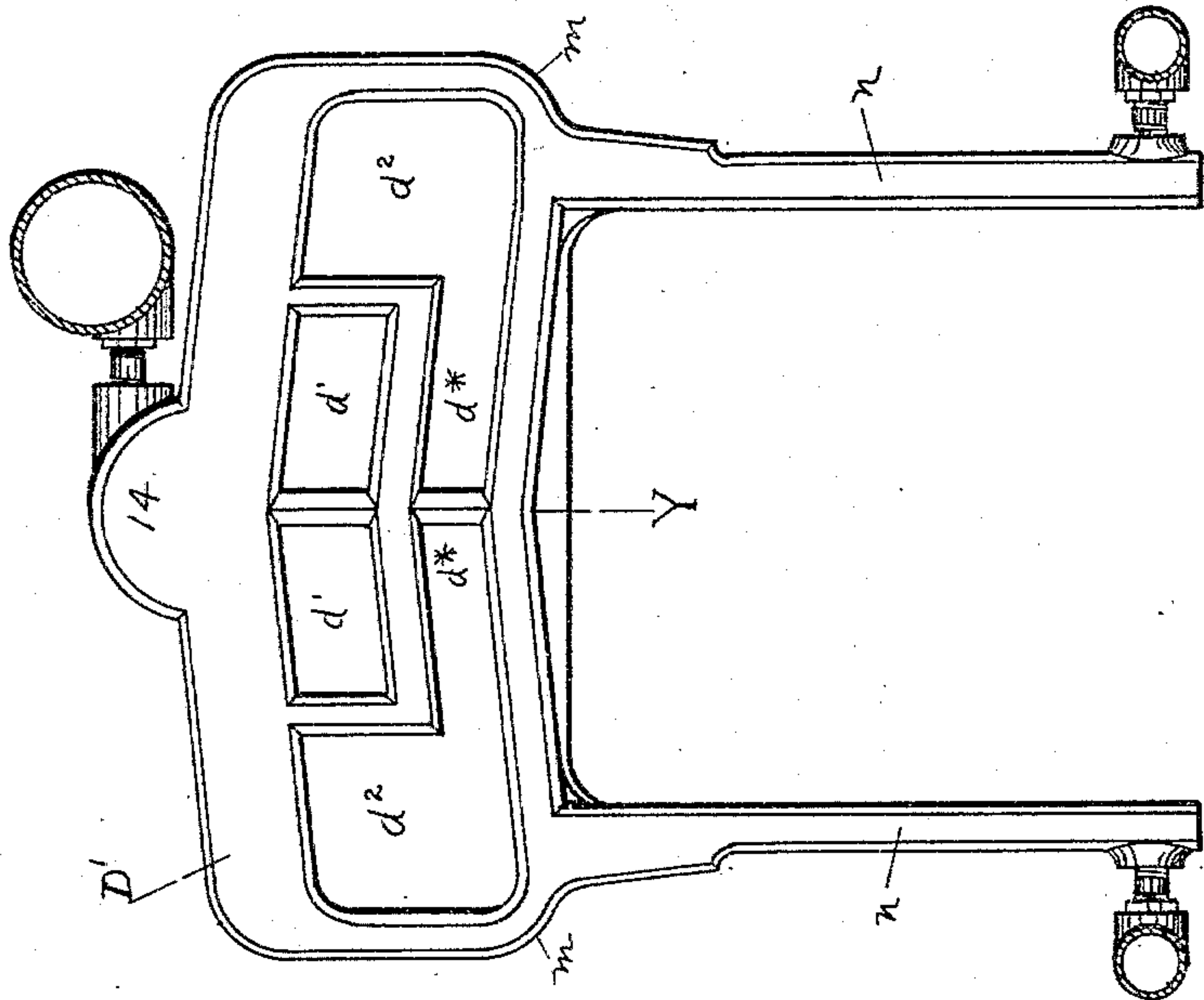


Fig. 10.

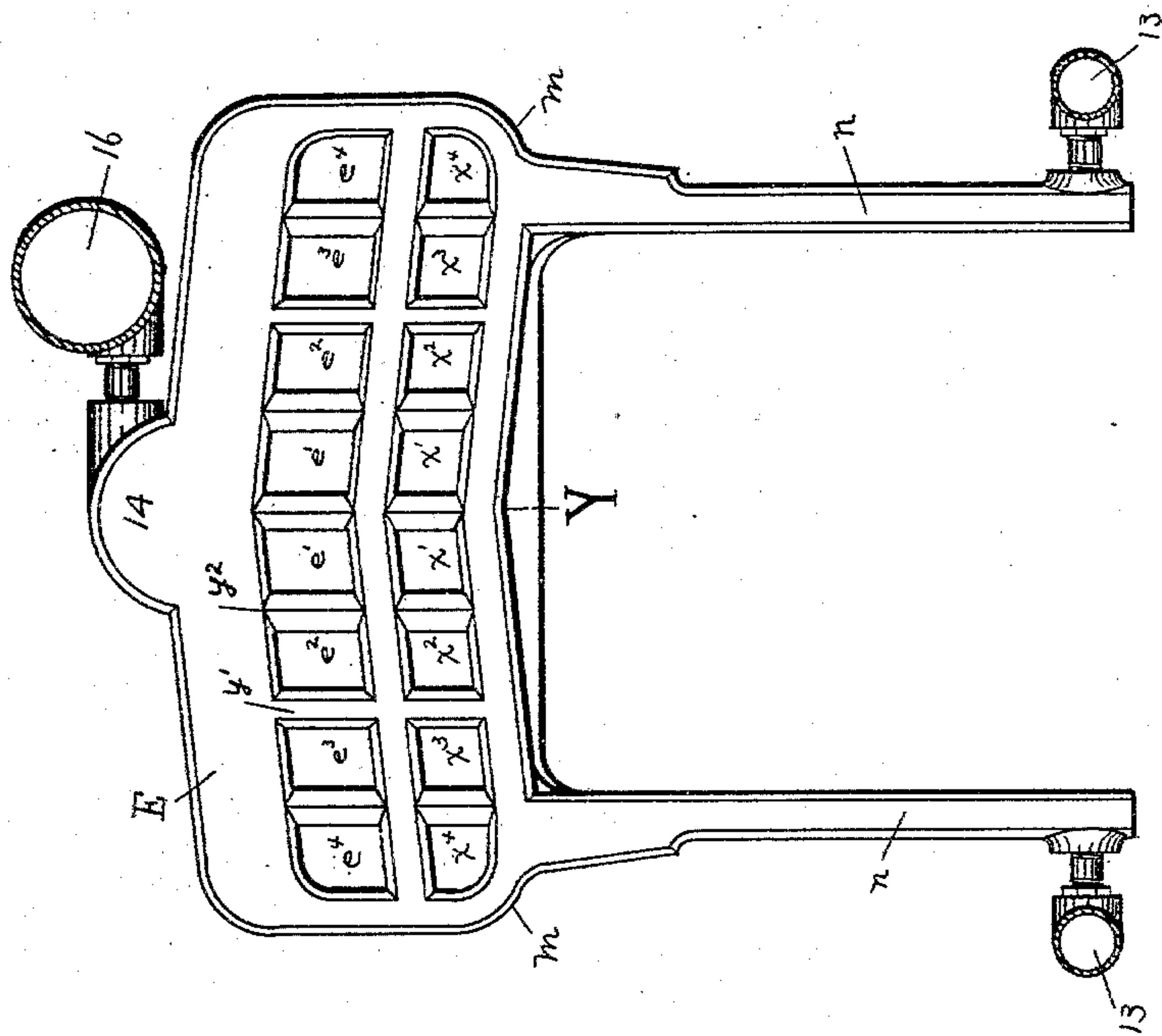


Fig. 9.

Witnesses:  
Chas. W. Parker,  
Hubert & Peck

Inventor:  
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by Henry C. Baker  
Att'y.

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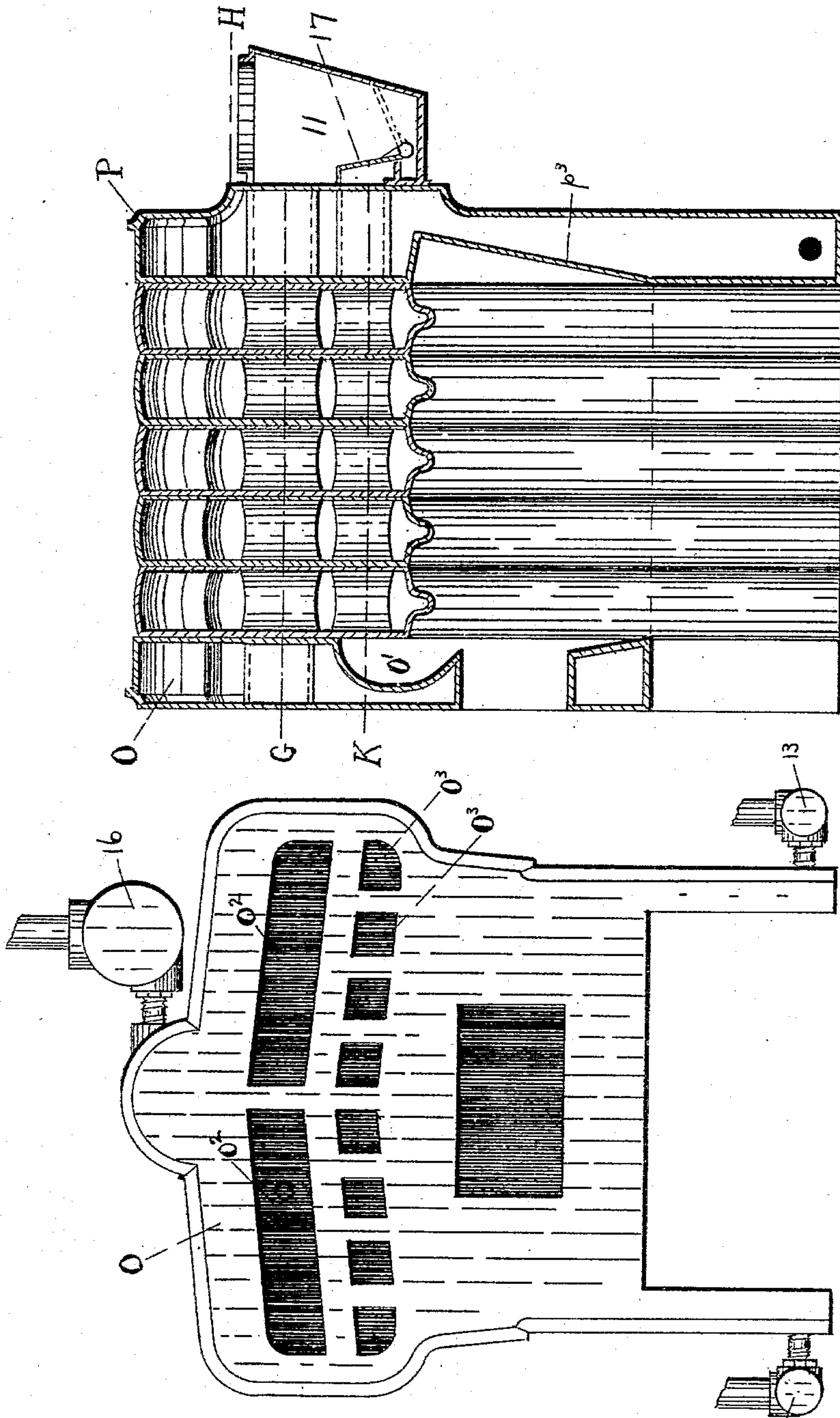


Fig. 12.

Fig. 11.

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By Henry Calver  
Atty.



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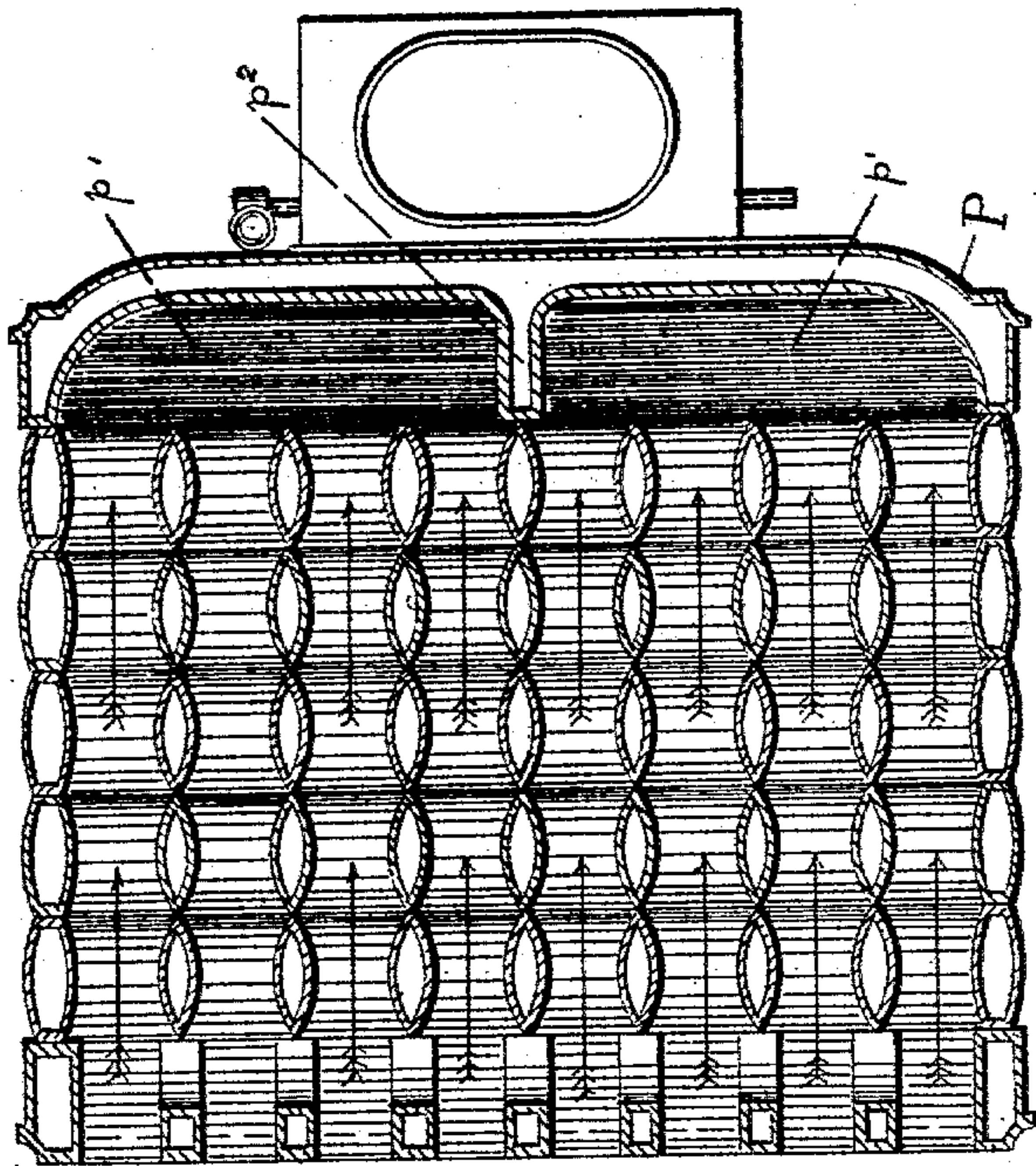


Fig. 14.

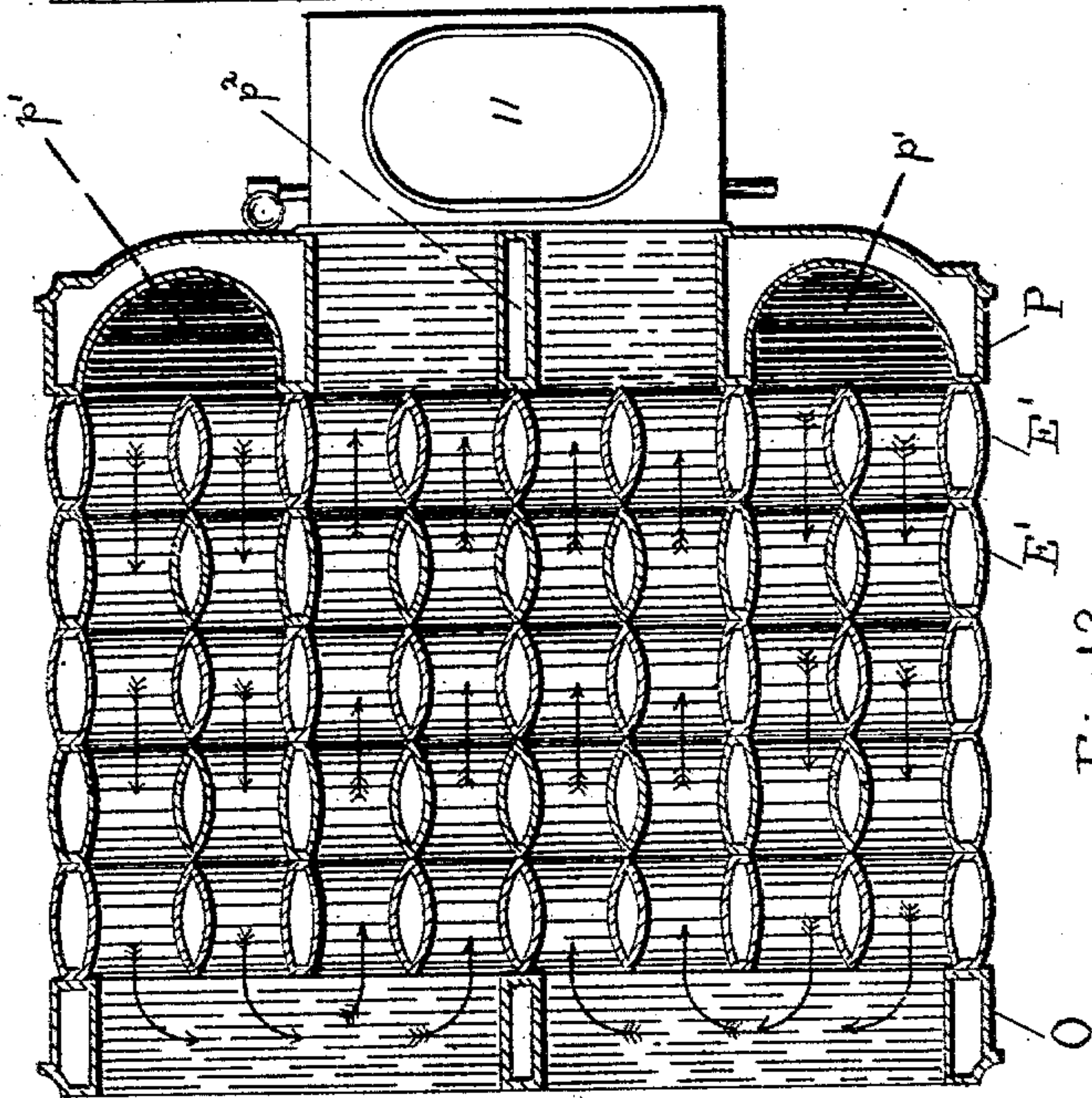


Fig. 13.

Witnesses:  
Chas. W. Parker,  
Hubert O. Beck

Inventor:  
Lewis S. Daniels  
by Henry Calver  
Atty.



# UNITED STATES PATENT OFFICE.

LEWIS S. DANIELS, OF UTICA, NEW YORK, ASSIGNOR TO RUSSEL WHEELER  
& SON, OF SAME PLACE.

## HEATER.

SPECIFICATION forming part of Letters Patent No. 551,528, dated December 17, 1895.

Application filed June 24, 1895. Serial No. 553,843. (No model.)

*To all whom it may concern:*

Be it known that I, LEWIS S. DANIELS, of Utica, in the county of Oneida and State of New York, have invented certain new and useful Improvements in Heaters; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form part of this specification.

My invention relates to improvements in heaters.

In the drawings which accompany and form a part of this specification, and in which similar letters and numerals of reference refer to corresponding parts in the several views, Figure 1 shows a vertical broken section of the heater in perspective. Fig. 2 shows the front elevation with the doors on one side of the front omitted. Fig. 3 shows the front section of the heater. Fig. 4 shows the back from the outside. Fig. 5 shows one of the regular or intermediate sections in vertical section. Fig. 6 shows a vertical longitudinal section of the heater, taken on line A B of Fig. 8. Fig. 7 shows a partial vertical section taken on line C D of Fig. 8. Fig. 8 shows a horizontal section taken on line E F of Fig. 6. Fig. 9 shows one of the regular or intermediate sections. Fig. 10 shows the rear section. Fig. 11 shows the front section of a modified form of construction from the outer side of the section. Fig. 12 shows a vertical section of the heater of the modified form of construction in which the section of Fig. 11 is employed. Fig. 13 shows a horizontal section of the modified form of construction, taken on line G H of Fig. 12. Fig. 14 shows a horizontal section of the modified form of construction, taken on line K H of Fig. 12.

The heater, as shown in Figs. 1 to 10, inclusive, consists of a water-front A' and a water-back B' with a special front section C' and any desired number of regular intermediate sections E'. The front section is provided with a feed-door opening 1 closed by a door 2, and a base-opening 3 closed by an ash-pit front 4, and suitable clean-out openings 5 and 6 closed

by doors or covers 7 and 8 respectively. The back B' is provided with a pair of openings 9 and 10, which furnish passage-ways into the smoke-box 11 secured on the outer side of the back B'. The intermediate sections E' are provided with a series of upper openings  $e'$   $e^2$   $e^3$   $e^4$  and a series of lower openings  $x'$   $x^2$   $x^3$  and  $x^4$ , which when the sections are arranged in the heater side by side form a series of flues extending from front to rear of the heater. In order to furnish sufficient area of flues and provide for the circulation of the water, the upper portions of the sections are extended transversely, so that they overhang at the sides, as shown at  $m m$ , the vertical water-legs  $n n$  of the regular sections. This also aids in keeping the height of the heater as a whole down to the minimum, and the heater may be extended or overhung at the sides to a much greater extent than shown in the drawings if desired.

The front section C' of the heater is provided upon either side with a large opening  $c'$ , which corresponds in position to the flues or openings  $e'$   $e^2$ , &c., of the regular sections of the heater, and the space between the water-legs of the front section is extended above the tubes which form the lower face of the crown of the regular heater-sections, thereby affording a space in which the products of combustion are enabled to turn when arising from the fire and enter the flues  $x'$   $x^2$ , &c., of the regular or intermediate sections. The front section C' is also provided with a short curved tube  $c^2$ , which spans the corner between the water-leg of the section and the crown of the same, forming a circulation in the water-leg and increasing the area of heating-surface. The water-legs and body of the front section correspond in outside outline with that of the intermediate sections and overhang the water-legs at the upper end in the same manner. The rear section D' (shown in side elevation in Fig. 10) is made of the same width and depth corresponding to that of the regular sections; but it is provided with openings  $d'$  and  $d^2$  in lieu of the openings of the regular sections. The openings  $d^2$  correspond in position to the openings  $x'$   $x^2$   $x^3$   $x^4$   $e^3$ , and  $e^4$  of the regular section and the opening  $d'$  corresponds in position



with the openings  $e'$  and  $e^2$  of the regular section. The arm portions  $d^*$  of the openings  $d^2$  of the rear section correspond also in position with the openings 10 in the water-back through into the smoke-box 11, and the openings  $d'$  correspond in position with the openings 9 through the water-back into the smoke-box 11.

The cross-tube  $y$ , which divides the series of openings  $e^2$ ,  $e^3$ , &c., from the series of openings  $x'$ ,  $x^2$ , &c., is preferably doubly made inclined, as shown, to correspond with the crown-tube  $y$ , and is made comparatively wide on its face sides, as shown, so that when several sections are mounted together packing can be inserted between the tubes  $y$  of the several sections and prevent the products of combustion passing or crossing the tubes  $y$ . The same provision is also made in the vertical tubes  $y'$ , while the other tubes, as  $y^2$ , which separate some of the flues, have sharp edges, as shown, which may perhaps allow a small portion of gases to pass between the flues, this not being detrimental to the efficiency of the heater. These tubes only form additional heating-surface. All the tubes  $y$ ,  $y'$ , and  $y^2$  are made oval in cross-section, as readily appears from the horizontal sections, particularly Fig. 8.

The grate  $G'$  preferably consists of rocking grate-bars mounted in the front and back and dividing the base portion of the sections into a combustion-chamber, portion  $H'$ , and an ash-pit base portion  $K'$ .

The water-legs of the several sections, including the intermediate and front and rear sections as well as the water-front and water-back, are connected by short nipples, as 12, with the manifolds 13 extending along either side of the heater at the base. The top of each section and water-front and water-back are provided on the center of the section with a semicircular or oval enlargement 14, which provides for a side opening in which engages a nipple 15, which connects each section and the front and back with the steam drum or header 16, from which the distributing-pipes extend to the several portions of the building to be heated. The enlargement 14 provides for the ready separation of the steam from the water when used as a steam-heater, and facilitates the circulation of the water when used as a hot-water heater.

By the arrangement of the side connection from the enlargement 14 on the top of the sections of the heater the height of the heater, including the drum or header, is reduced without interfering with the circulation in the sections and heater as a whole.

The crown-sheet flues  $y$  of the intermediate and rear sections are provided with a V-shaped (on cross-section) lower surface which drops into the combustion-chamber, affording a greater area of heating-surface and providing for expansion and contraction of the tubes, and the arms of the V are preferably curved, as shown in Fig. 6.

There is shown at 17 a damper, which is mounted on a horizontal shaft or spindle 18 extending transversely across the smoke-box 11, which damper is adapted to close openings 10 through the water-back B.

The operation of the heater is substantially as follows: A fire being located on the grate  $G$ , the products of combustion arising therefrom circulate in and occupy the combustion-chamber  $H$ , where they are commingled with a fresh supply of air admitted through the door 2 above the grate  $G$ , and passing to the front and through the opening  $X$ , formed in the front section into the lower set of the horizontal flues formed by the openings  $x$ ,  $x^2$ , &c., to the rear section of the heater. In case the damper 17 is open in the position shown in dotted lines in Fig. 6, the products of combustion pass directly into the smoke-box 11 and thence out the draft-flue connected to the smoke-box at 19. This is what I term my "direct draft" and is preferably used in starting a fresh fire in the heater. When the heater is in full operation, it is preferably used, however, with the damper 17 closed in the position shown in full lines in Fig. 6, in which case when the products of combustion reach the opening  $d^2$  in the rear section  $D'$  they shift to the side and upward into and pass toward the front of the heater through the flues formed by the openings  $e^3$  and  $e^4$  of the intermediate sections into the opening marked  $c'$  in the front section, where they pass from the outer side of the heater toward the center and back through the flues formed by the openings  $e'$  and  $e^2$  in the intermediate sections and through the opening marked  $d'$  in the rear section, and through the opening marked 9 in the water-back into the smoke-box 11, and out, which makes the full circulation of the products of combustion through the heater. The return-pipes (marked 20) of the radiator circulating system are connected to the manifolds 13, preferably an equal number upon each side of the heater. The hot water or steam is distributed from the drum 16, and the arrangement of the tubes of the sections is such as to tend to work the hottest water toward the drum 16, while the colder portion of the water in the several sections of the heater is allowed to work back and have a second application to the heated surfaces of the heater before passing on their course through the radiating system connected with the heater.

In the modified form of construction shown in Figs. 11 to 14, inclusive, the water back and front are dispensed with and the front and rear sections are so constructed as to include the essential elements of the water front and back of the construction, as heretofore described. To this end the front section  $O$  of the modified form of construction is provided with a series of substantially semicircular grooves or passage-ways, as indicated at  $o'$ , which affords a passage-way from the front end of the fire-box chamber into the lower set of flues of the regular sections, and the



section O is also provided with large openings  $o^2$  in the upper portion of the body of the section, which affords a transverse passage-way between the outer two and the inner two flues of the regular sections of the heater. These openings  $o^2$  are covered by doors or covers, as is usual with a furnace or heater front, and there is also provided a series of openings  $o^3$ , extending from the front side of the front section through the curved passage-ways  $o'$ , to afford a clean-out for the lower series of the flues in the regular sections. The upper flue may be cleaned through the opening  $o^2$ . The special rear section P is provided with an L-shaped pocket or recess  $p'$ , substantially conforming in shape to the opening  $d^2$  in the rear section D' of the regular construction, as shown in Fig. 10, and which affords a passage-way between all the lower sets of flues into the outer two of the upper set of flues, performing the same office as the opening  $d^2$  of the rear section D' of the regular construction. This rear section is also provided with two openings passing through into the smoke-box arranged substantially in the same manner as the openings 9 and 11 in the water-back. The flues of each half are separated by a vertical water-partition  $p^2$  and the circulation of the products of combustion in the modified form of construction are essentially the same as those of the regular construction, the main difference being as before stated that the water front and back are combined with the front section and back section respectively of the main construction.

In the fire-box portion of the construction of the modified form, and particularly as shown in Fig. 12, the back wall of the fire-box is inclined or let in to the inner side of the rear section P, as shown at  $p^3$ , reducing the water-space of this section and increasing the combustion-space.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination in a heater of the sections E', having a crowning body, having upper flue openings  $e'$ ,  $e^2$ ,  $e^3$  and  $e^4$ , and lower flue openings  $x'$ ,  $x^2$ ,  $x^3$  and  $x^4$ , the two legs spanning the fire chamber, a front end section having transverse openings forming a passage between the flue openings, a passage

from the fire chamber into the lower flues, and a rear section having an opening forming a passage from all the lower flues to the outer side upper flues, substantially as set forth.

2. The combination in a heater of a series of sections each having water legs spanning the fire chamber and a crowning body with an upper and lower series of openings, forming longitudinal flues in the heater, a passage from the front of the fire chamber into the lower set of flues, a passage from the rear end of the lower set of flues into the outer flues only of the upper set and a transverse passage at the front of the heater from the outer flues to the inner flues of the upper set, substantially as set forth.

3. The combination in a sectional heater of a water front having feed door and clean out openings, a front section having openings forming transverse passages, a series of intermediate sections each having a series of openings forming a series of longitudinal flues, a water back having openings forming transverse passage-ways between part of the longitudinal flues and having a smoke exit passage connecting with other of the longitudinal flues and a smoke box inclosing the smoke passage in the back, substantially as set forth.

4. The combination in a heater of a series of sections each having a protuberance at its top with a large internal area and a side opening of smaller area, a drum lying beside the protuberances of the several sections and connections between the drum and the protuberances of the several sections at the side openings thereof, substantially as set forth.

5. The combination in a sectional heater of a front section having openings affording transverse passages, a series of intermediate sections having a series of openings affording a series of longitudinal flues, a back section having openings affording transverse passages and a smoke exit passage, substantially as set forth.

In witness whereof I have affixed my signature in presence of two witnesses.

LEWIS S. DANIELS.

Witnesses:

P. A. TANNER,  
H. C. DANIELS.