

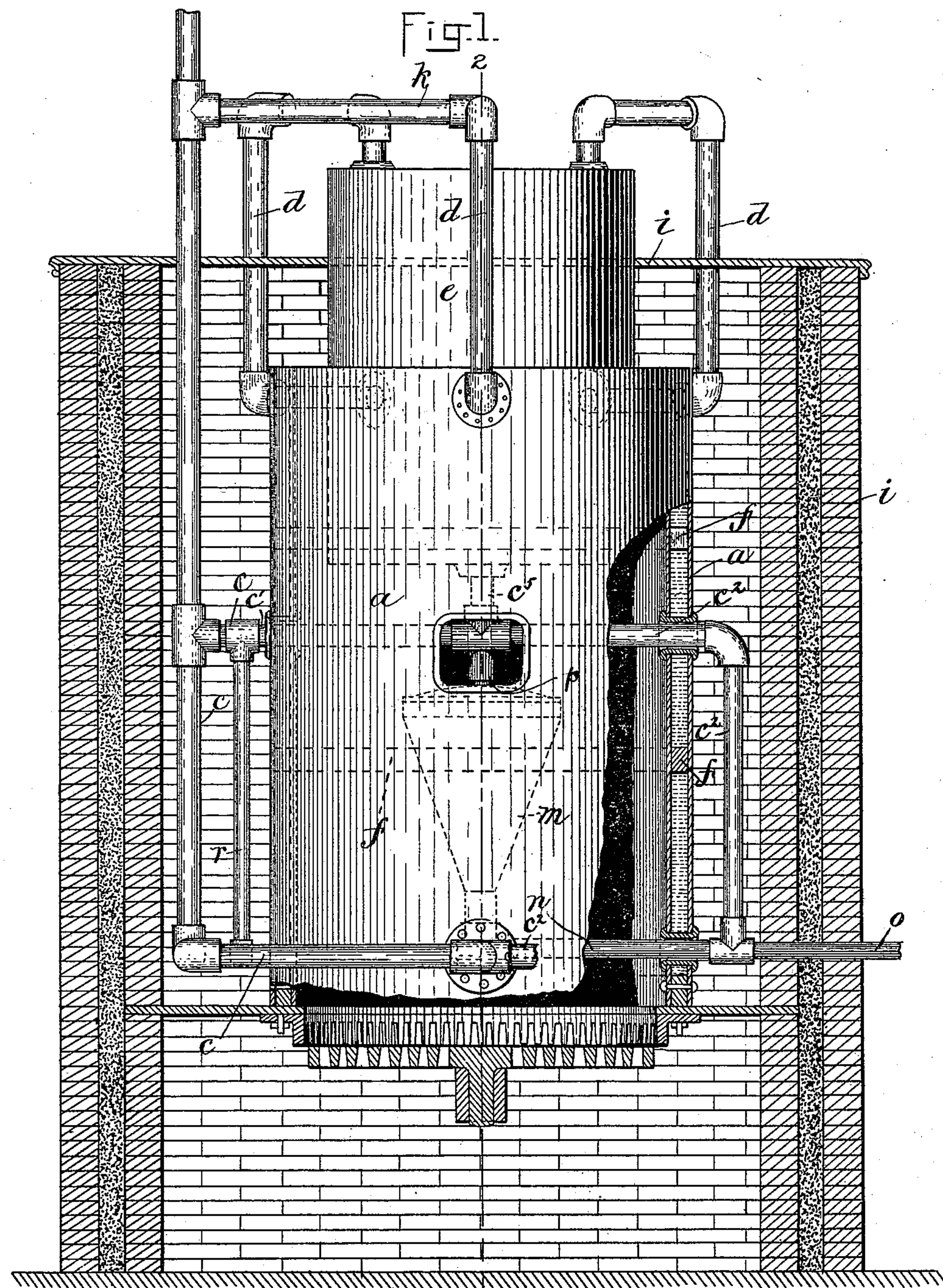
(No Model.)

5 Sheets—Sheet 1.

C. A. SAWIN.  
HEATING APPARATUS.

No. 465,210.

Patented Dec. 15, 1891.



WITNESSES:

*C. C. Battelle*  
*A. D. Hanson*

2

INVENTOR:

*C. A. Sawin*  
*by Nipps, Brown & Company*  
*attys*



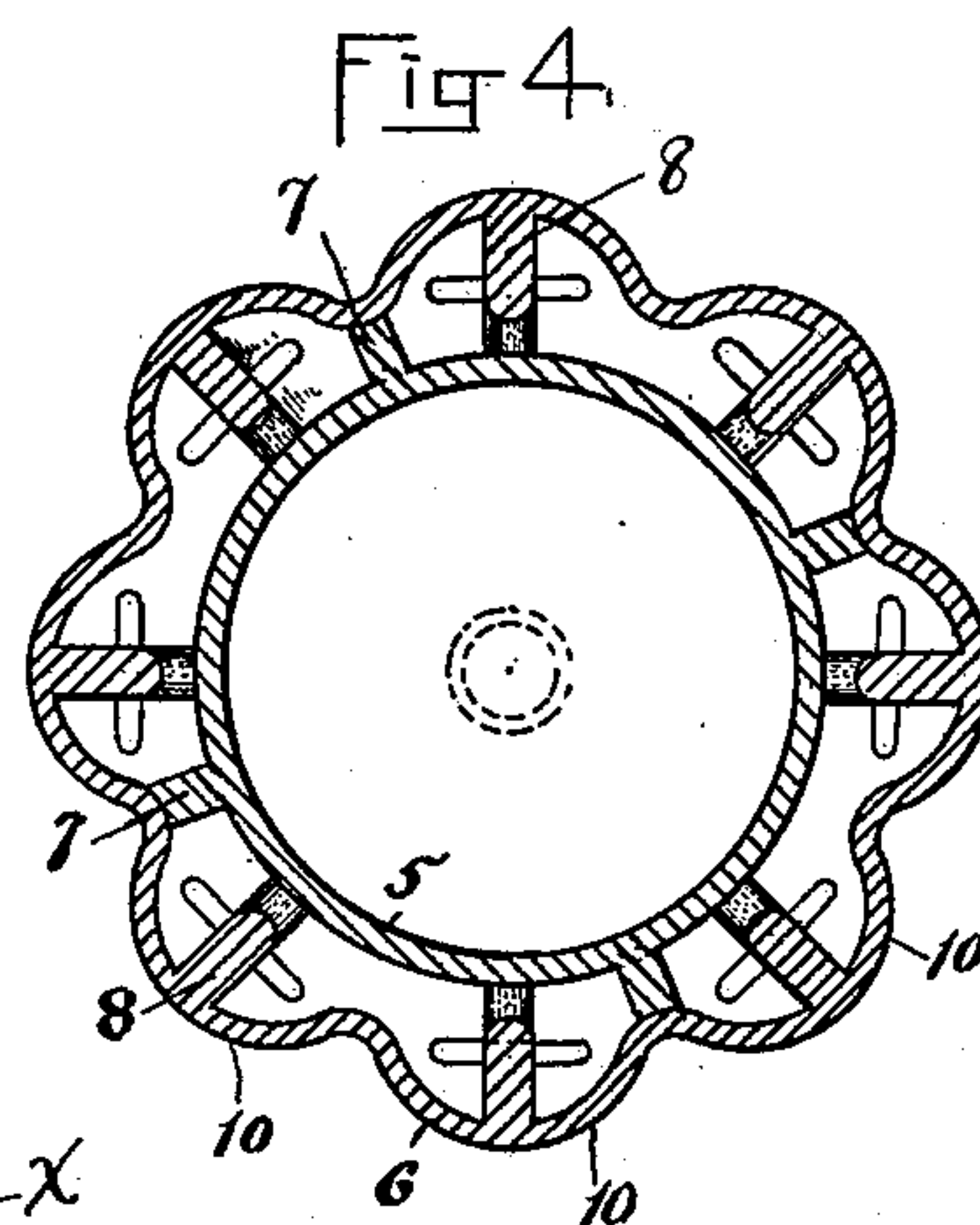
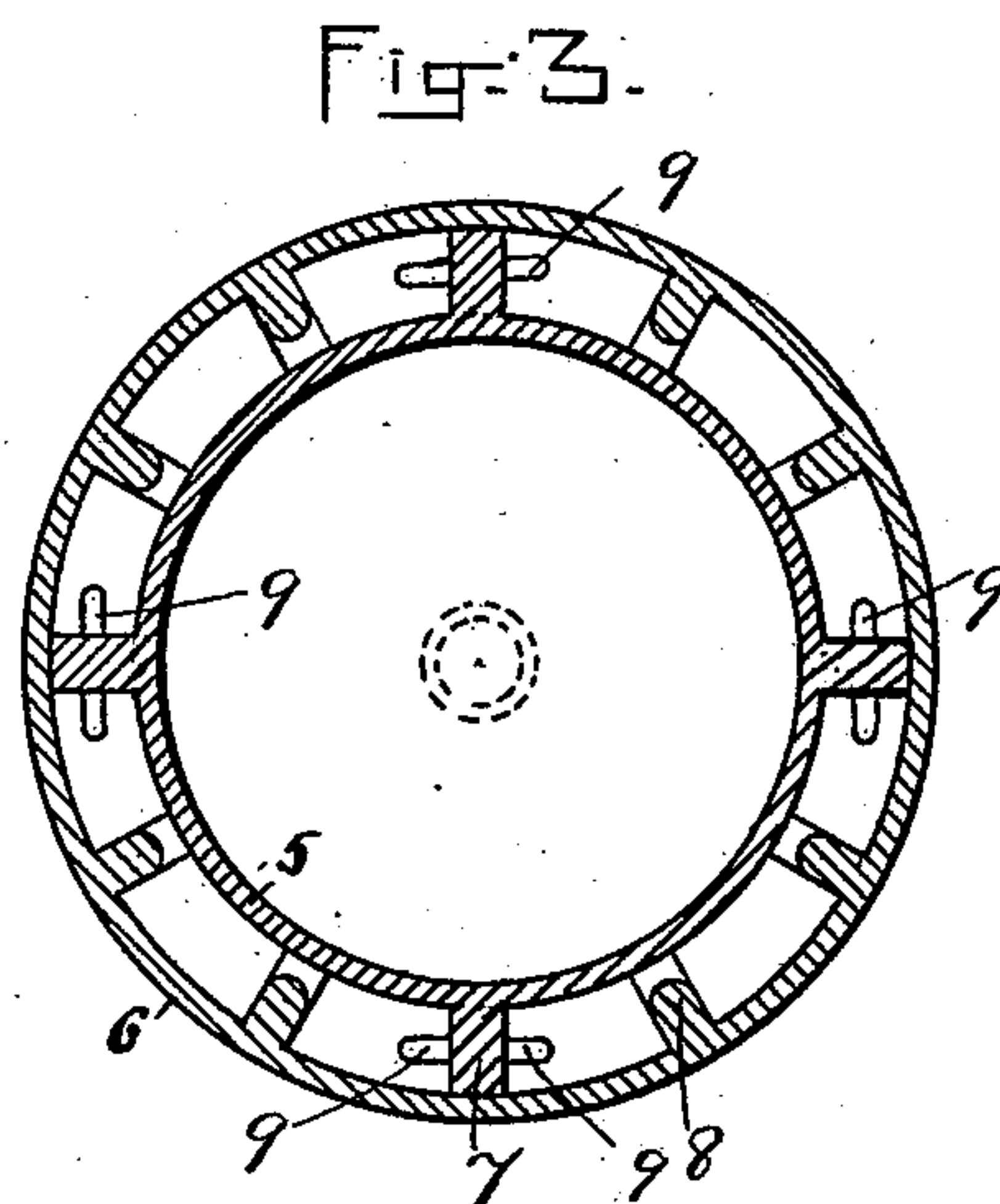
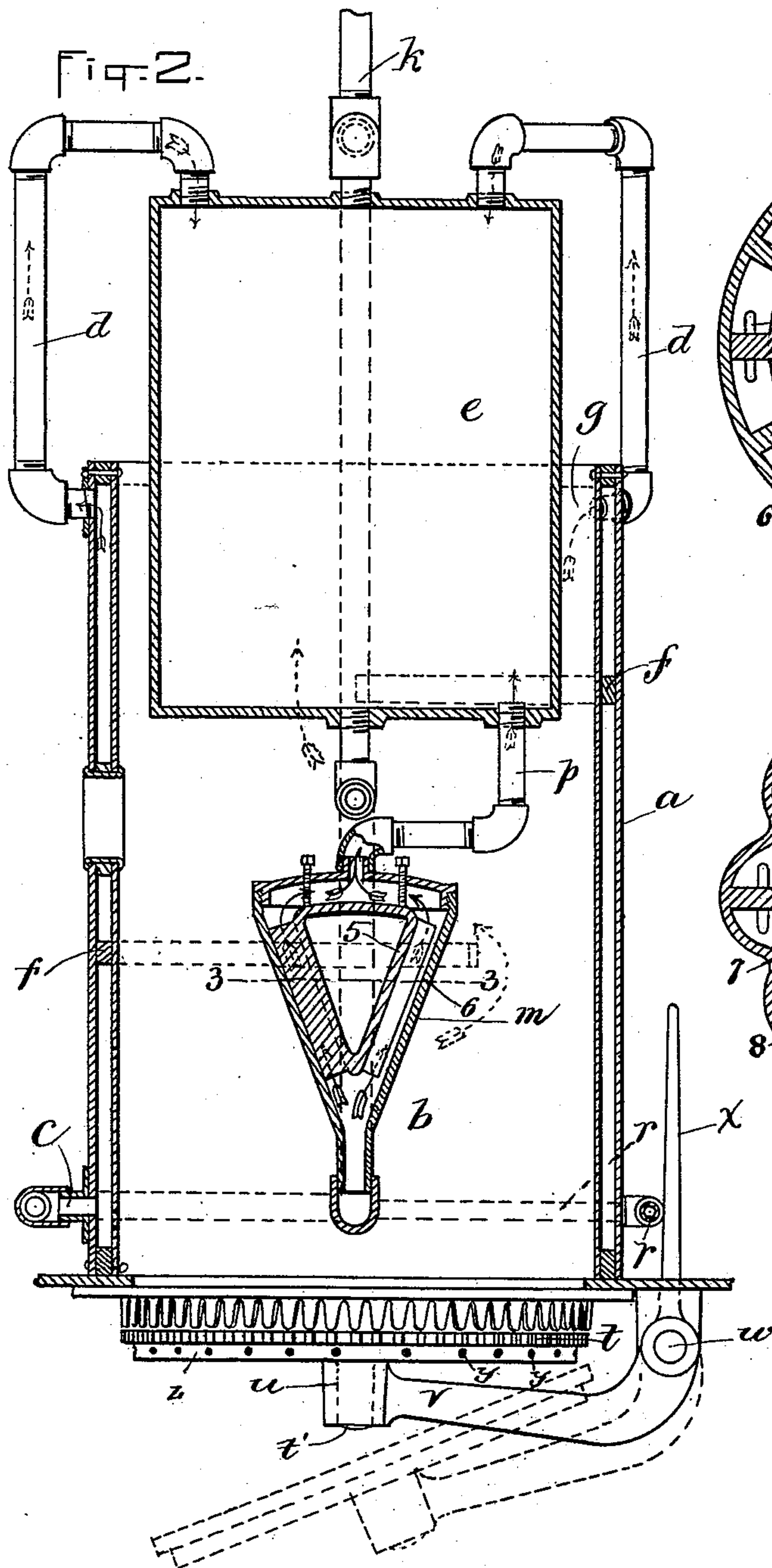
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5 Sheets—Sheet 2.

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(No Model.)

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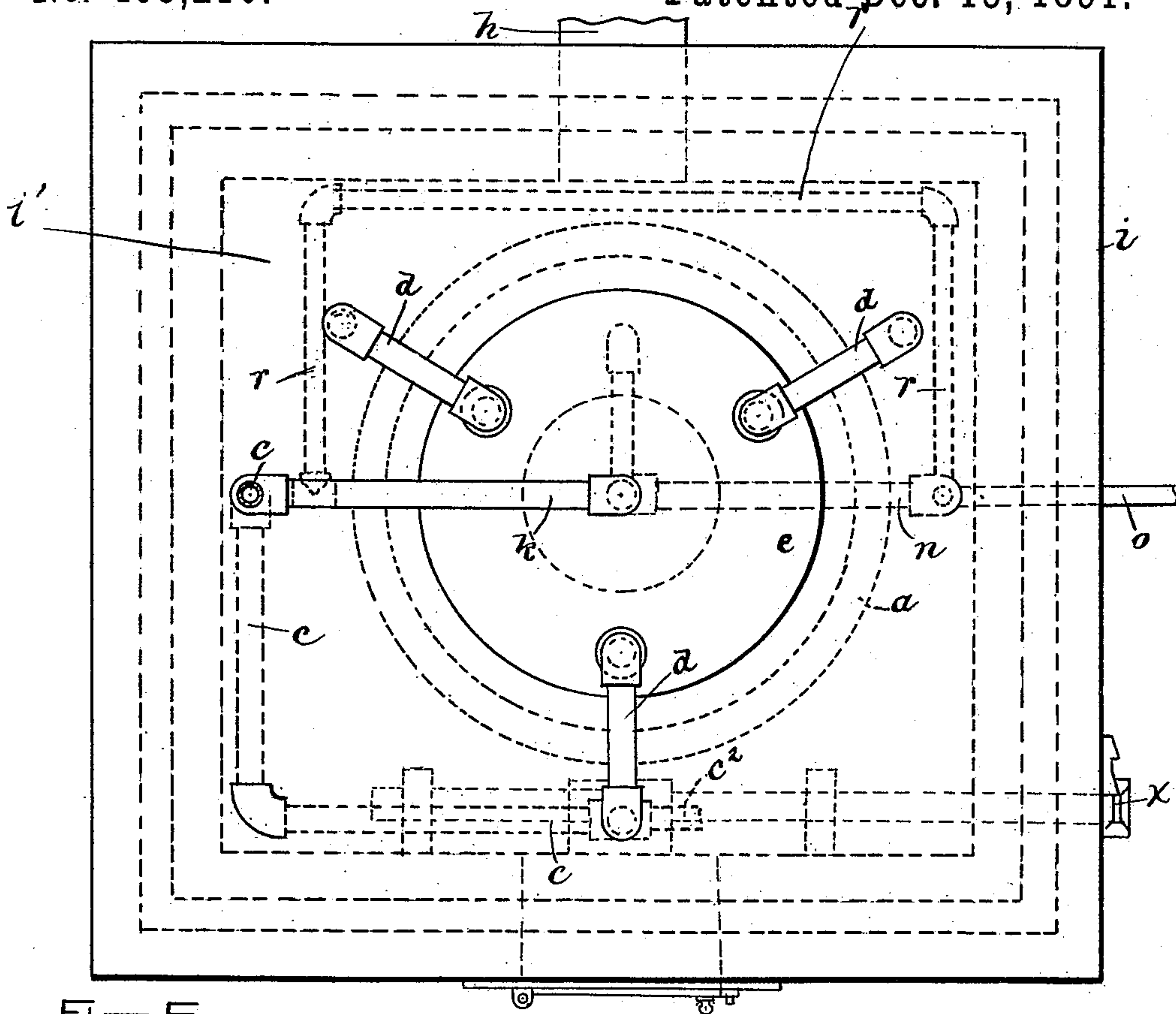


Fig. 5.

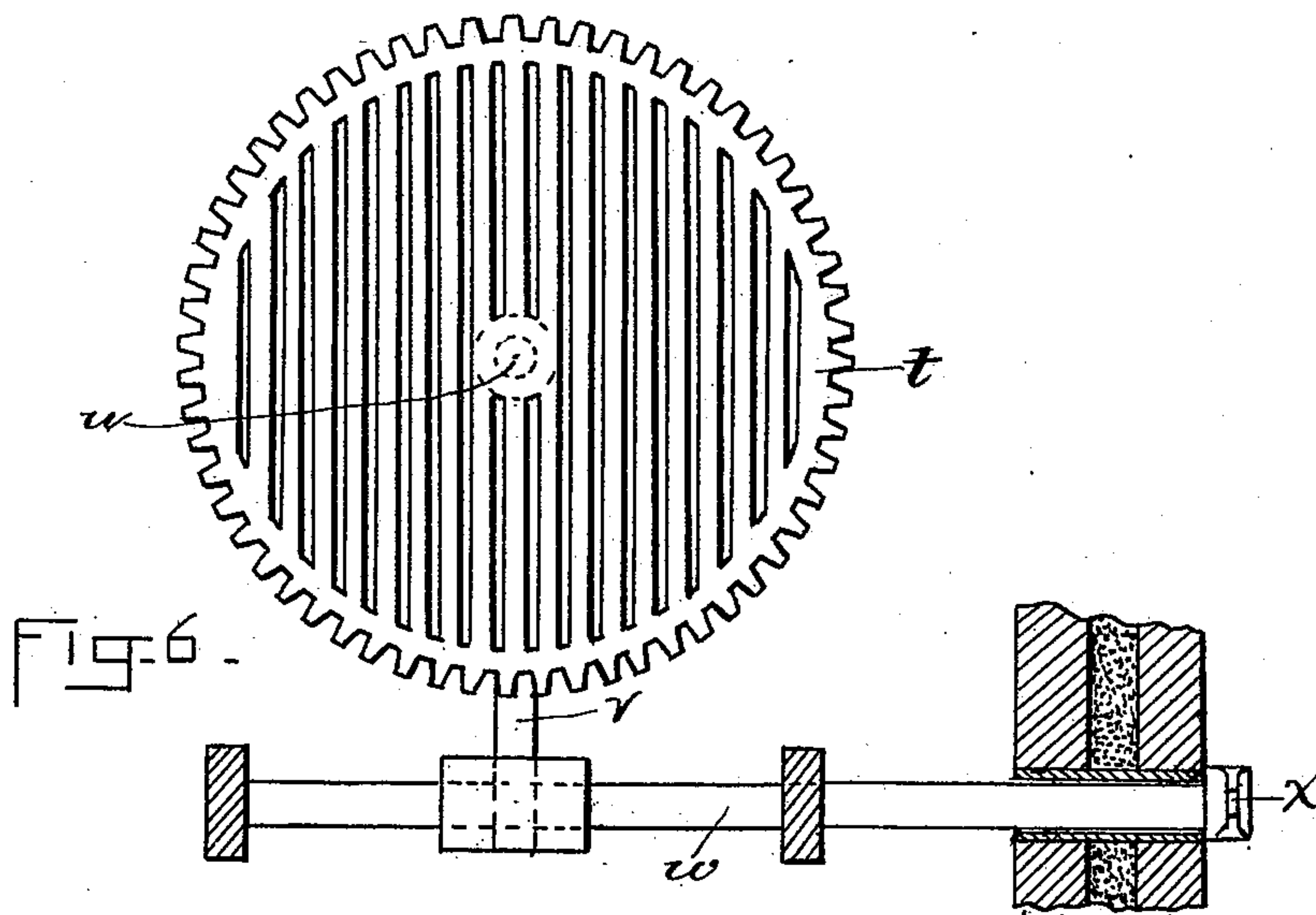


Fig. 6.

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INVENTOR:

*by C. A. Sawin*  
*Night, Brown & Crossley,*  
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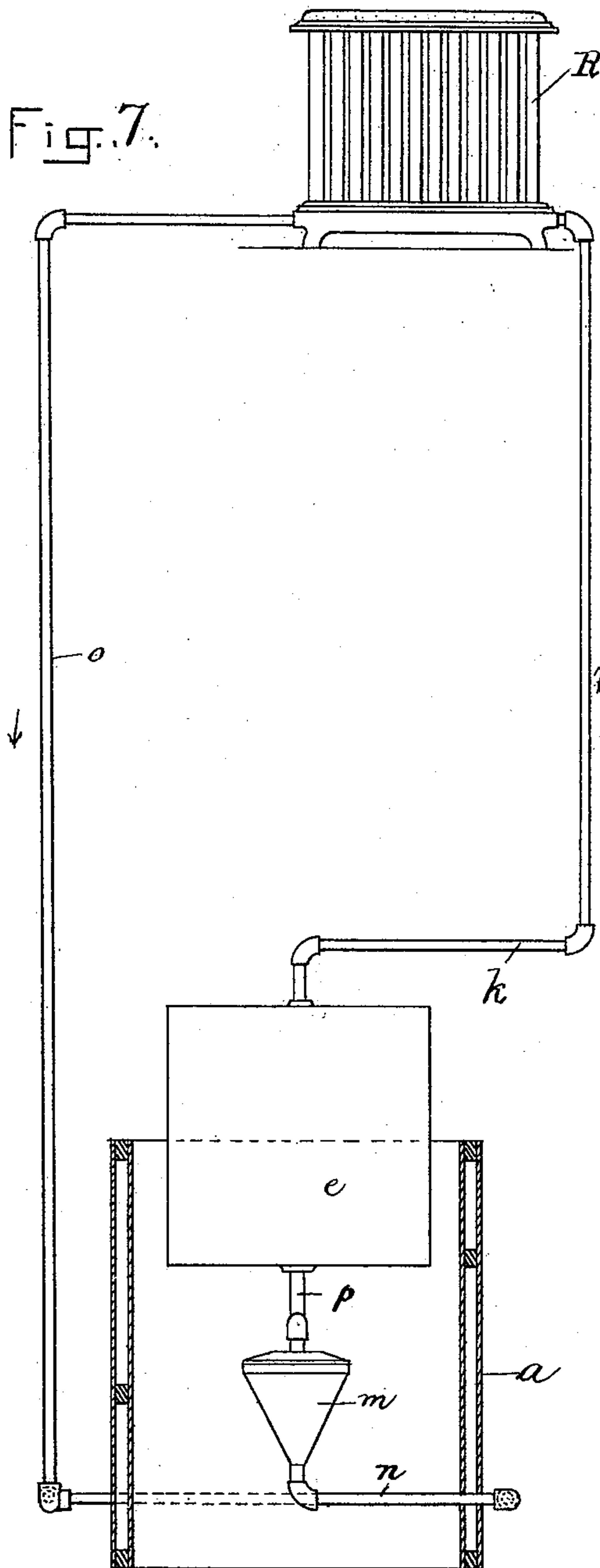
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Patented Dec. 15, 1891.



WITNESSES:  
*C. E. Bartlett*  
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INVENTOR:  
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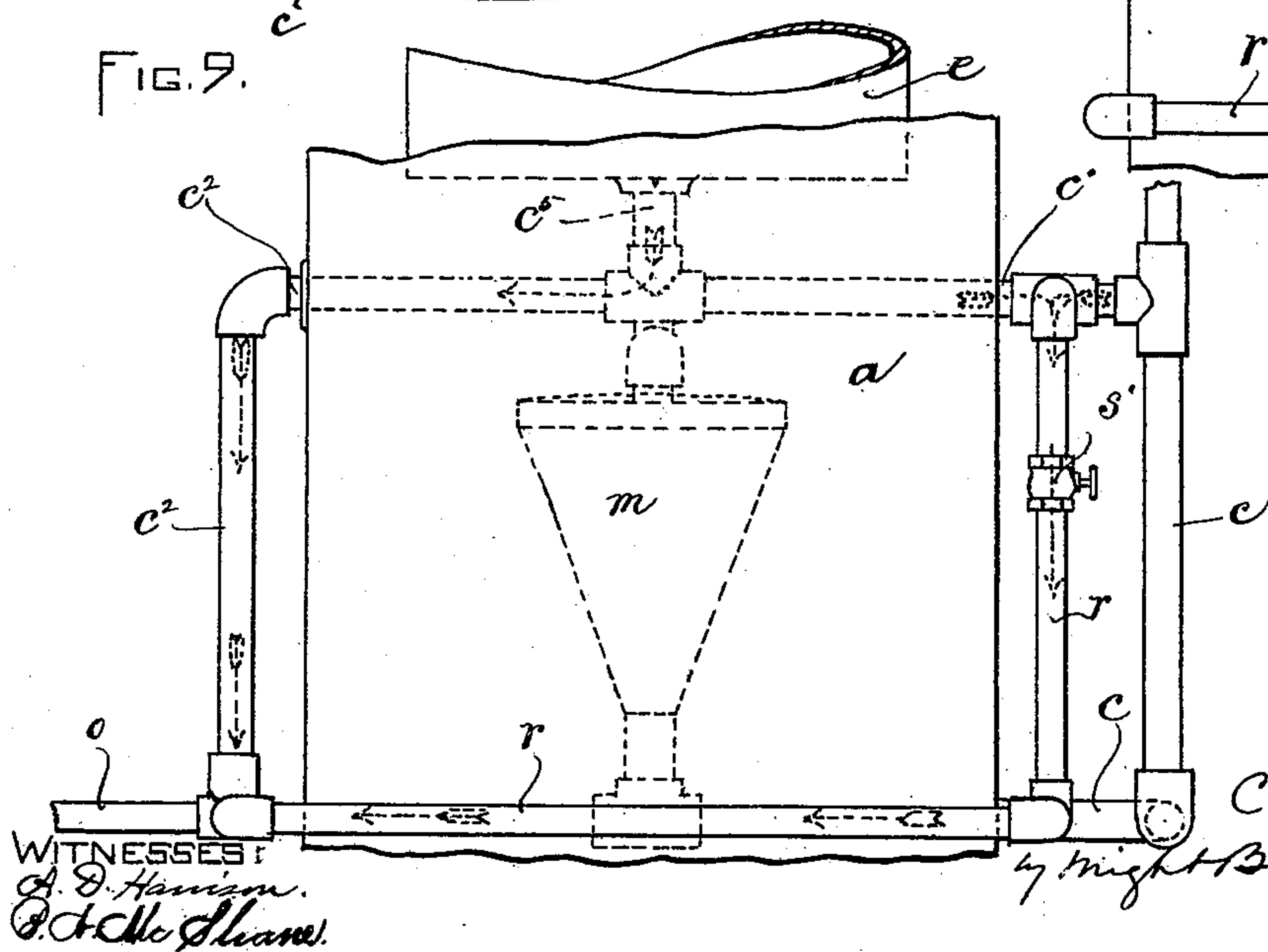
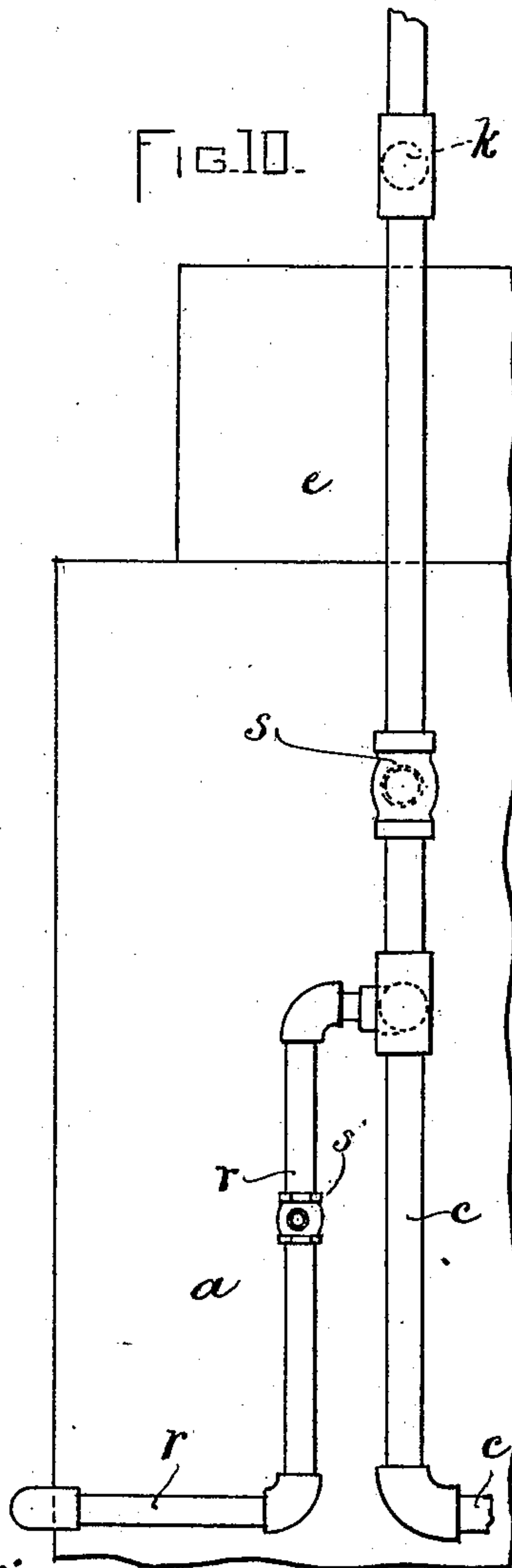
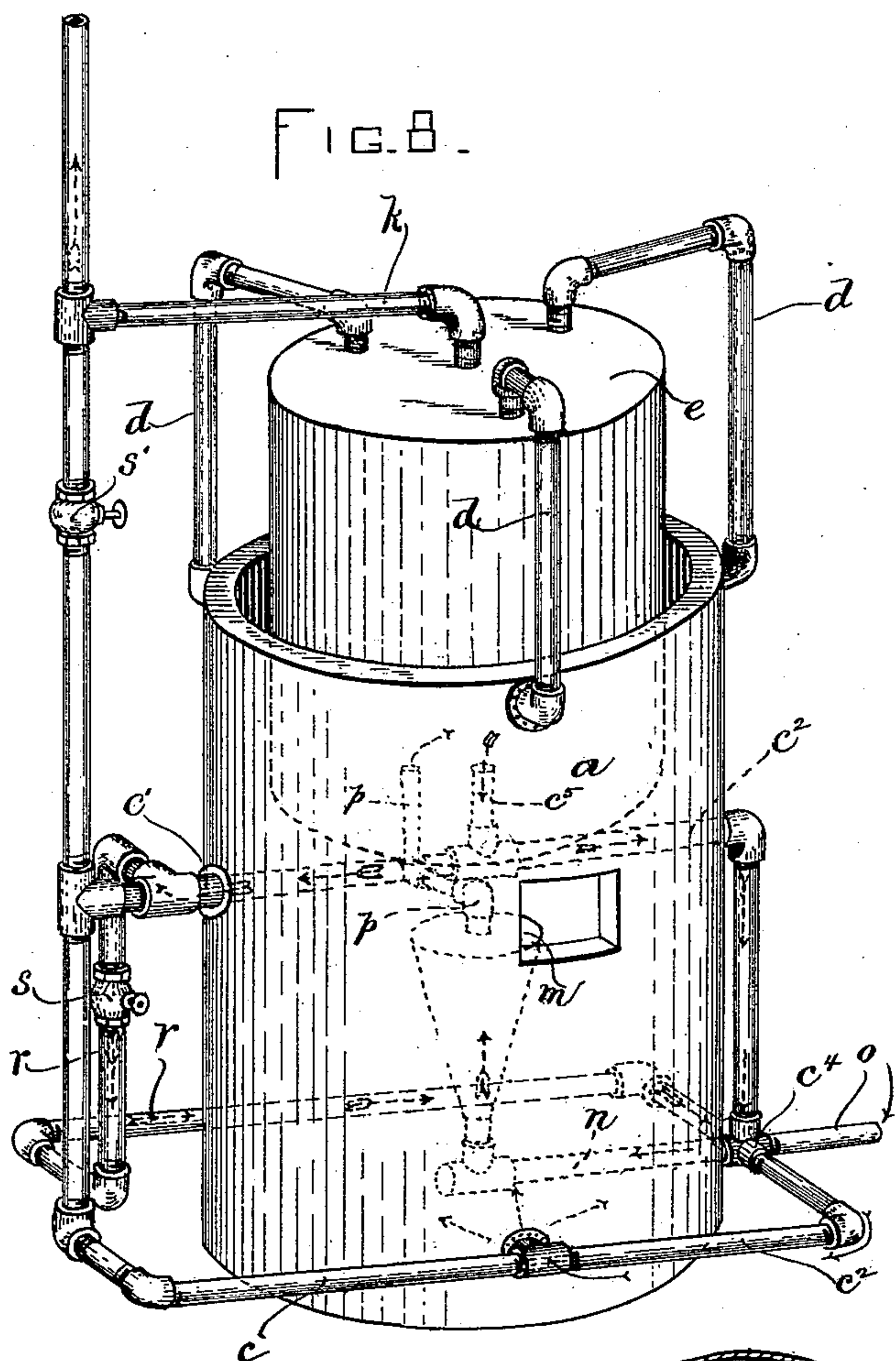
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5 Sheets—Sheet 5.

C. A. SAWIN.  
HEATING APPARATUS.

No. 465,210.

Patented Dec. 15, 1891.



INVENTOR:  
C. A. Savin  
Bromine Counsel  
Atty.



# UNITED STATES PATENT OFFICE.

CHARLES A. SAWIN, OF WALTHAM, MASSACHUSETTS.

## HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 465,210, dated December 15, 1891.

Application filed July 14, 1890. Serial No. 358,716. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES A. SAWIN, of Waltham, in the county of Middlesex and State of Massachusetts, have invented certain  
5 new and useful Improvements in Heating Apparatus, of which the following is a specification.

This invention relates, chiefly, to apparatus for heating by the circulation of steam or hot  
10 water; and it consists in the several improvements hereinafter described and claimed.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a side elevation, partly in section, showing  
15 my improved heating apparatus. Fig. 2 represents a vertical section on line 2 2, Fig. 1. Fig. 3 represents a section on line 3 3, Fig. 2. Fig. 4 represents a section on the same plane as that on which Fig. 3 is taken, but showing  
20 a different form. Fig. 5 represents a top view of the apparatus. Fig. 6 represents a top view of the grate and its operating devices removed. Fig. 7 represents a diagram showing a heating system embodying my invention. Fig. 8  
25 represents a perspective view of the apparatus with the casing removed, showing the arrangement of the circulating-pipes and their connection with the same. Fig. 9 represents a side view of a portion of the same, looking  
30 from the left; and Fig. 10 represents a view of a portion of the rear on opposite side of Fig. 8.

The same letters of reference indicate the same parts in all the figures.

35 In the drawings, *a* represents a hollow cylindrical wall or water-leg, which surrounds the fire-box *b*, and is composed of outer and inner annular walls separated by an annular water-space. Water is introduced into the  
40 lower portion of the water-leg *a* through the pipe or pipes *c*, and is heated as it rises in said water-leg. The upper portion of the water-leg is connected by a series of pipes *d*  
45 *d* with the upper portion of a hot-water and steam receptacle or dome *e*, which is partially inclosed by the water-leg, the upper portion of said dome projecting above the water-leg and receiving the upper ends of the pipes *d*.  
50 The water-leg is provided with semi-partitions *f*, which alternate, as shown in Fig. 2, and cause the water passing upwardly through

the water-leg to flow in a sinuous or zigzag course, as indicated by the arrows in Fig. 2, so that the water has a more extended or prolonged contact with the heated inner surface  
55 of the water-leg than it would have if its upward course were direct.

The dome *e* is of smaller diameter than the interior of the water-leg, and is separated from the latter by an annular space or flue *g*,  
60 through which the products of combustion pass upwardly from the fire-box into the space outside of the water-leg and dome inclosed by the casing or setting *i*, said casing having a flue *h*, Fig. 5, communicating with  
65 a chimney. The top of the casing is preferably a metal plate or cap *i'*, which fits closely all around the dome, as shown in Fig. 1, and has orifices for the connecting-pipes *d* and supply-pipe *c*.  
70

It will be seen that the elevation of the upper portion of the dome above the water-leg and the connection of the water-leg to the dome by the pipes *d*, which rise to a considerable height above the water-leg reduces the  
75 liability of water being forced by the steam-pressure into the dome, thus insuring drier steam in the dome when the apparatus is used for steam-heating.

Steam is conducted from the dome to the  
80 radiators *R* by one or more pipes *k*, extending from the top of the dome. (See Fig. 7.) In a two-pipe system the return water resulting from condensation in the radiators is conducted to the dome through a conduit *m* with-  
85 in the fire-box, said conduit being connected at its lower portion by a pipe *n* with the return-pipe *o* and at its upper portion by a pipe *p* with the dome.

The conduit *m*, by reason of its extensive  
90 heating-surface and being located in close proximity to the fire when the apparatus is being used as a steam-heater, is liable to become overheated, owing to an insufficient supply of water of condensation through re-  
95 turn-pipe *o*, and it is necessary to provide against such a contingency by supplying water from another source. To this end I connect with the lower central portion of the dome *e*, by means of short branch pipe *c*<sup>5</sup>, two  
100 pipes *c'* *c*<sup>2</sup>, (see Figs. 1, 8, and 9,) said pipes extending outwardly through the water-leg,



the pipe  $c^2$  being connected with a coupling  $c^4$ , to which is connected the pipe  $n$ , leading to the conduit. Pipe  $c'$ , through pipe  $r$  and coupling  $c^4$ , also connects with the conduit 5 and through pipe  $c^2$  with the water-leg.

By the means above described it will be seen that the water which is taken from the dome to the conduit, being at a high temperature, has a tendency to maintain a high temperature of the water in the lower portion of the water-leg and also to neutralize the effect of the cool water as it enters the apparatus through the return-pipe  $o$ . Pipe  $r$  can be rendered inoperative, if necessary, by closing 10 valve  $S$ , Fig. 8, and connection between pipe  $c'$  and the water-leg be maintained through pipe  $c^2$ .

The described operation thus far relates to the apparatus when used as a steam-heater. 20 By closing valves  $S$  and  $S'$ , Fig. 8, it may be used for water, the heated water ascending through pipes  $d$  to the dome and through pipe  $k$ , (in the same manner as with the two-pipe system of steam heretofore described,) the descending column of water entering at  $o$ . By 25 closing valves  $S$   $S'$  the circulation will operate as a one-pipe system in steam-heating, the steam passing to the radiator through pipe  $k$  and the condensed water returning through the same pipe to the heater, communication with the water-leg being maintained through pipe  $c^2$  from the under side of the dome  $e$ . (See Figs. 8 and 9.)

The conduit is here shown as having a form 35 resembling that of an inverted cone, and is composed of an inner wall 5 and an outer wall 6, said walls being separated by an annular space for the passage of the water through the conduit. I prefer to subdivide 40 said space by vertical partitions 7, extending entirely across it and by semi-partitions or projections 8, extending partly across the space, as shown in Fig. 3. The chief object of said partitions is to afford a large extent 45 of heat-conducting surface to the water passing through the conduit, and thereby facilitate the heating of such water. Said heating-surface may be additionally increased by projections or spurs 9, formed on the partitions, as shown in Fig. 3, said projections 50 being heated by conduction from the exposed surfaces of the conduit and aiding to heat the water in the conduit.

The preferred form of conduit is that shown 55 in Figs. 2 and 4. The corrugations 10, being vertical, allow the products of combustion to pass the outer surface of the conduit without interference with or obstruction to the draft, while the inverted-cone shape of the conduit 60 causes the passage for the products of combustion to be sufficiently contracted to prevent a too free escape thereof.

In Fig. 4 I show the conduit as made with a ribbed or corrugated outer wall, the construction being in other respects the same as 65 in Fig. 3. The ribs or corrugations 10 of the outer wall afford an increased area of sur-

face exposed to the fire, and therefore facilitate the heating of the water. The conduit is in direct contact with the burning fuel at 70 the center of the fire-box, and the water passing through it will be rapidly heated, as will be readily seen.

A portion of the water which passes through the supply-pipe  $c$  may be conducted from said 75 pipe to the conduit  $m$  by a branch pipe  $r$ , Figs. 1, 2, and 5, so that whether the return-pipe be employed or not a constant current of water through the conduit is assured, the water supplied by the pipe in a one-pipe system being divided so that a portion passes 80 through the water-leg and a portion through the conduit, thus insuring a quick generation of steam.

The grate  $t$  at the bottom of the fire-box is 85 circular and is provided at its center with a downwardly-projecting stud  $t'$ , which is fitted to rotate in a socket  $u$  on an arm  $v$ , which is attached to a rock-shaft  $w$ , fitted to turn in bearings affixed to the casing. A lever  $x$ , af- 90 fixed to said rock-shaft, enables the latter to be raised and lowered, so that the grate may be dropped, as indicated by dotted lines in Fig. 2, or raised, as indicated by full lines. The grate may be rotated or shaken by means 95 of a handle or lever inserted in one of a series of holes  $y$  in a flange  $z$ , formed on the under side of the grate near its margin.

I do not limit myself to the employment of the dome or receptacle  $e$  in all cases, as it may 100 be feasible to connect the conduit  $m$  directly with the flow or conducting pipe  $k$ , extending to the radiator  $R$ .

I claim—

1. In a steam or hot-water heating apparatus, the combination, with a direct-flow or conducting pipe  $k$  and a return-pipe  $o$ , of a fire-box or heater, a water-leg surrounding the fire-box, a dome or receptacle  $e$  over the same and connected with the pipe  $k$  and having external connections from its upper part to said 105 water-leg, a conduit or water-receptacle located in the central portion of the fire-box and exposed externally to the fire therein, the lower portion of said conduit being connected 110 directly with the return-pipe  $o$ , whereby water from the return-pipe is caused to enter the lower portion of the conduit, and direct connections between the upper portion of the conduit and the dome  $e$ , whereby water heated 115 in the conduit is permitted to rise to said dome, as set forth.

2. The combination of a furnace or fire-box, a steam dome or receptacle above the same, a conduit in the fire-box communicating at its 125 lower portion with a return-pipe  $o$  and at its upper portion with the dome, said conduit being arranged so that the burning fuel is in contact with its outer surface, and a connection between the dome and the lower portion 130 of the said conduit, whereby water from the dome is supplied to the lower portion of the conduit to supply any deficiency in the supply through the return-pipe, as set forth.



3. The combination of a furnace or fire-box,  
a steam dome or receptacle above the same,  
a water-leg surrounding the fire-box and hav-  
ing external pipe connections from its upper  
5 portion to the upper portion of the dome, a  
conduit in the fire-box, and a water-supply pipe  
having separate connections with the water-  
leg and conduit, whereby the water is divided,  
a portion passing through the water-leg and  
10 a portion through the conduit, as set forth.

4. The inverted-cone-shaped conduit com-  
posed of the outer wall having vertical hollow  
ribs or corrugations 10, and the inner wall  
separated from the outer wall by a water-  
15 space, as set forth.

5. The annular water-leg having an inlet  
pipe or pipes at its lower end and an outlet

pipe or pipes at its upper end and the sub-  
stantially horizontal semi-partitions, whereby  
the water is compelled to pass in a sinuous 20  
or zigzag course through the water-leg, in com-  
bination with the dome supported partly with-  
in and partly above the water-leg, and pipes  
connecting the water-leg above the upper par-  
tition with the upper part of the dome, as set 25  
forth.

In testimony whereof I have signed my  
name to this specification, in the presence of  
two subscribing witnesses, this 9th day of  
July, A. D. 1890.

CHARLES A. SAWIN.

Witnesses:

A. D. HARRISON,

CLARENCE G. BARTLETT.