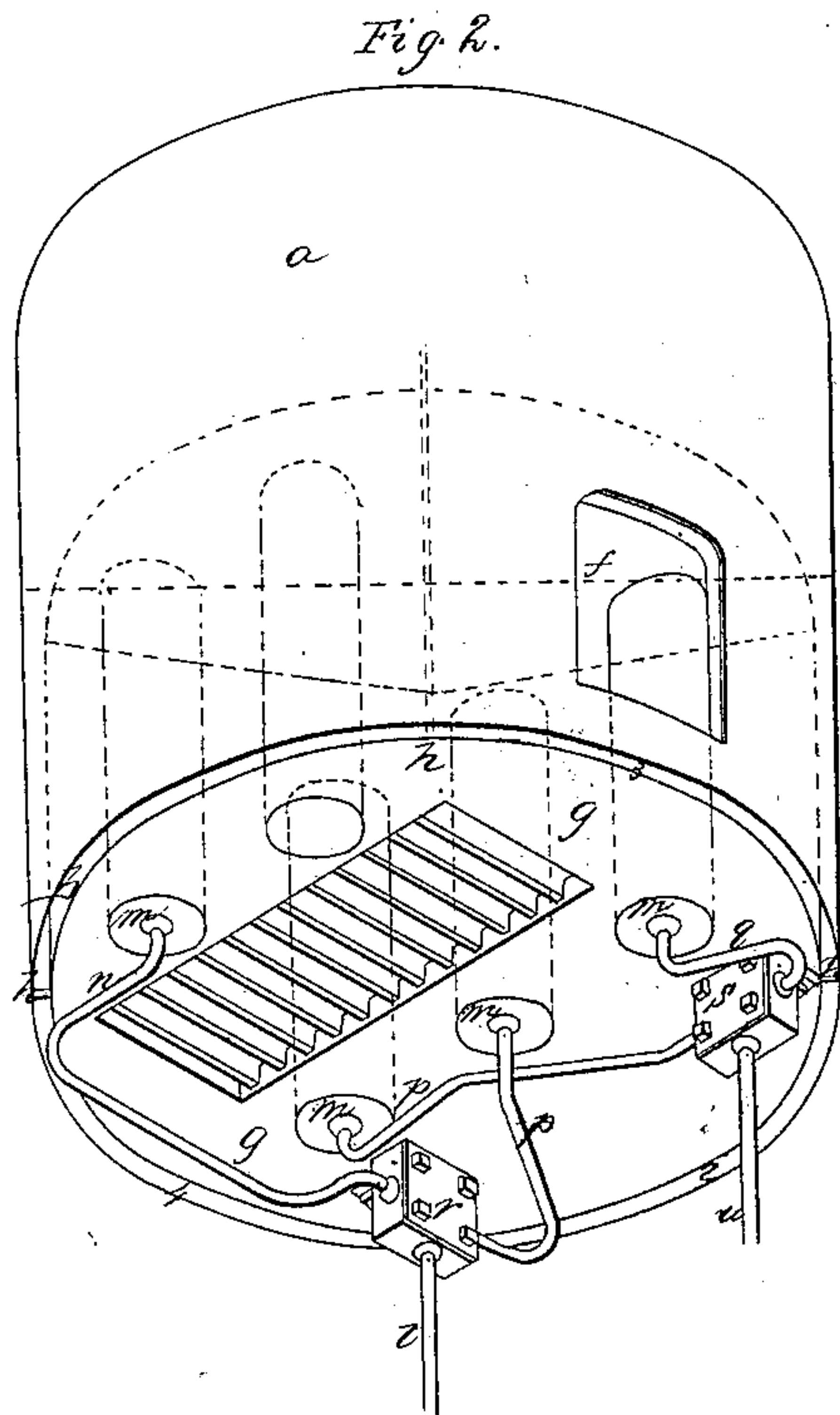
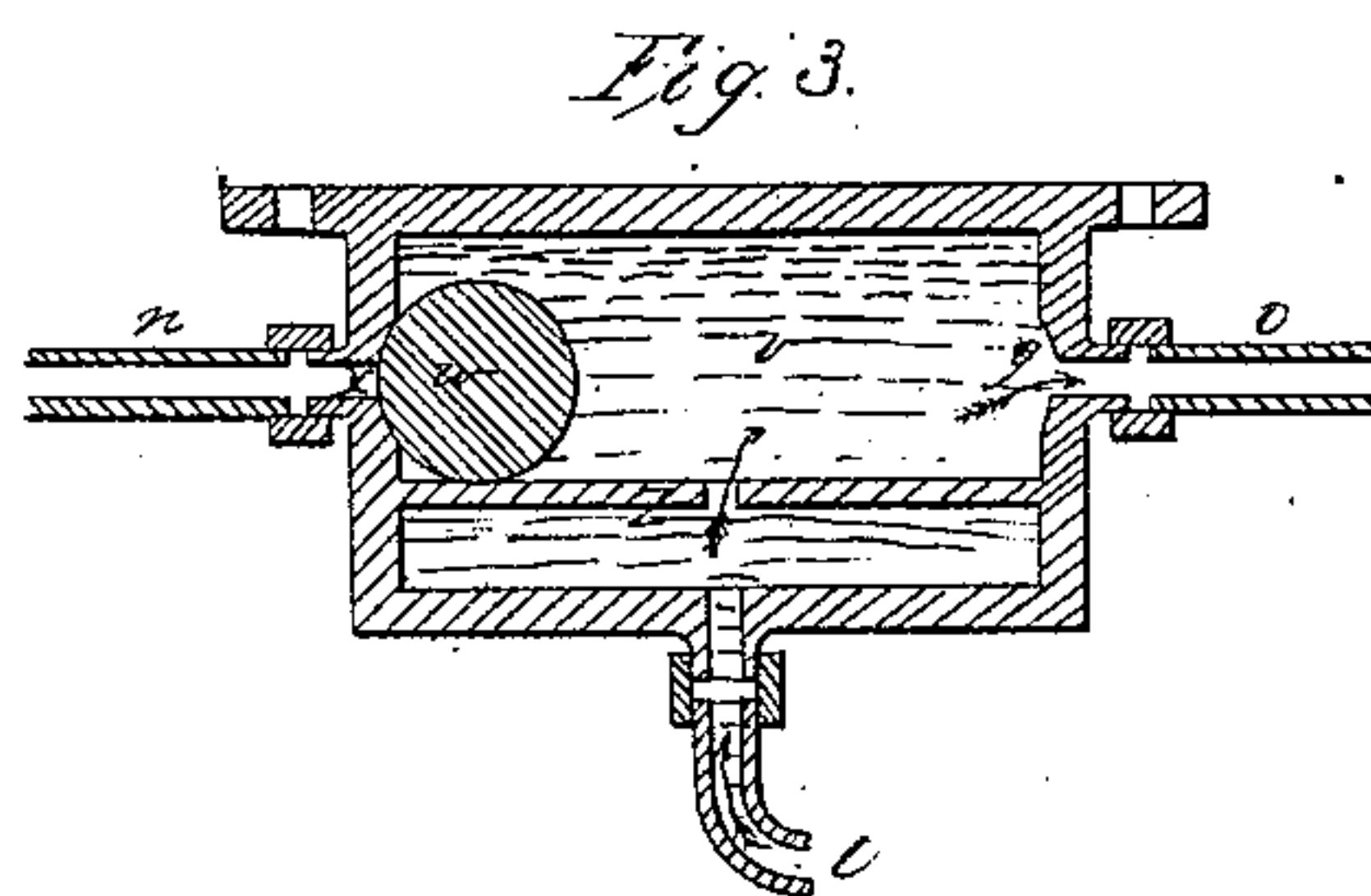
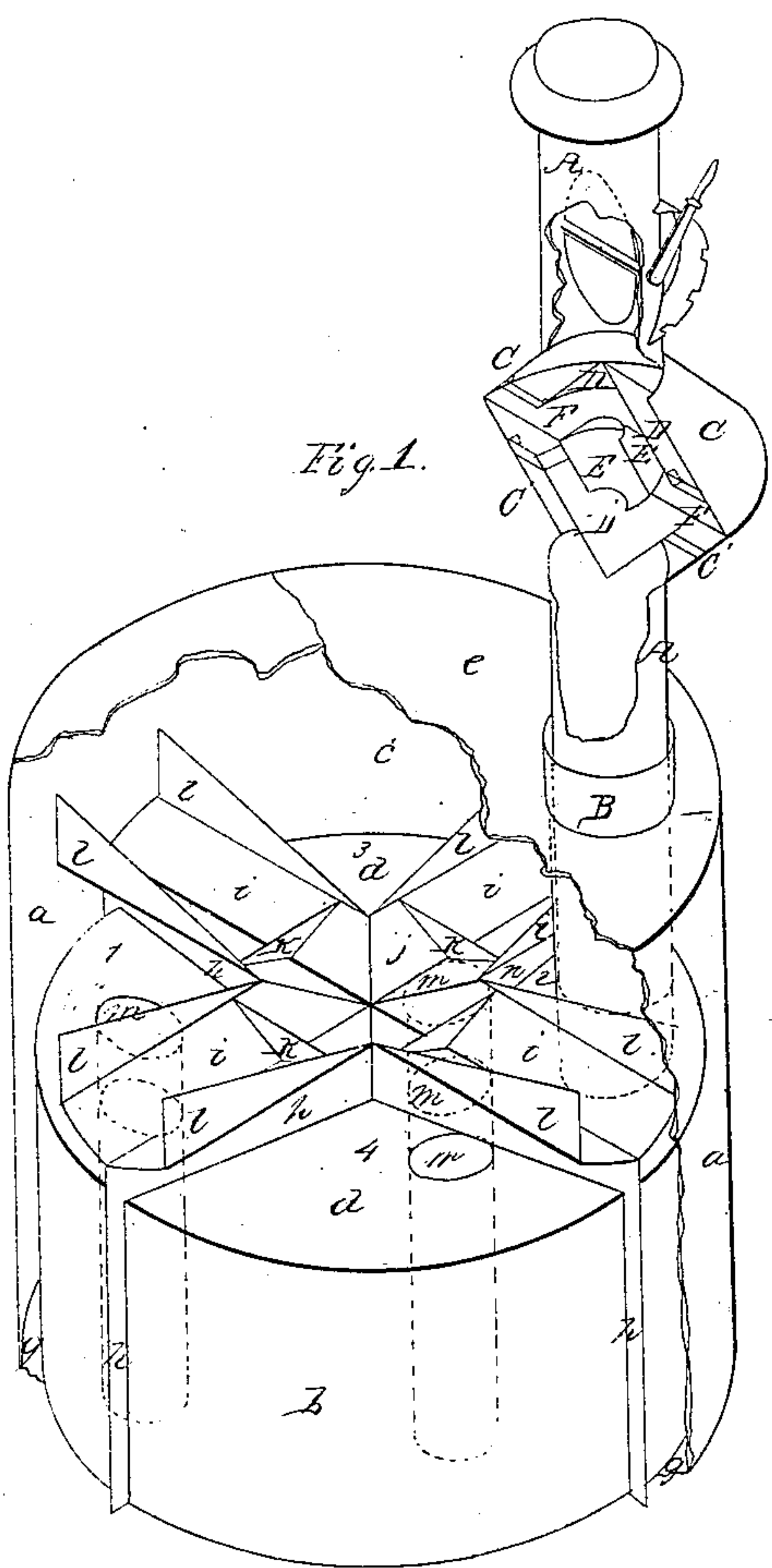


*S. Knight,*  
*Steam-Boiler Water-Circulator,*  
*No 7171.                      Patented Mar. 12, 1850.*





# UNITED STATES PATENT OFFICE.

SYLVANUS KNIGHT, OF WINCHESTER, INDIANA.

## IMPROVEMENT IN THE INTERIOR ARRANGEMENT OF STEAM-BOILERS.

Specification forming part of Letters Patent No. 7,171, dated March 12, 1850.

*To all whom it may concern:*

Be it known that I, SYLVANUS KNIGHT, of Winchester, Randolph county, Indiana, have invented new and useful Improvements in Boilers for Steam-Engines, Particularly for those Employed to Propel Vehicles Subject to Careening; and I do hereby declare the following to be a full, clear, and exact description of the nature, construction, and operation thereof, reference being had to the annexed drawings, making part of this specification, in which—

Figure 1 exhibits in perspective, looking obliquely downward, a boiler embodying my improvements, a portion of the stack and of the outer shell of the boiler being removed. Fig. 2 exhibits in perspective, looking obliquely upward, the exterior and bottom of the boiler with the valves and water-pipes thereto belonging, that portion of the bottom plate which terminates the space between the inner and outer shell being left out in the drawings in order to expose the vertical partitions. Fig. 3 is a vertical section of one of the oscillating valve-chambers.

The first part of my invention consists of contrivances for obviating the difficulties hitherto incident to steam-boilers subject to great changes of position, such as those employed in locomotive steam-engines on common roads and in marine steam-vessels. These objects I accomplish by the following arrangements of apparatus, to wit: I make the water-space of my boiler to consist of a number of distinct chambers separated vertically by plates diverging from a common intersection at or near the center of the boiler and extending upward from the bottom to a little above the water-level. Connected with these chambers are cocks or valves—one to each pair of opposite chambers—so arranged as that the feed is shut off from whatever chamber or chambers happen for the time being by the careening of the apparatus to be lowermost, and the entire body of water is thrown into the portions which, being uppermost, are most liable to become exposed.

The second part of my invention consists in arrangements for the more economical and effectual working of the stack.

*a* is the outer shell of a cylindrical boiler placed vertically. *b* is an inner shell concen-

tric with the former and falling so much short of it in height as to allow of adequate steam-room *c* between the top *d* of the inner shell and the top *e* of the outer one. The interior *f* of the inner shell is the furnace or fire-chamber. The circular plate *g* is the common head of both shells at bottom.

*h* are plates forming vertical diaphragms and dividing the water-space of the boiler into a number of separate and isolated cells or chambers, 1 2 3 4. In the present instance there are four such chambers. Each plate extends upward from the top of the inner shell a little higher than it is intended the water shall stand in the boiler and passes down the annular space between the cylindric sides of the shells till it meets the lower head. The upper edges of these diaphragms are surmounted by troughs *i*, which form by their junction a basin, *j*, which may have walls *k* athwart the troughs. The sides *l* of these troughs become higher as they approach the outside, and thus are made subservient to the retention of the water which flows from the upper sections under any very considerable tilting of the boiler, and on the righting of the boiler the water caught by the troughs flows backward and distributes itself among the cells. In cases of slight overflow the walls *k* are sufficient to detain the surplus.

*m* are four tubes opening at top each into its respective water-space, of which space their interior forms a part. Leading into these tubes at their lower ends are water-pipes *n o p q*, proceeding from valve-chambers *r s*, one valve-chamber and its pair of pipes pertaining, respectively, each set to a pair of opposite spaces in the boiler. Thus one pair of pipes, *n o*, lead to the opposite water-spaces 1 2, and the other pair of pipes, *p q*, lead to the opposite spaces 3 4.

*t u* are pipes conducting water to the valve-chambers *r s*. In Fig. 3 the several parts and appurtenances of these valve-chambers are exhibited by a section passing through the water-pipes, *v* being the interior of the valve-chamber; *t*, the induction and *n o* the eduction pipes; *w*, a ball-valve dropping into either of two valve-seats, *x y*, at the commencement of the eduction-openings.

*z* is a shelf upon which the valve *w* rests, and along which it rolls to and fro. This shelf



need not occupy the whole width of the chamber, so that passage can be permitted for the water around it.

Let us suppose the valve Fig. 3 attached to the bottom of a boiler of the above-described construction, and the pipes *n o* connected to their respective opposite water-spaces. Let the boiler be supposed charged with water up to a little below the top of the diaphragms. Then let it be so canted as to elevate one cell and depress the opposite one. The water in the higher cell will flow into the troughs, and that in the lower cell will be prevented from escaping by the sides of the troughs which bound it. At the same time the water is immediately shut off from the lower chamber and the entire stream thrown into the higher one, for it will be seen by reference to Fig. 2 that each valve is so situated relative to the chambers with which it communicates that the instant one chamber becomes lower than the other the valve is subjected to a corresponding cant, and the ball, rolling to the lowermost part, closes the opening leading therefrom. By these means the feed is made to co-operate with and greatly extend the effective action of the vertically-divided arrangement of boiler before described in counteract-

ing the evils of unequal exposure incident to changes of position of the boiler.

A is the stack.

B is a conical sheath extending from the furnace-top up through the head of the boiler. Within this sheath the stack rests, and by it the latter is entirely isolated from the steam-chamber, so that no undue pressure can be brought to bear upon the stack, which is at times greatly weakened by heat, besides which the dangerous contact of a highly-heated body with the steam is by this simple means effectually avoided.

What I claim herein as new and of my invention, and desire to secure by Letters Patent of the United States, is—

The troughs *i*, surmounting diaphragms, (which separate the water-space vertically into as many isolated chambers,) and having sides which rise higher toward the outside, in order to collect such water as overflows and to distribute it among the several parts when the boiler recoils.

SYLVANUS KNIGHT.

Teste:

GEO. H. KNIGHT,  
THOS. G. CLINTON.