No. 881,668.

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R. M. DIXON.

EXPANSION TRAP.

APPLICATION FILED MAY 10, 1904. RENEWED JULY 12, 1907.

Fig. II.

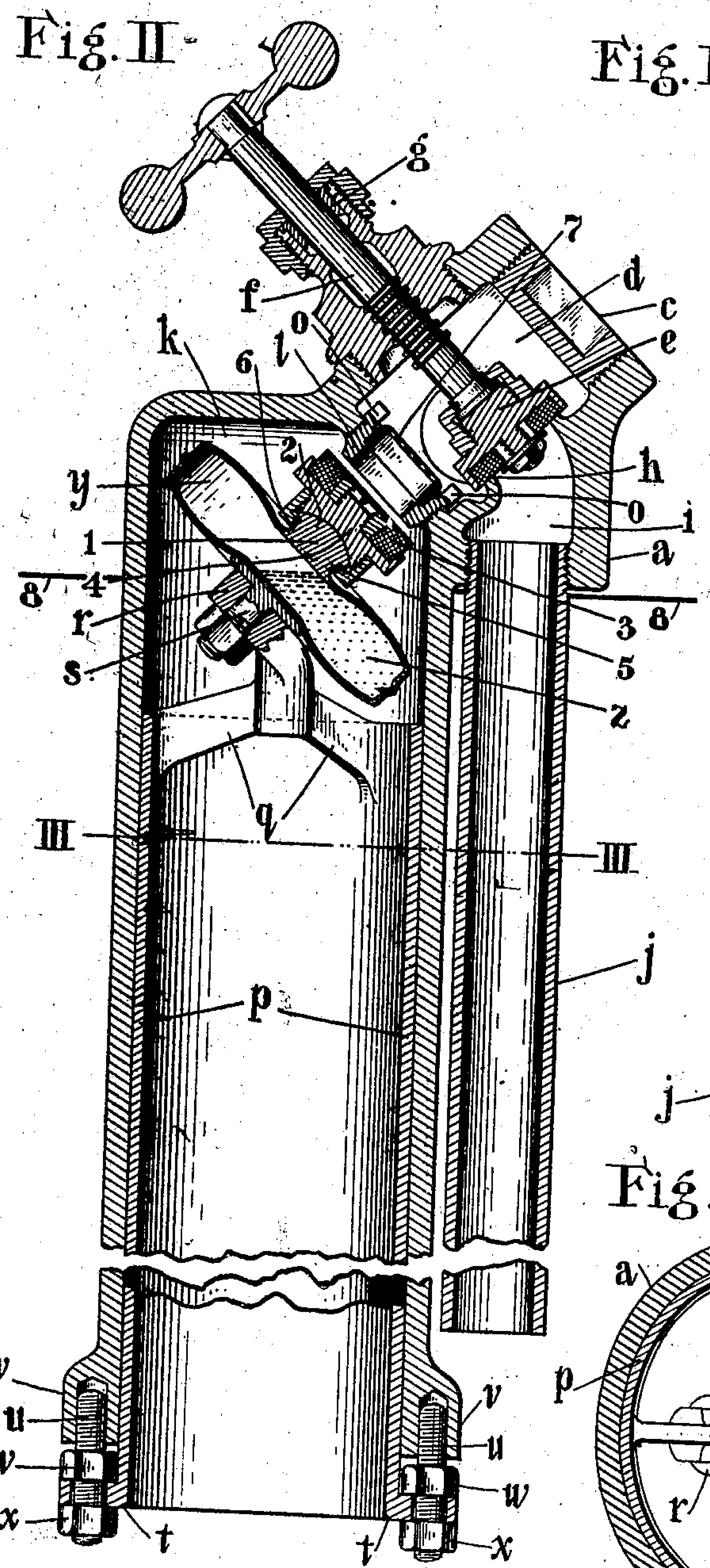


Fig. I.

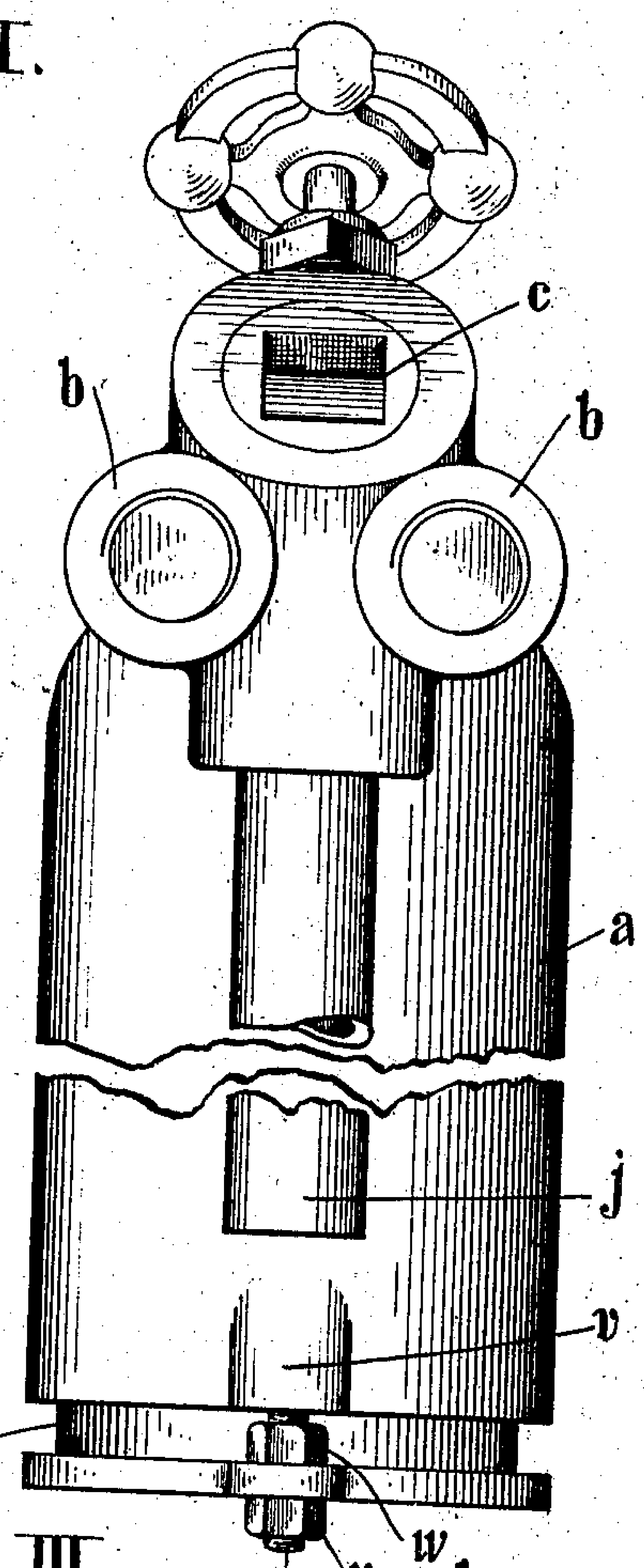
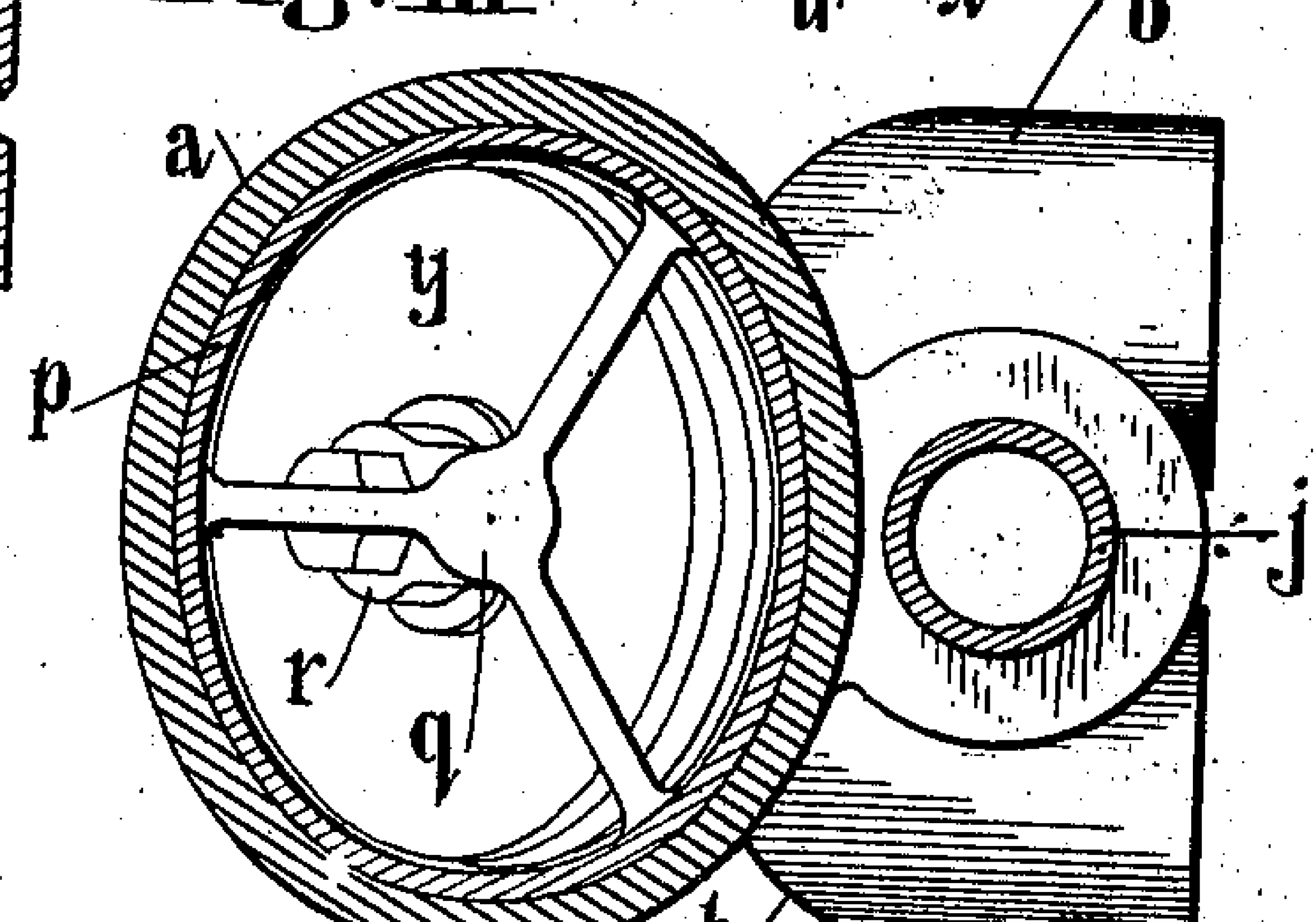


Fig. III.



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EXPANSION-TRAP.

No. 881,668. Specification of Letters Patent. Patented March 10, 1908.

Application filed May 10, 1904, Serial No. 207,269. Renewed July 12, 1907. Serial No. 383,515.

To all whom it may concern:

Be it known that I, ROBERT M. DIXON, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Expansion-Traps, of which the following is a specification.

My invention relates to the general class of steam traps known as expansion traps in which the principal of the expansion of a suitable expansion element or device is relied upon to relieve the trap of water of condensation.

The expansion trap shown in the drawing, which illustrates one form of trap in which my invention is embodied, comprises *inter alia* a hand valve chamber and an automatic valve chamber and hand and automatically operated valves in the respective chambers. The automatic valve serves to automatically relieve the trap of the water of condensation, the hand operated valve being utilized to blow off steam when desired.

The trap shown on the drawing is so constructed and arranged that the device for operating the automatic valve will be located within the space to be heated and thereby be affected by the discharged condensation from the radiating pipes, and be unaffected by the temperature of the external air through which the train is passing, or in which the car stands.

The new arrangement gives considerable economy in the saving of steam for it frequently occurs where thermostats are located outside of the car that they contract and allow the valve to open and considerable quantities of steam to escape before it has given up its latent heat of evaporation for the purpose of heating cars.

In the drawing:—Figure I is a broken away side elevation of the trap shown for illustrative purposes; Fig. II is a transverse vertical section of the trap shown in Fig. I; and Fig. III is a section on line III—III of Fig. II, the direction of view being upward.

In this drawing, *a* indicates a body casing or casting from which or by which the other operating parts of the device are or may be supported. This casting is provided with conduits *b* by which steam may be given access to the casing. This body casting or casing may be effectively formed or constructed by casting which is at present considered by me the most effective mode of constructing same. A suitable bushing *c* may be provided for affording access to certain of the operating parts in the interior of the casting.

The casting *a* is provided with a chamber *d* to which the steam has access and in which is located a hand operated valve *e* whose stem *f* extends through a suitable gland *g* to the outside of the device. This hand operated valve *e* coöperates with the valve seat *h* in the wall of the chamber *d* which valve seat communicates with a conduit *i* communicating with a pipe or conduit *j* for conducting steam from the chamber *d* when the hand operated valve is off its seat. In another portion of the casting *a*, a chamber *k* is formed for the reception of the automatic valve. This chamber *k* is shown as elongated and of an elliptical or ellipsoidal shape in cross section with the major axis transverse to the width of the casting so as to save space in one direction; that is to say, the trap ordinarily should have a certain effective width to accommodate the pipes or connections *b* and by employing the elliptical form of chamber with its major axis extending across the width of the trap considerable space in the other dimension or width of the trap is saved, which would not be the case if a cylindrical chamber were employed.

Screwed into the wall of the chamber *d* is a valve seat *l* for coöperation with the automatic valve, which valve seat *l* is adjustable with respect to the valve by means of suitable tangs or lugs *o* which may be engaged by a tool for the purposes of such adjustment.

Located within the chamber *k* is a suitable support for the automatic valve and for the portion of the mechanism most intimately associated therewith to effect its operation. This supporting device is herein shown as a sleeve *p* having integral therewith a spider *q* from which rises an apertured arm *r* for the reception of the stem *s* of the automatic valve. The sleeve *p* fits snugly within the chamber *k* of the casting *a* so as to leave a very slight air space between said sleeve and the inner face of the wall of the casting *a*. The object of this more or less loose fit is to increase the effective body of metal and thereby rendering the device non-homogeneous so as to prevent as far as possible the loss of heat which would occur if but a single integral body of metal were employed at

these points instead of two mechanically associated layers of metal. The sleeve *p* is suitably supported in the casting *a*. The manner herein shown is by providing a flange *t* on the lower end of the sleeve *p* apertured for the passage of screws *u* which are tapped into lugs *v* on the casting *a*, a pair of locknuts *w*, *x*, being provided on each side of the flange *t* for the purpose of adjustably securing the sleeve in the casting.

Carried by the stem *s* of the automatic valve is a chamber *y* whose walls are capable of dilation and which contains a suitable expansible liquid *z*. This chamber and its contents constitute what is ordinarily known under the generic term of "aneroid chamber". The device for operating the automatic valve and the upper end of its enveloping casing are contained within the space to be heated for reasons hereinbefore set forth. The horizontal line 8—8 shows approximately the level of the car or other floor bounding the space to be heated.

Mounted upon the side of the chamber *y* is a suitable button 1 herein shown as having a curved face 2. An automatic valve 3 is shown as suitably mounted upon an exteriorly screw-threaded base 4 having a concave back adapted to the curved face of the button 1. A threaded sleeve 5 secures the automatic valve base adjustably to its seat, the flange 6 of said sleeve resting behind the head of the button 1.

By the connections just described the automatic valve is capable of almost universal adjustment which though slight will be found sufficient for the purpose. The faces of the automatic valve as well as the valve seat are shown as in an inclined position and located at one side of the valve chamber *k*. The object of this construction is to provide for a more ready discharge of water of condensation from the face of the valve and to determine the direction of flow of such condensation water. Any usual or suitable form of strainer 7 may be employed between the valve chamber *d* and the valve chamber *k*.

The operation of the device will be readily understood. While the steam pressure or direct contact of steam with the operating parts of the trap exists or continues the automatic valve will be held firmly to its seat by the thermostat. Upon the gathering or accumulation of water of condensation in the chamber *d* the temperature of the trap will be gradually lowered and the aneroid chamber or thermostat will contract and by such contraction draw the automatic valve away from its seat and permit the water of condensation to flow out of the chamber *d* over the valve seat and automatic valve into the chamber *k* by which it will be discharged from the trap. As soon as the water of condensation has passed out of the trap and steam begins to flow into the chamber *k* the thermostat will again expand and close the automatic valve against its seat.

It will be observed that in the present instance I have shown a small aneroid contained in a relatively large valve chamber having thick walls and in which the said aneroid chamber is located at a distance from the discharge end of the casing thereby affording opportunity for a relatively large volume of steam to come into intimate contact with the aneroid chamber and to be maintained for a while at an elevated temperature so that the efficient action of the aneroid chamber is thereby assured.

When, for any reason, it is desirable to blow steam through the trap, the hand valve *e* is operated which will have the effect of blowing steam through the chamber *d*, the conduit *i* and the pipe or conduit *j* and if the automatic valve is off its seat, steam will also pass over same through the chamber *k*. By reason of the fact that the automatic valve and its operating means are located so near the chamber *d* where the water of condensation accumulates and within the space to be heated, the trap will operate very efficiently and will not freeze except, perhaps, under most extraordinary circumstances.

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

1. In a trap, the combination of a valve chamber, an automatically operating valve located therein, expansion means for operating said automatically operating valve, the operating face of the said automatically operating valve receiving direct steam pressure and being angularly disposed with respect to the vertical line of the trap, whereby the water of condensation may be effectively delivered from the face of the valve.

2. In a trap, the combination of a valve seat inclined with respect to the vertical line of the trap, an automatic valve adapted to said seat and having its face inclined with respect to the vertical line of the trap and automatic means acting in a line inclined with respect to the vertical line of the trap and operating to actuate the valve.

3. In a trap, the combination of a hand operated valve and an automatically operated valve with means for automatically operating the said last named valve, the said valves being set angularly with respect to each other and inclined with respect to the vertical line of the trap.

4. In an expansion trap, the combination of a plurality of valves with mechanical means for operating one valve, automatic means for operating the other valve, one of the said valves having its operating face receiving steam pressure and placed angularly with respect to the vertical line of the trap.

5. In a trap, the combination of a valve

expansion means for automatically operating said valve, an elongated valve chamber enveloping the said valve and its automatically operating means, the said automatically operating means and valve being located at or near one end of the said elongated chamber, the said elongated chamber being open to the atmosphere at the other end.

6. In an expansion trap, the combination of a tubular elongated valve chamber, a valve having automatically operating means contained within the said chamber and a support for the said valve also located within the said chamber and comprised in part by a tubular support loosely fitting within the said elongated chamber, whereby a more effective heat retaining body is provided.

7. In an automatic steam trap, the combination of an elongated valve casing, an expansion device and valve operated thereby located at or near one end of the said elongated casing and an elongated tubular support independent of and located within the said casing and serving to support the automatic valve and its operating device.

8. In a trap, the combination of an automatically operating valve and a hand operated valve, a discharge device for discharging steam outside of the trap out of contact with the operating device of the automatic valve, an expansion device for operating the automatic valve and a chamber for containing the expansion device comprised by a plurality of thicknesses of material within heat radiating proximity to the discharge device.

9. In an automatic steam trap, the combination of a casting having two valve chambers, steam inlets to one of the said valve chambers, the width of the said steam inlets determining one transverse dimension of the trap, the other chamber being of a general elliptical form in cross section and having its major axis extending transversely of the trap along the diameter determined by the width of the inlets.

10. In an expansion trap, the combination of a casting comprised in part by a chamber of a general elliptical form in cross section and steam inlet means projecting from the said elliptical chamber in the direction of the minor axis thereof.

11. In an expansion trap, the combination of an elongated chamber *k*, an automatically operating valve and thermostat therefor connected directly together and located entirely at one end of the said chamber, a hand operated valve located at or near the same end of the chamber as the automatic valve and a blow-off device for delivering steam from the trap.

12. In an expansion trap, the combination of an enlarged elongated chamber *k*, a chamber *d* for a hand operated valve, an aneroid suitably supported at one end of the chamber *k* and carrying a valve directly connected therewith and means for venting the trap to the atmosphere without bringing the fluid so vented into contact with the aneroid chamber.

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Witnesses:
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