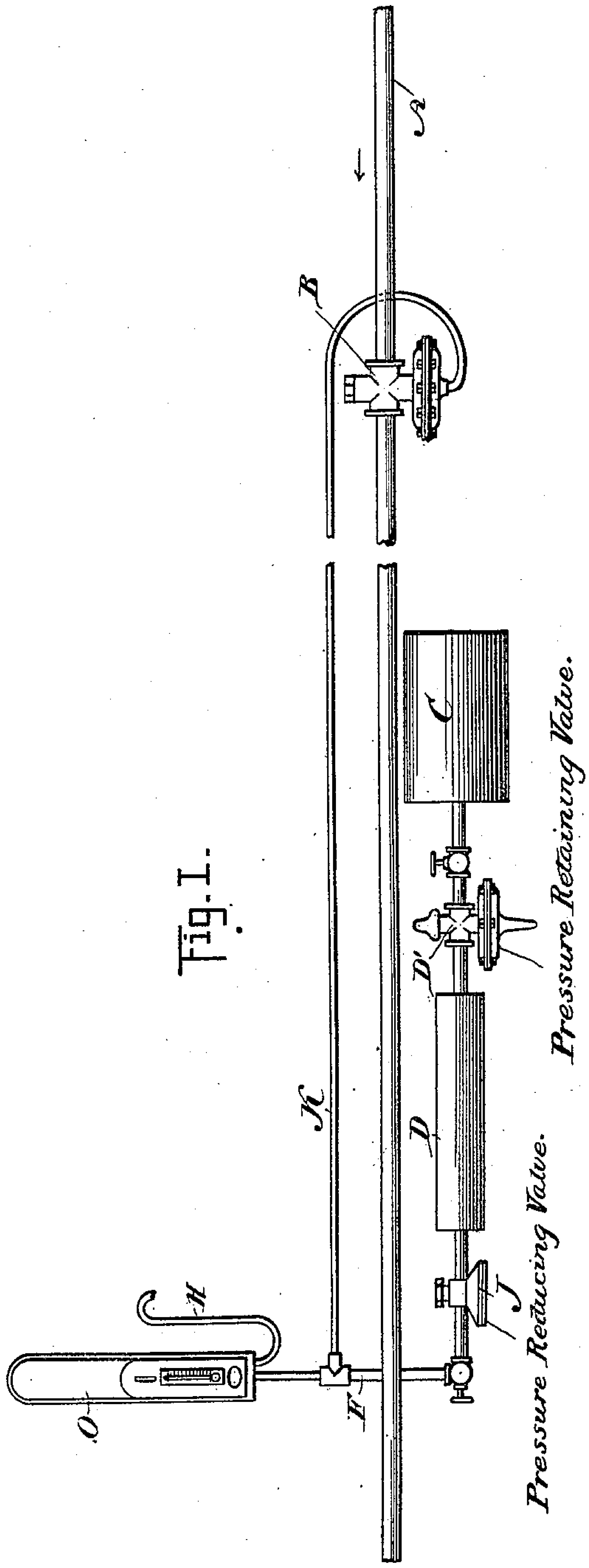
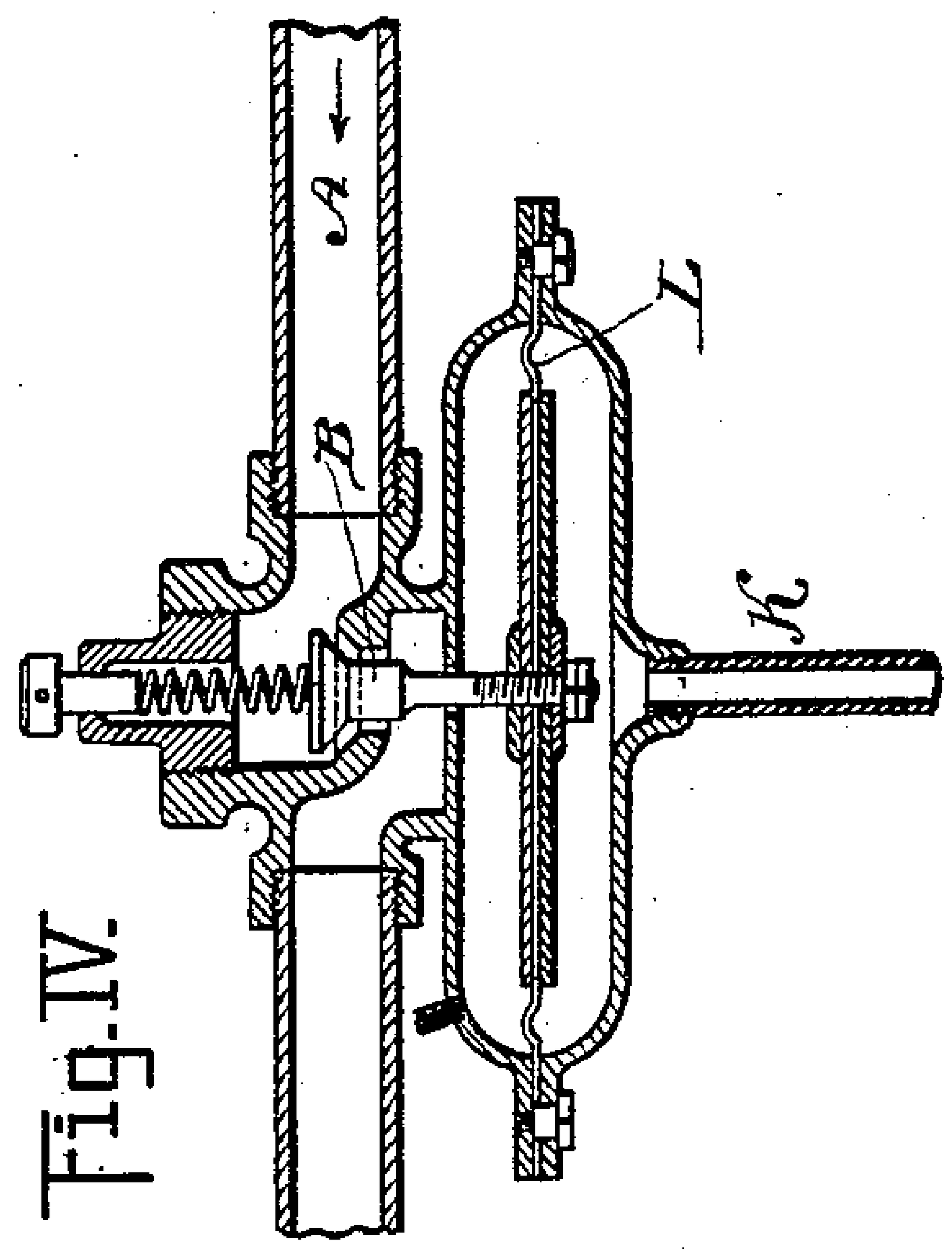
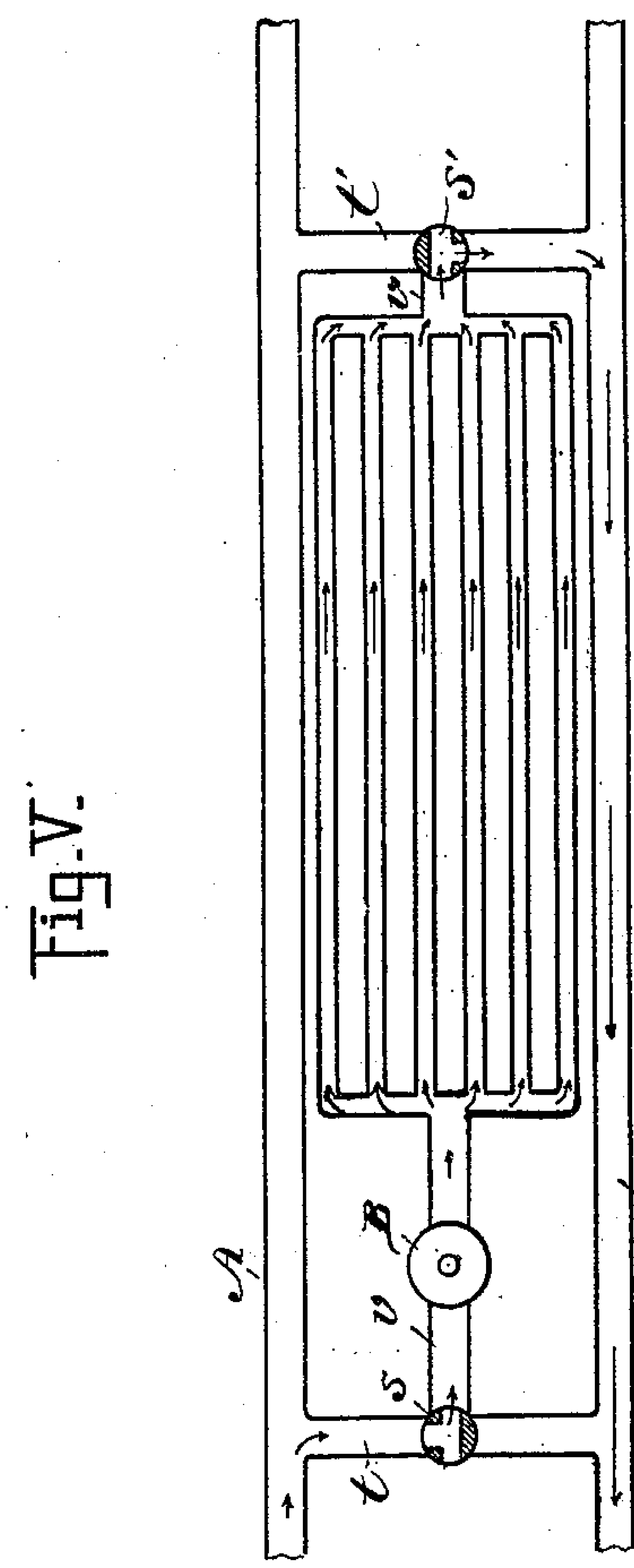
(No Model.) 2 Sheets—Sheet 1.

E. C. MERRILL.
THERMOSTATIC REGULATOR.

No. 471,182. Patented Mar. 22, 1892.







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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

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Fig. II.

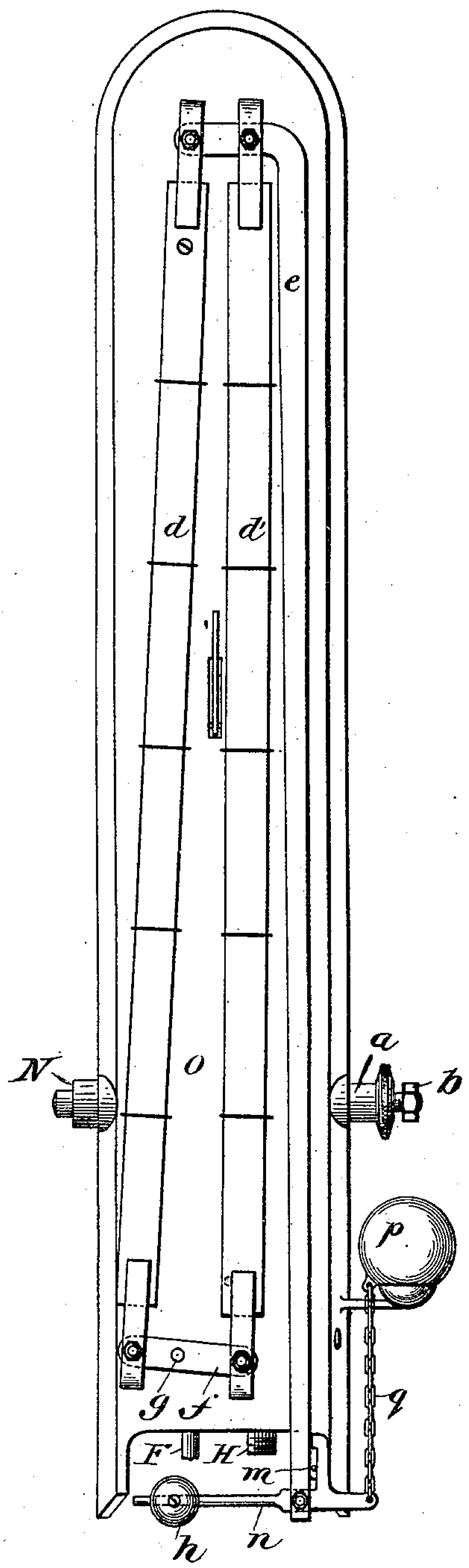


Fig. III^a

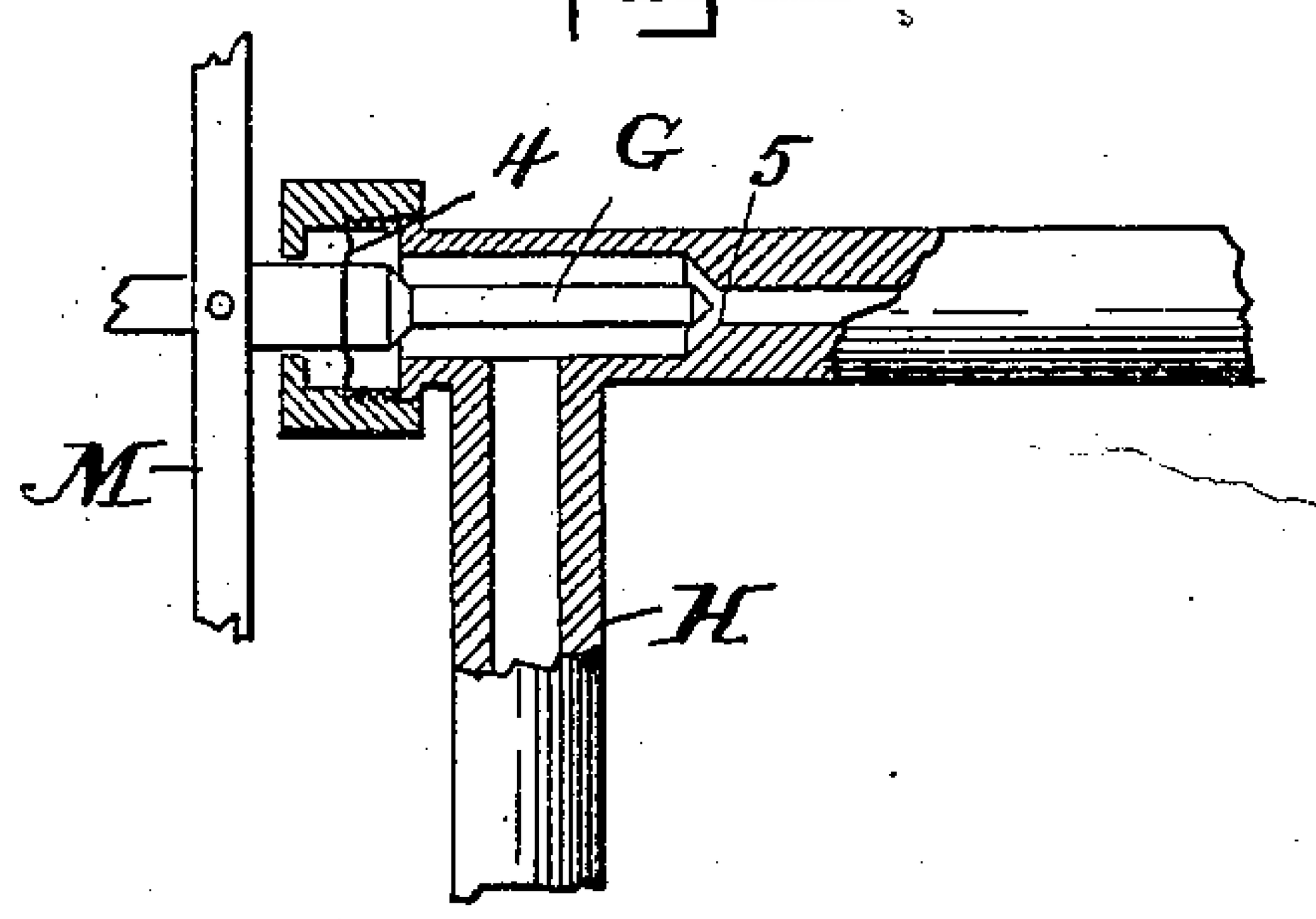
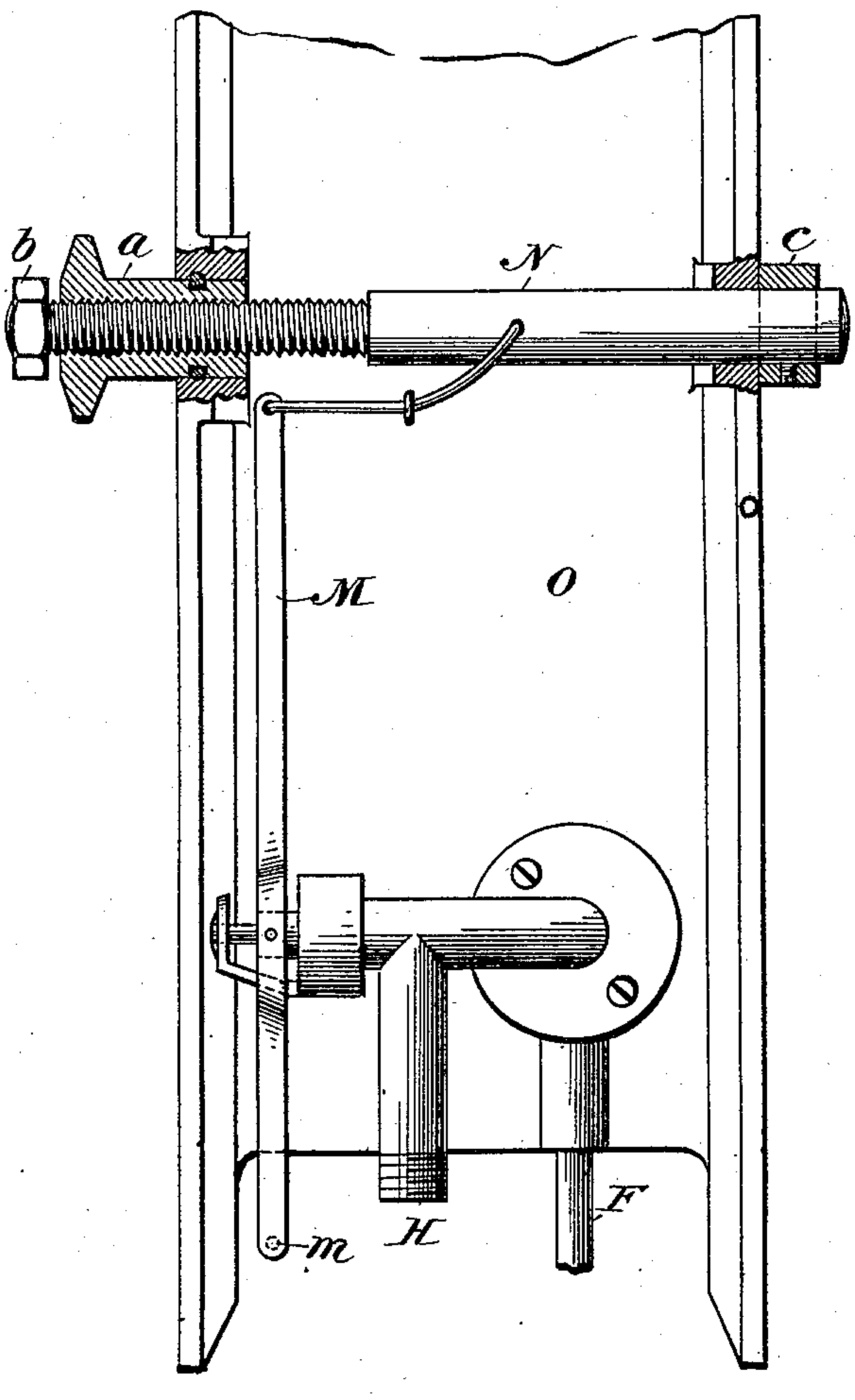


Fig. III.



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UNITED STATES PATENT OFFICE.

EDWIN C. MERRILL, OF ALLEGHENY, PENNSYLVANIA.

THERMOSTATIC REGULATOR.

SPECIFICATION forming part of Letters Patent No. 471,182, dated March 22, 1892.

Application filed March 16, 1891. Serial No. 385,277. (No model.)

To all whom it may concern:

Be it known that I, EDWIN C. MERRILL, a citizen of the United States, and a resident of Allegheny, county of Allegheny, and State of Pennsylvania, have invented a new and useful Improvement in Thermostatic Regulators, which improvement is fully set forth in the following specification.

This invention has reference to the automatic regulation of temperature in railway-cars, though it is, wholly or in part, applicable to other uses.

In Patent No. 412,280, granted to me October 8, 1889, I have described a system of thermostatic regulation, and in Patent No. 446,583, granted to me February 17, 1891, I have described certain improvements upon this system. The specifications and drawings of these patents may be referred to for a clear understanding of the nature and scope of the present invention and of the improvements included therein.

This invention is designed to regulate the amount of steam supplied to the radiators by which the car is heated, this amount being controlled by the main valve in the steam-pipe. The secondary valve is in this case placed in a branch pipe connected with the air-brake system, so that said branch pipe conveys compressed air to said secondary valve, the pressure of the air having been reduced by a suitable reducing-valve. The air-pipe is also connected to one side of the flexible diaphragm or equivalent device actuating the main valve, so that when the pressure of this diaphragm or valve-actuating device is increased or diminished by the secondary valve the main valve will open or close more or less, and thus pass a greater or less quantity of steam to the radiators.

While for the purpose of explanation an automatic air-brake system is referred to, it will be obvious that the arrangement is applicable to other fluid-pressure brake systems.

The new improvements, forming the subject-matter hereof, as well as the best mode contemplated for carrying the same into effect, will be explained in connection with the accompanying drawings, in which—

Figure I is a diagram illustrating the application of the invention to a railroad-car equipped with an automatic air-brake apparatus of the Westinghouse type; Fig. II, an elevation of the thermostat and accessory parts; Fig. III, a partial rear elevation showing the secondary valve; Fig. III^a, a detail in section of the secondary valve, and Fig. IV an enlarged detail in section of the main or steam valve. Fig. V is a diagram illustrating a particular application of the invention.

A represents the steam-pipe which supplies steam from the locomotive to the radiators in the cars in the usual way.

B is the main valve in the steam-pipe, and its position determines the amount of steam supplied to the radiators.

C represents the storage-reservoir of an air-brake apparatus, and D is an auxiliary reservoir.

F is a pipe connected with reservoir D and leading to the secondary valve G, and H is an outlet or escape pipe for the air passed by the secondary valve.

J is a pressure-reducing valve of any ordinary construction interposed between the reservoir D and secondary valve. A branch pipe K leads from the air-pipe F to one side of the flexible diaphragm L, by which the main valve B is actuated. The main valve will obviously open or close more or less as the pressure in this pipe increases or diminishes.

In order to avoid interference with the action of the brakes by diminishing the pressure available for working them, I place between the storage-reservoir C and the auxiliary reservoir D, which is supplied from the latter, a pressure-retaining valve D′, which can be set to open at any desired minimum pressure, say seventy-five pounds. By this arrangement the regulating apparatus does not draw any air from the brake system, except when the pressure in the storage-cylinder C exceeds the amount desired for the efficient operation of the brakes.

The secondary valve G is constructed and operates as described in my aforesaid patent of February 17, 1891. It is attached to a flexible diaphragm 4, and operates to regulate the valve-opening 5, as obvious from inspection of Fig. III^a. Its actuating-lever M (see Fig. III) is hung from a bolt N, as heretofore, and the bolt is adjustable crosswise in

the supporting-frame O of the thermostat, whereby the valve may be set to maintain any desired temperature. In this case, however, the bolt is provided with two limit-stops. It is moved by the internally-threaded thumb-nut *a*, tapped into the frame, and has fixed on the end adjacent thereto a hexagonal nut *b*. When the bolt is moved to the right to shift the fulcrum of the actuating-lever N toward the valve, the nut *b* will come in contact with nut *a* and arrest further motion in this direction. This is the high-temperature limit, and may be set to maintain, say, 70°. On the other end of the bolt is a collar *c*, which limits the motion of the bolt in the opposite direction. This may be set to maintain, say, 60° or lower. By this arrangement the instrument may be sent out initially adjusted to either of two predetermined temperatures.

The construction of the thermostat-arms has been modified to produce greater sensitiveness in operation. As now constructed a variation of a single degree in temperature will actuate their valves, whereas a variation of at least two or three degrees was heretofore necessary to produce this effect.

The thermostat-arms *d d'* consist, simply, of two trussed frames of zinc, instead of one zinc and one compound arm, as heretofore. These arms are connected at their upper ends to the thermostat-lever *e*, which is in construction and function the same as in my last-named patent. At their lower ends the arms *d d'* are pivoted to opposite ends of a small connecting-lever *f*, fulcrumed in the frame at *g*, closer to arm *d* than to *d'*, and which increases the leverage. When the expansion (or contraction) of the first arm *d* is transmitted through this lever, the movement is augmented, and a further gain in leverage is effected by the expansion (or contraction) of the second arm *d'*. The arms *d d'* diverge from their points of attachment to lever *e* toward their lower ends, so that the motion of lever *f* is proportionally amplified when transmitted to lever *e*.

It is desirable as a matter of precaution to provide for the cutting off of the steam in case of a collision or of any violent concussion. To effect this I connect with the secondary valve an automatic tripping or actuating device, which normally is inoperative, but is released by any violent shock to the car. I have devised several forms of such device, one of which is shown in Fig. II and will serve to illustrate the principle of that part of my invention.

The pin *m*, connected with the secondary valve-lever, transmits to the latter the motion of the thermostat-lever *e*, as heretofore; but instead of receiving pressure to close the valve from a spring I use the pressure of an adjustable weight *h*, carried by the horizontal arm of a three-arm lever *n*, pivoted in the end of lever *e*. Its vertical arm bears against the side of said lever *e*, and this is the normal condition of the parts. The substitution of a weight for a spring to give the yielding pressure by which the secondary valve is held against its seat has special advantages over a spring apart from its function in the tripping operation.

The weight *p*, connected, as shown, by a chain *q* with the three-arm lever *n*, rests normally in a cup. A violent jar or concussion would, however, dislodge it, and its weight falling on the lever *n* causes it to tilt in the direction to free the pin *m* and allow the secondary valve to discharge into the atmosphere. As a result the main steam-valve will instantly close.

I do not claim the use of a ball or weight arranged to be dislodged from its support by a violent concussion, but show this only as a type of means which, while not normally interfering with the operation of the secondary valve, will come into action in the event of an accident and open said valve instantly to its fullest extent.

The operation of the system will be readily understood. The thermostat is set up in some convenient place in the car, being set to the temperature which it is desired to maintain, and the proper pipe connections are made, as indicated in Fig. I. The system, as will be seen, can easily be applied to cars already in use. When the main valve B is closed and steam shut off the thermostat is allowing a small quantity of air to pass the secondary valve and escape by outlet H. Should the temperature fall below the fixed limit, the contraction of the arms *d d'* closes the small secondary valve and the air-pressure accumulates in pipe F, and being communicated by branch pipe K to the under side of diaphragm L the latter opens the main valve A and admits steam to the radiators. When arms *d d'* expand by reason of a rise of temperature beyond that desired, they cause the secondary valve to open, relieving the pressure in pipes F and K and so permitting the main valve to fall far enough to diminish the supply of steam to the proper extent.

In a heating system which is extensively used on one of the principal railroads two steam-pipes leading from the locomotive are employed and these are so connected with the radiators and with suitable cocks and valves that when the car is turned one way the pipes serve, respectively, as the supply and the return pipe, and when turned the other way what was formerly the supply-pipe becomes the return-pipe, and vice versa. It is important in applying my improvements to such a system to avoid the necessity of using two main valves and connections. Fig. V illustrates the arrangement to be employed in such case. A A' are the two parallel steam-pipes, the former acting at this time as the supply and the latter as the return. In the cross connecting-pipes *t t'* are located three-way cocks S S'. From the latter, pipes *v v'* lead to the radiators. In the pipe *v* is located the

main valve B, and when the cocks S S′ occupy the positions indicated steam enters from pipe A through pipes *t*, cock S, and the main valve, returning by pipe *v′*, cock S′, and pipes *t′* and A′. When the car is turned the other way, it is only necessary to reverse the cocks S S′, when the steam passes from pipe A′ to pipe *t*, cock S, and main valve B, as before.

It is obvious that modifications may be made in details of construction and arrangement, and that some of the improvements may be used separately, if desired, without departing from the spirit of the invention.

Having now fully described my said invention, what I claim is—

1. In a railroad-car, the combination of a pipe supplying heat to the radiators, a fluid-pressure brake system, a main valve in the supply-pipe, an actuating device therefor, such as a flexible diaphragm, a pipe connecting the fluid-pressure brake system with the actuating device of the main valve, a secondary valve, a thermostat controlling the same, and a branch pipe leading through said secondary valve to an outlet, substantially as described.

2. In a car equipped with a fluid-pressure brake system and with steam-pipes and radiators, the combination of a main valve in the supply-pipe, a pipe connected with the auxiliary or storage reservoir of the brake system and provided with a pressure-retaining valve, a secondary valve regulating the main valve by varying the pressure in said pipe, and a thermostat connected with the secondary valve, substantially as described.

3. In a car equipped with a compressed-air or equivalent brake system and with steam-pipes and radiators, the combination of a main valve in the supply-pipe, a pipe connected with the auxiliary or storage reservoir of the brake system and provided with a pressure-reducing and with a pressure-retaining valve, a secondary valve regulating the main valve by varying the pressure in said pipe, and a thermostat connected with the secondary valve, substantially as described.

4. The combination, with duplex steam-pipes, cross-connecting pipes containing each a three-way cock, and branch pipes leading from said cocks to the radiators, of a main valve in one of said branch pipes between the three-way cock and the radiators, and thermostatic regulating device, such as described, connected with said main valve, as set forth.

5. The combination, with the regulating-valve, of a lever adapted to transmit motion to said valve, two expansible arms attached at one end to said lever and diverging from each other toward their other ends, and a multiplying lever connecting the ends of said arms and fulcrumed eccentrically between them, substantially as described.

6. The combination, with the main valve actuated by pressure in a suitable pipe, the secondary or regulating valve in said pipe, and the expansible arms and connections for actuating said secondary valve, of an automatic tripping or releasing device such as specified, normally held out of action, but adapted in case of violent concussion to release the secondary valve from its actuating mechanism, substantially as described.

7. The combination of the secondary valve, the thermostat arms and lever, the weighted lever pivoted to the latter and transmitting motion to the valve, and a tripping or releasing device adapted when released to tilt the weighted lever away from the valve, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

EDWIN C. MERRILL.

Witnesses:
J. E. PEW,
WM. K. GRAY.