

G. L. KITSON.

Automatic Regulating Valves.

No. 139,163.

Patented May 20, 1873.

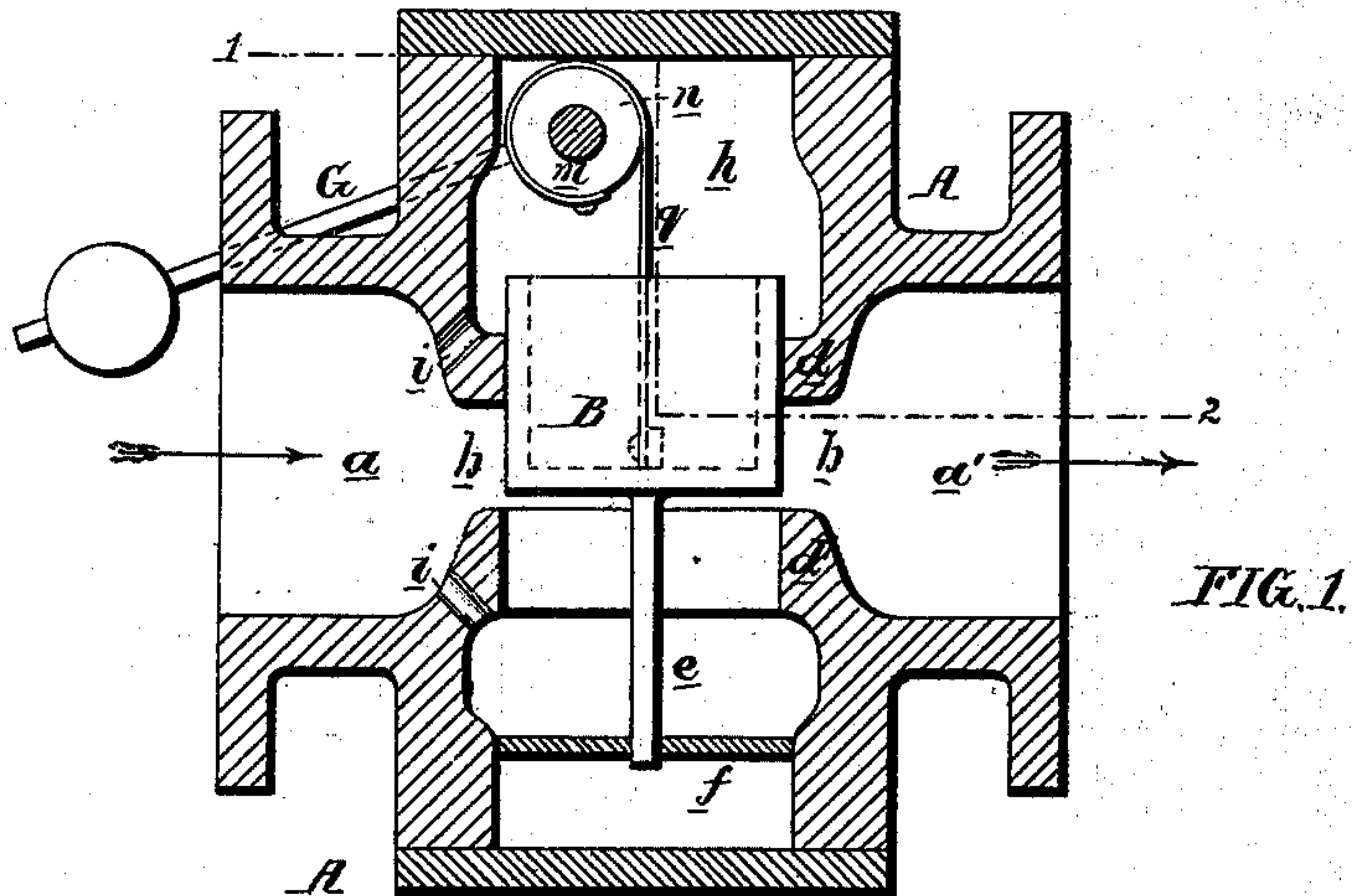


FIG. 1.

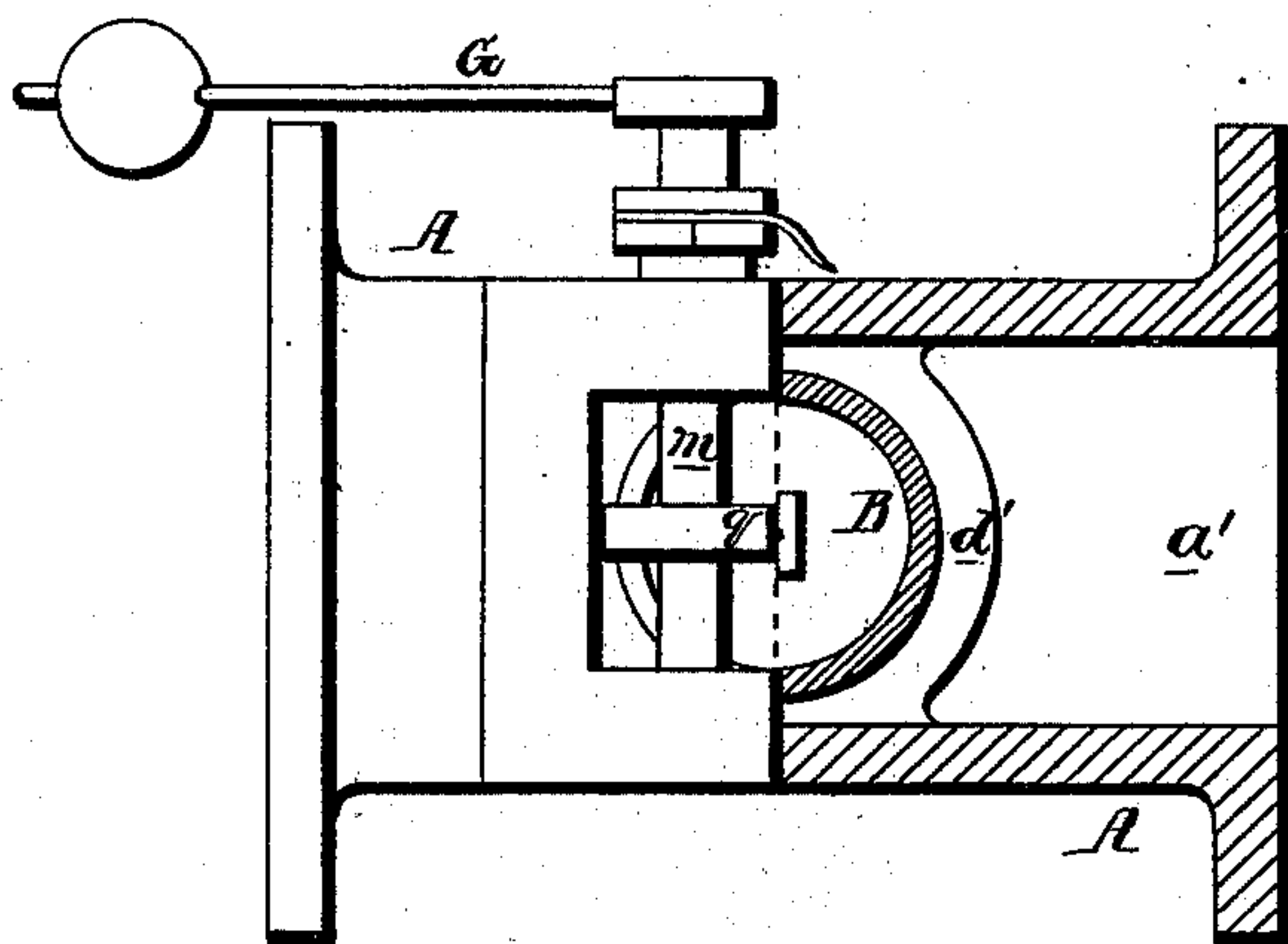


FIG. 2.

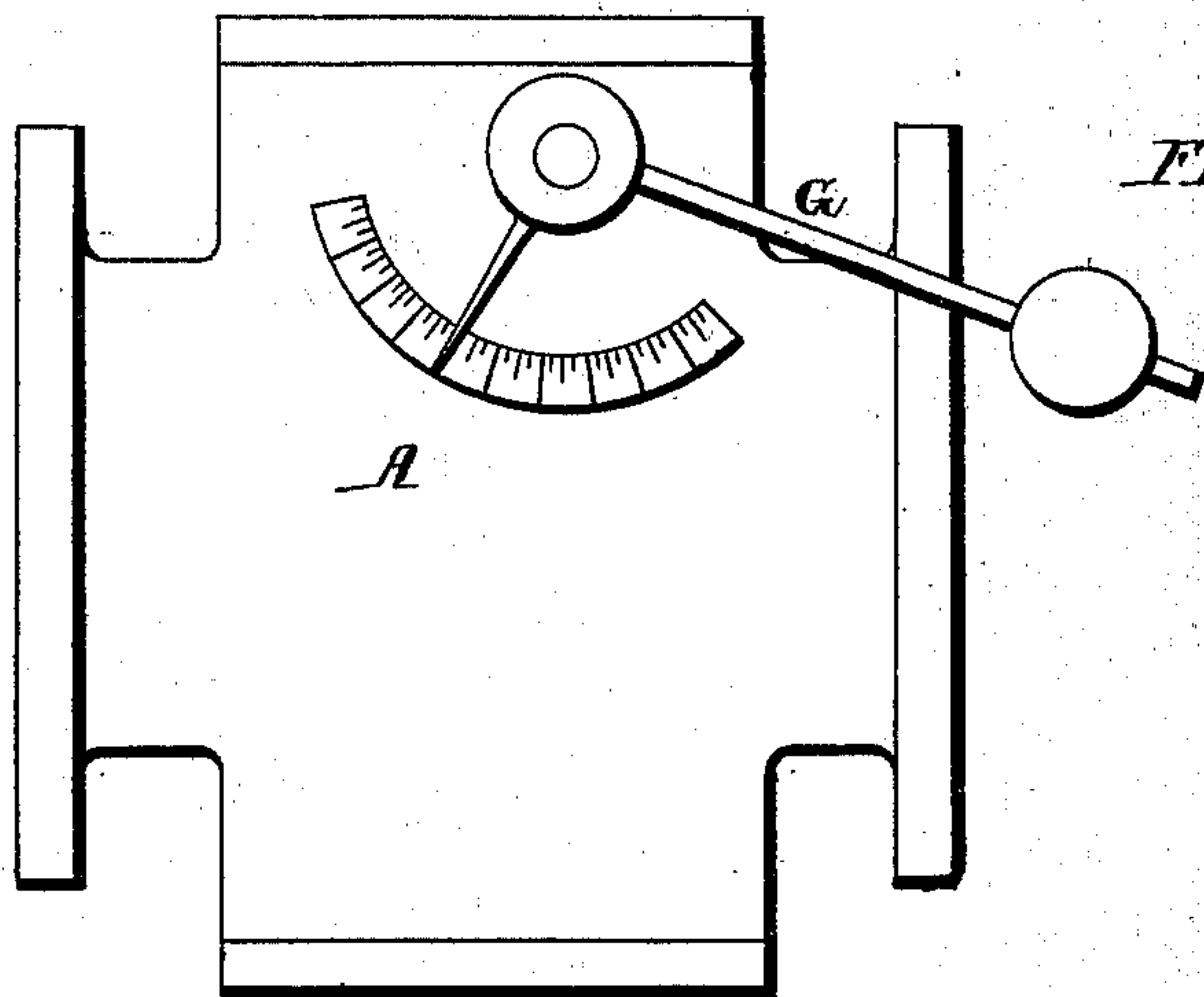


FIG. 3.

Witnesses,
Harry Smith
Thomas McWhain

George L. Kitson
by his Atty.
Howson & Son.

UNITED STATES PATENT OFFICE.

GEORGE L. KITSON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO HIMSELF AND GEORGE W. CARR, OF SAME PLACE.

IMPROVEMENT IN AUTOMATIC REGULATING-VALVES.

Specification forming part of Letters Patent No. **139,163**, dated May 20, 1873; application filed January 29, 1873.

To all whom it may concern:

Be it known that I, GEORGE L. KITSON, of Philadelphia, Pennsylvania, have invented an Automatic Regulating-Valve, of which the following is a specification:

The object of my invention is to dispense with the costly governors used in connection with steam-engines, and this object I attain by a valve-chest, forming part of the passage for the conveyance of steam from the boiler to the engine, and containing a valve so weighted and so exposed to the action of the steam from the boiler that any alteration in the speed of the engine, or any change in the pressure of steam in the boiler causing differences of pressure on opposite sides of the valve in the chest, will induce the said valve to expose or obstruct the passage in the chest to an extent proportionate to any increase or decrease in the speed of the engine or in the pressure of the boiler.

My invention admits of many modifications, but the views in the accompanying drawing will suffice to explain its general character and the mode of operation.

Figure 1 is a vertical section of the regulating-valve; Fig. 2, a sectional plan on the line 1 2, Fig. 1; Fig. 3, a side view.

A represents a valve-chest having two branches, *a* and *a'*, the former being connected to a steam-pipe, which terminates at the steam-boiler, and the latter to a steam-pipe, terminating at and communicating with the valve-chest of a steam-engine, so that the steam from the boiler to the engine must pass in the direction of the arrow through this chest. Between the two branches the passage is contracted at *b*, and across this passage operates a valve, B, through the medium of which the engine regulates itself, in the manner explained hereafter. The valve passes freely through and is guided by a partition, *d*, in the chest, and in a lower and similar partition, *d'*, is an opening of a diameter equal to or a trifle larger than that of the valve, the lower end of which is guided, in the present instance, by its stem *e* passing through a cross-bar, *f*.

It should be here understood that the steam from the boiler has free access through openings *i*, or other suitable apertures, to the cham-

ber *h*, above the valve, from which chamber, however, there is no outlet, there being similar openings in the partition *d'* for the free passage of steam from the boiler to the space beneath the valve.

The valve is made hollow, and, consequently, light, and is connected to a small weighted arm, G, secured to that end of a spindle, *m*, which projects through a stuffing-box on the chest. A pulley, *n*, is secured to this spindle, and to the periphery of the pulley is attached one end of a flexible band, *g*, the other end of the latter being connected to the top of the valve, as shown in the drawing.

Steam, as it passes through a pipe from a boiler to an engine in active operation, is liable to vary in pressure at and near its opposite ends, these variations, or, as they may be more properly termed, pulsations, in the pipe, being attributable to the sudden increase or decrease in the speed of the engine, caused by decrease or increase of the duty which it has to perform, or by a sudden increase or decrease of pressure of steam in the boiler. If the engine be suddenly overloaded, for instance, the flow of steam will be partially arrested, and a slight recoil will take place of the steam, toward the boiler; if the engine, on the contrary, by a withdrawal of a portion of its load, suddenly increases in speed, there will be a pulsation in the pipe in the direction of the engine. The same results will occur on any sudden increase in, or diminution of, the pressure of steam in the boiler. I utilize these pulsations by causing them to so actuate the valve B that it will obstruct or expose the passage for the steam from the boiler to the engine to an extent commensurate with the duty which the engine has to perform, thereby insuring a uniformity in the speed of the engine.

When the usual throttle-valve is closed, and no steam is permitted to pass through the pipe, the engine being consequently at a standstill, the valve B will be elevated by the weighted lever to its extreme height. The moment steam is admitted in the direction of the arrow it rushes through the valve-chest, and at the same instant gains access to the upper chamber *h*. As there is no outlet from

this chamber the steam therein assumes a greater pressure than that rushing through the chest, hence the valve will descend to a distance determined by the weight of the lever, the latter having been adjusted in accordance with the load which the engine has to carry, and with the desired speed of the engine, the valve being in or near the position shown in the drawing, when the engine is doing its proper duty.

If the duty of the engine be suddenly increased its speed will be diminished, the flow of steam through the chest will be partially interrupted, a reaction taking place toward the boiler, so that, for an instant of time, the pressure of steam in the branch *a'*, of the chest A, will be greater than that in the branch *a*, and the valve will consequently rise, and the area of the passage *b* will be increased, so as to admit an increased supply of steam to the engine, the supply being commensurate with the demands of the engine.

It should be understood that all this takes place in an instant of time, the valve B being so sensitive in its action that it will instantly obey the slightest pulsation in the pipe, consequent upon the slightest variation of speed in the engine. In other words, the first attempt of the engine to depart from its uniformity of speed will be instantly, almost simultaneously, counteracted by the operation of the valve.

When the engine is suddenly relieved from a portion of its regular duty, and it has a tendency to increase its speed, a sudden pulsation takes place in the steam-pipe in the direction of the engine, and there will be an instantaneous excess of pressure in the branch *a* of the chest A, and, consequently, in the chamber *h*, and the valve will descend and contract the passage *b* so quickly as to frustrate the first efforts of the engine to exceed its proper speed. Should the engine, owing to the breaking of the driving-belt, attempt to "run away"—as it is technically termed—the attempt will be at once frustrated by the instant descent of the valve into the opening of the partition *d'*, the in-

stant closing of the passage *b*, and the consequent stoppage of the engine.

The object of permitting steam from the boiler to have access through the openings *i* to the space beneath the valve at all times is to insure the proper action of the valve, when the latter has closed, or nearly closed, the passage *b*; but for this provision the valve would lose much of its sensitiveness when it is depressed. Precisely similar regulating results will take place when there is no change in the load of the engine to induce a change of its speed, but when sudden variations of the pressure of steam in the boiler have that inducement.

I prefer the mode of connecting the valve to the shaft by means of a flexible band, as it dispenses with the more costly levers and links which would be liable to get out of order.

There may be on the spindle, outside the chest, a pointer, adjacent to a fixed graduated quadrant, shown in Fig. 3, by the aid of which the first adjustment of the weight on the levers may be accomplished, and the proper subsequent action of the valve determined. The graduation also affords a medium for indicating the actual power exerted by the engine.

Instead of weighting the valve by means of a weighted lever, in the manner described, it may be loaded with a spring; but I prefer the weighted lever.

I claim as my invention—

The combination of a steam-pipe, a loaded valve, and a steam-chest adapted to the valve, substantially as described, so that one end of the said valve shall be exposed to the action of the steam from the boiler end only of the pipe, while the other end of the valve is exposed to the steam at both boiler and engine ends of the pipe, as set forth.

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

Witnesses: GEORGE L. KITSON.

WM. A. STEEL,

HUBERT HOWSON.