

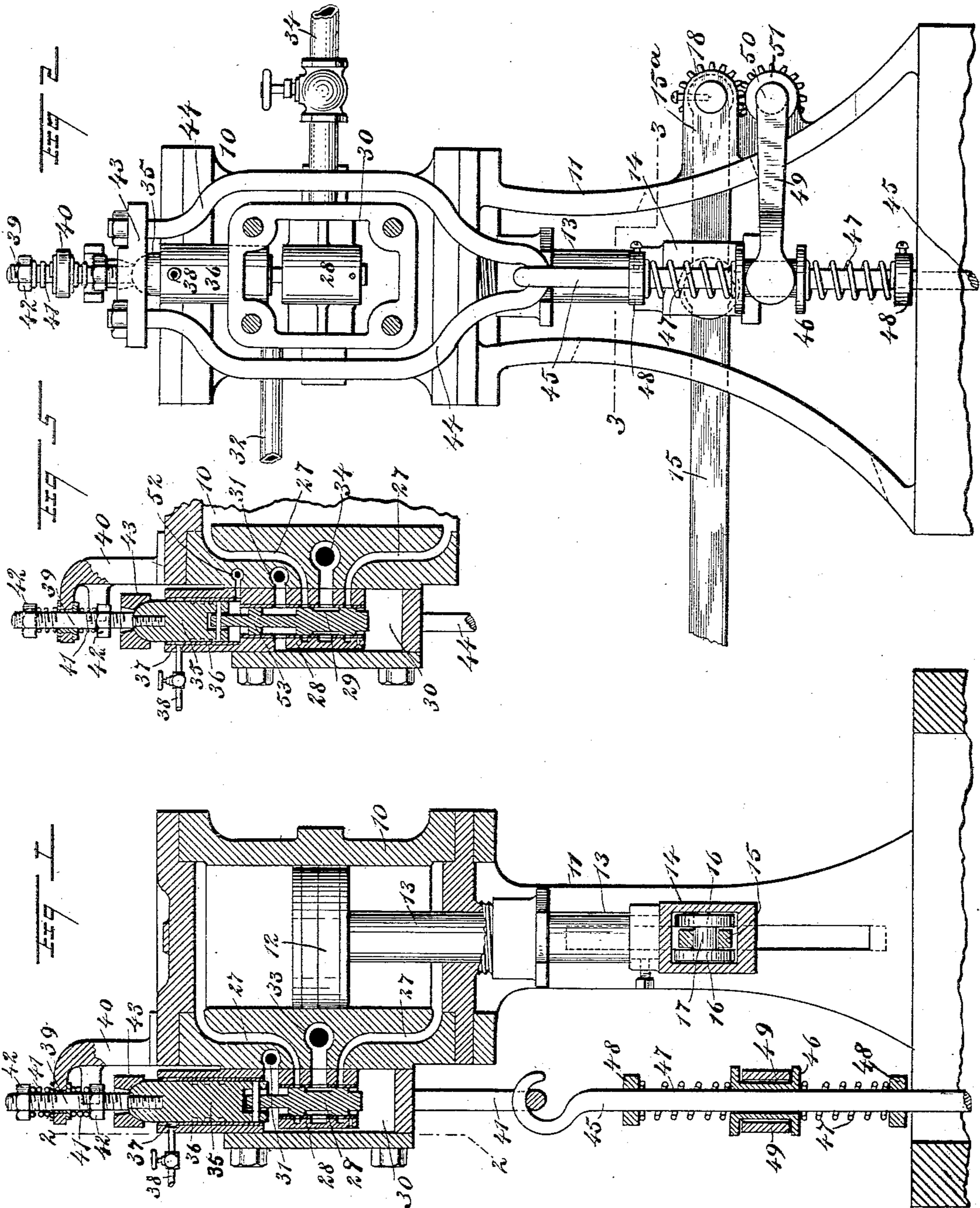
(No Model.)

2 Sheets—Sheet 1.

J. H. BLAKE.  
DAMPER REGULATOR.

No. 504,659.

Patented Sept. 5, 1893.



WITNESSES:

H. Walker  
C. Sedgwick

INVENTOR:

J. H. Blake  
BY  
Munn & Co.  
ATTORNEYS.

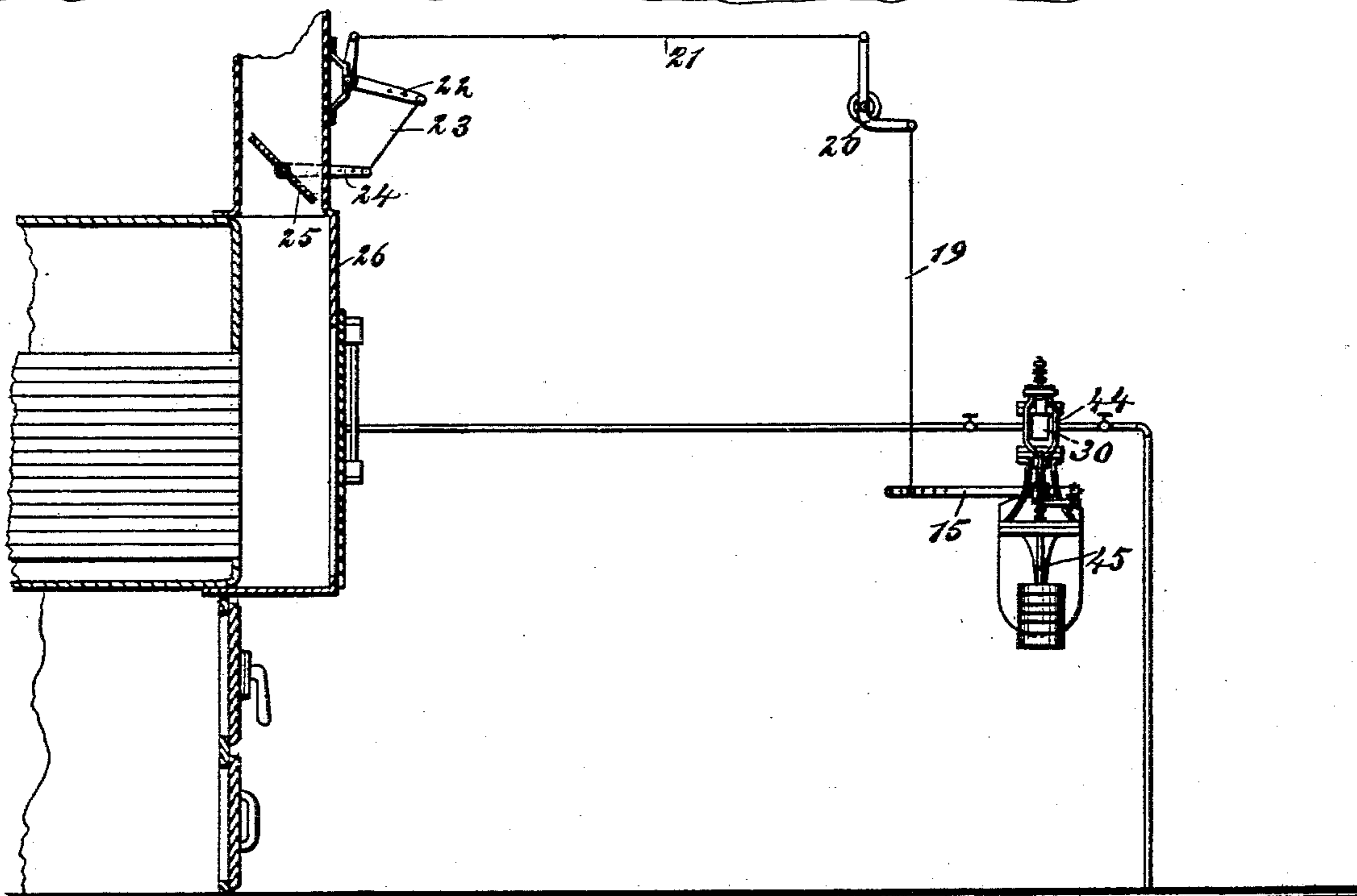
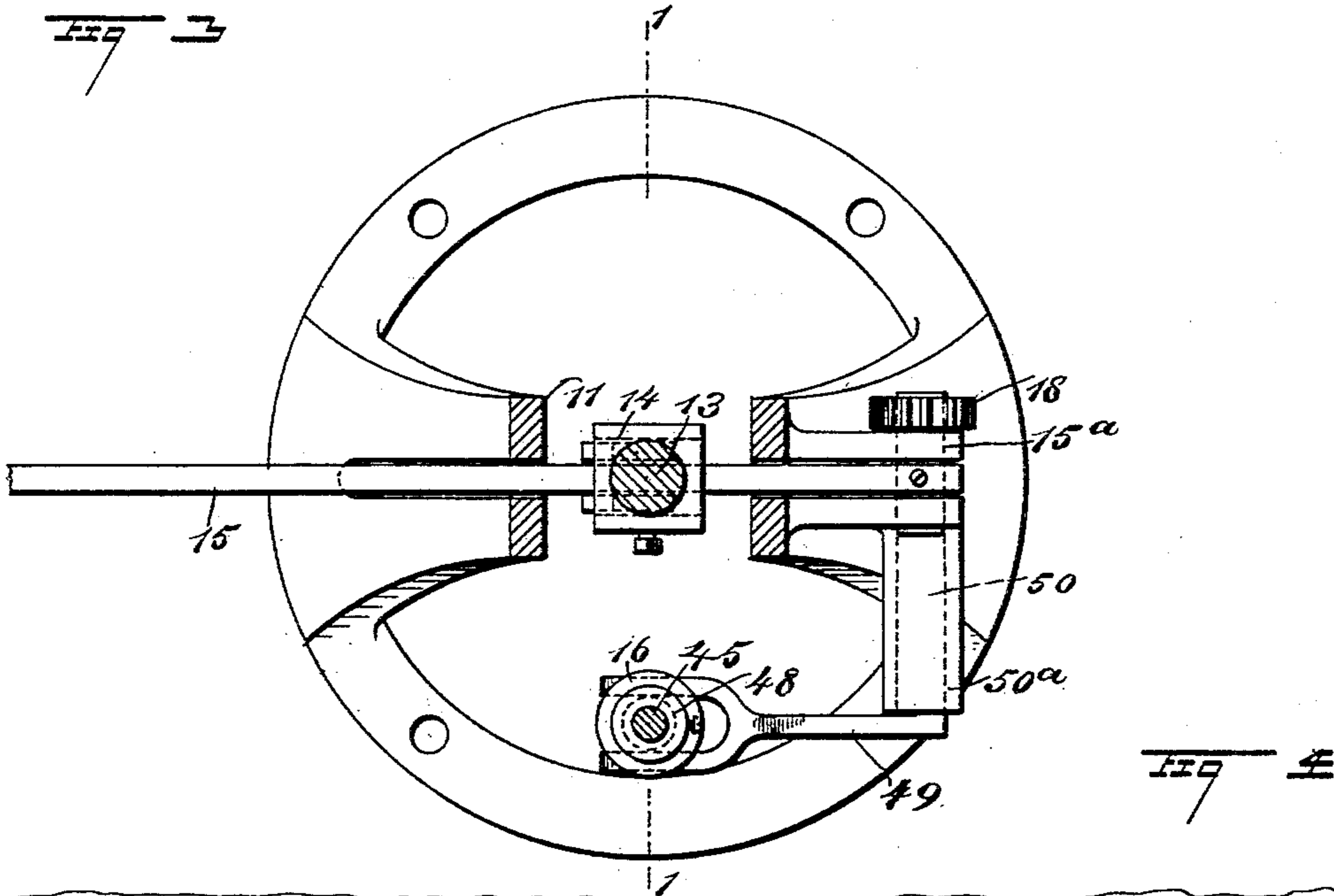
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# UNITED STATES PATENT OFFICE.

JOHN H. BLAKE, OF NEW YORK, N. Y.

## DAMPER-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 504,659, dated September 5, 1893.

Application filed June 27, 1891. Serial No. 397,697. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN H. BLAKE, of the city, county, and State of New York, have invented a new and Improved Damper-Regulator, of which the following is a full, clear, and exact description.

My invention relates to improvements in damper regulators, and the object of my invention is to produce a damper regulator which may be connected with the boiler so as to operate by boiler pressure and which will automatically regulate the boiler dampers, so as to keep an even pressure upon the boiler.

A further object of my invention is to produce a machine which, while especially adapted for operating dampers may be also used for other purposes, such as operating pumps, mechanical feeders, mechanical stokers, &c.

To this end my invention consists in certain features of construction and combinations of parts which will be hereinafter described and claimed.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar figures of reference indicate corresponding parts in all the figures.

Figure 1 is a broken, vertical section of the machine taken partially on the line 1—1 in Fig. 3. Fig. 2 is a broken front elevation partly in section on the line 2—2 in Fig. 1. Fig. 3 is a broken sectional plan on the line 3—3 of Fig. 2. Fig. 4 is a broken view partly in section showing the general arrangement of the machine when connected with the boiler damper; and Fig. 5 is a broken detail sectional view showing the modified form of valve and steam chest which enables the indicating piston to be operated from the boiler and the damper operating piston to be operated by any other convenient source of power.

The main working cylinder 10, is supported upon a suitable frame 11 and is provided with a piston 12 having a piston rod 13 which extends downward through one end of the cylinder, and this piston rod carries at its lower end a box cross head 14, through which the main operating lever 15 extends, the said lever being pivoted between lugs 15<sup>a</sup> on one side of the machine and in order that the lever and piston rod may move freely in relation to each other, the cross head 14 is provided with rollers 16 which are mounted on a

pin 17, extending transversely through the main lever. The pivoted end of the main lever is also provided with a gear wheel 18 which forms part of a different mechanism, which will be hereinafter described. The main lever 15 is connected with the damper, as shown in Fig. 4, by means of a rod 19, bell crank 20, rod 21, bell crank 22, and rod 23, the latter rod being secured to the stem 24 of the damper 25, which is arranged in the smoke stack of the boiler 26.

I have not described this arrangement of parts in detail, as it is a common way to connect with the damper, and the main lever may be connected in any other suitable way, so as to open and close the damper.

The piston 12 may be operated by either steam or water pressure, and the main cylinder 10 is provided with end ports 27 which connect near the center of the cylinder, with corresponding ports in a valve case 28, which case has a piston valve 29 adapted to reciprocate in it, and the case is arranged within the steam chest 30.

The piston valve is of common construction, and other forms of valves may be substituted and it will be seen by reference to Fig. 1, that when the valve is moved in the valve case, it will open one of the ports of the main cylinder and permit the steam or water to enter it.

The steam chest 30 has an inlet 31 through which steam or water is admitted to the chest by means of a pipe 32 which connects with the boiler, and the cylinder 10 is provided with an exhaust port 33 which connects with a suitable valve controlled pipe 34. The upper end of the piston valve 29 is coupled to an indicating piston 35 which moves in an open ended cylinder 36 arranged at the upper end of the steam chest 30, and if desired, the indicating piston and the piston valve may be made in one piece, although it is more convenient to make them in two pieces. It will thus be seen that the indicating piston 35 will move in unison with the piston valve 29 and to guard against excessive leakage, the upper end of the cylinder 36 is provided with an annular groove 37, which connects with the waste pipe 38.

The indicating piston 35 is provided at the top with a vertical stud 39, which is screwed

in the top of the piston and this stud moves in a projecting arm of a bracket 40, and above and below this arm is a spring 41 which encircles the stud, and the tension of which is  
 5 adjusted by means of the thumb nuts 42, one nut being arranged at the top of the upper spring, and the other beneath the lower spring. These nuts fit a thread on the stud, and by  
 10 tightening or loosening them, the springs may be given a greater or less tension. It will thus be seen that the bracket 40 serves as a guide for the indicating piston, and the springs 41 serve to steady the piston and have a tendency to hold the piston valve 29 in a mid-  
 15 way position in the case 28, which position the valve is intended to normally maintain, as the piston 35 will be pressed on one side by steam or water, which enters the steam chest, and on the other side, by weights as de-  
 20 scribed presently.

The indicating piston 35 is preferably rounded at the top and enters a socket on the under side of a cross head 43, and suspended from this cross head is a yoke 44 which em-  
 25 braces the steam chest 30, and which has hooked to its lower end the weight rod 45 which is adapted to carry the balancing weights. The weights are applied to the rod in the usual manner, and enough weights are  
 30 put on to counterbalance the desired amount of pressure. For instance, if the pressure in the boiler was to be maintained at eighty pounds, the weights should weigh eighty  
 35 pounds, and the pressure of the weights on the upper end of the piston 35 will counterbalance the eighty pounds pressure of steam or water on the under side of the piston, that is, if the area of the piston was one inch and it will be readily understood that the weights  
 40 may be easily arranged to counterbalance the pressure on the piston without regard to its area.

It will be seen that if the main lever 15 of the piston rod 13 were connected directly with  
 45 the damper, the movements of the piston 12 would keep the damper slamming and consequently there would be a great deal of wear on all the connected parts. To offset this difficulty the following mechanism is em-  
 50 ployed for effecting a differential movement so as to move the damper only the required distance to maintain the proper boiler pressure. A further object of this differential movement is to prevent hunting, or wide open  
 55 and dead shut regulation so called. A flanged sleeve 46 is held to slide on the weight rod 45 and this sleeve is held normally in a central position on the rod by means of springs 47 which are arranged on opposite sides of it and  
 60 which are held in a proper position by means of collars 48 on the rod. A lever 49 has one end forked so as to enter between the flanges of the sleeve 46, and the opposite end of the lever is connected rigidly with a shaft 50  
 65 which shaft is mounted horizontally in the sleeve 50<sup>a</sup> and carries at the end opposite the lever a gear wheel 51 which meshes with the

gear wheel 18 operated by the main lever 15. It will thus be seen that the tendency of the two levers 15 and 49 will be to move in opposite  
 70 directions and consequently the lever 49 acting on the weight rod and the piston with which the rod is indirectly connected will in a measure, counteract the effect of the lever 15 so that the lever will only give the necessary move-  
 75 ment to the damper, that is to say, if the piston 35 moves downward, the piston valve 29 will also move downward, and steam entering the main cylinder 10 will force the piston 12, and the main lever 15 downward but the  
 80 downward movement of the lever 15 will turn the wheels 18 and 51 so as to raise the lever 49, sleeve 46, and the weight rod, thus lifting upward on the weights and allowing the piston 35 and piston valve 29 to rise so as to par-  
 85 tially counteract the movement of the main lever 15. It will thus be seen that by properly timing and arranging the two levers 15 and 49, the exact movement desired may be  
 90 obtained.

The operation of the device is as follows: The steam or water which enters the steam chest will be counteracted by the weights in the manner described and the piston valve 29  
 95 will be held in the position to close the ports 27. If, however, the boiler pressure becomes a little low, the weights being heavier than the pressure, will cause the piston 35 and piston valve 29 to drop a little, thus opening the  
 100 upper port 27 and the steam or water entering the main cylinder 10 will force down the piston 12, operate the main lever 15 and open the damper, and if the pressure becomes too high, it will raise the piston valve so as to open the lower port 27 and the opposite move-  
 105 ment will take place.

In Fig. 5, I have shown a slight modification, the parts being essentially as in Fig. 1, with the exception that the steam chest is  
 110 provided with an additional inlet 52, which is arranged at the upper part thereof, and the stem of the piston valve 29 is prolonged and is provided with a flange or collar 53 which separates the lower portion of the steam chest from the upper portion. It will thus be seen  
 115 that the inlet 52 may be connected with the boiler and the boiler pressure will operate the indicating piston and piston valve in a manner already described, while any suitable source of power may be let into the lower por-  
 120 tion of the steam chest through the inlet 31 and will serve to operate the main piston 12.

It will be readily understood that the piston 12 and its cylinder may be made large enough to give any desired amount of power  
 125 so as to operate heavy dampers or other mechanism and that the valve controlling mechanism connected with the main cylinder will serve to regulate the movements of the piston as already described.

Having thus fully described my invention, I claim as new and desire to secure by Letters  
 130 Patent—

1. A damper regulator, comprising a main

cylinder having suitable ports, a piston held to slide in the cylinder, a main lever pivoted on a support and connected with the piston rod, the lever being also operatively connected with the damper, a steam chest arranged on one side of the cylinder and in connection with its ports, a valve casing arranged within the steam chest and opposite the ports of the cylinder, a piston valve held to slide in the casing and over the cylinder ports, a second cylinder arranged at one end of the steam chest, an indicating piston held to move in the cylinder, said piston being coupled to the piston valve, and counterbalancing weights suspended from the indicating piston, substantially as described.

2. The combination, with the main cylinder having suitable ports and the piston held to move in the cylinder, and adapted to connect with a damper or other mechanism, of a steam chest arranged on one side of the cylinder, a valve casing arranged within the steam chest and over the cylinder ports, a piston valve held to slide in the valve casing and control the ports, a longitudinally adjustable indicating piston connected with the piston valve and held to slide above the steam chest and valve, a crosshead carried by the indicating piston, a yoke suspended from the crosshead, and a weight-carrying rod secured to the yoke, substantially as described.

3. A damper regulator, comprising a main cylinder having suitable ports, a piston held to slide in the cylinder and provided with the customary piston rod, a main lever pivoted adjacent to the piston rod and operatively connected therewith, a steam chest arranged

on one side of the cylinder and in connection with its ports, a counterbalanced slide valve held to move over the cylinder ports, a second lever fulcrumed adjacent to the main lever and geared thereto so that the movement of the main lever will move the second lever in an opposite direction, and an operative connection between the second lever and the slide valve whereby the latter will be moved in a direction opposite to that of the main piston and lever, substantially as described.

4. In a damper regulator, the combination with the main cylinder, the piston arranged therein and provided with a suitable piston rod, and the weighted piston valve for controlling the ports of the main cylinder, of a main lever connected with the piston rod, a lever connected with the weight rod of the piston valve, and a gear connection between the two levers, whereby they will be simultaneously moved in opposite directions, substantially as described.

5. The combination with the main cylinder, the piston held to slide therein, and provided with a projecting piston rod, the piston valve for controlling the ports of the main cylinder, and the weighted rod connected with the piston valve, of a main lever connected with the piston, a spring pressed flanged sleeve mounted on the weight rod of the piston valve, a lever connected with the flanged sleeve, and a gear connection between the two levers, substantially as shown and described.

JOHN H. BLAKE.

Witnesses:

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