F. A. JONES.

Automatic Damper-Regulator.

No. 224,544. Patented Feb. 17, 1880.

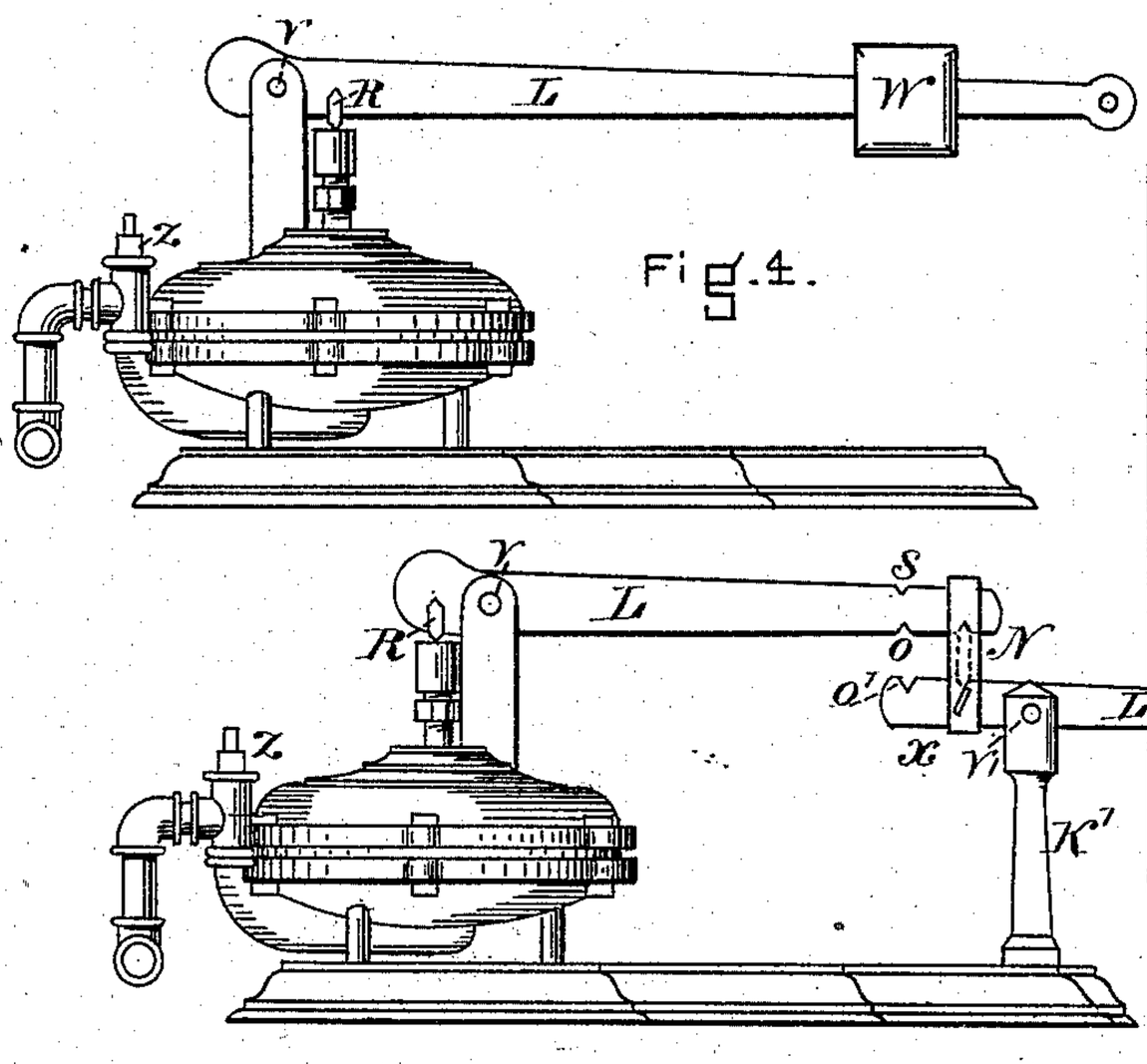

Fig. 4.

Fig. 1.

Fig. 3.

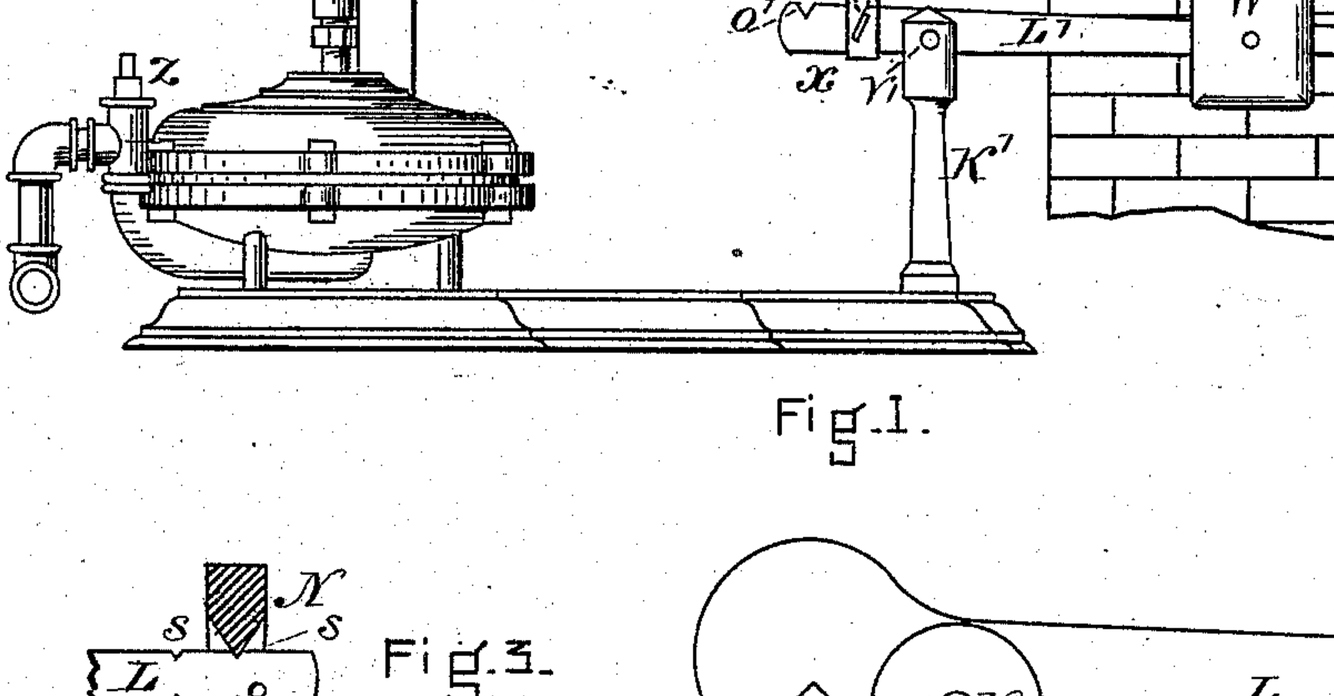

Fig. 2.

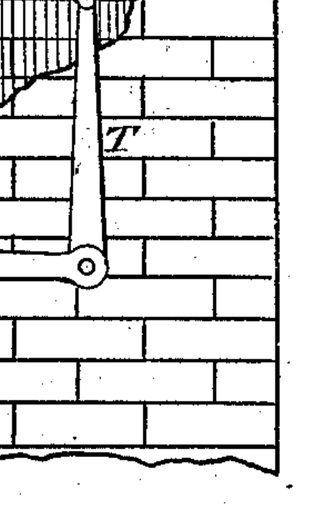

Fig. 5.

WITNESSES

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AUTOMATIC DAMPER-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 224,544, dated February 17, 1880.

Application filed October 20, 1879.

To all whom it may concern:

Be it known that I, FLORENTINE A. JONES, of New York, in the county and State of New York, have invented a new and useful Improvement in Automatic Damper-Regulators, of which the following is a specification.

The invention relates to that class of machines which automatically regulate the draft of furnaces by means of the steam-pressure.

Heretofore it has not been possible to control high and very low pressures with one and the same machine, but it has been necessary to use machines of different sizes, which, when the same boiler is used at different times for high and low pressure, causes much inconvenience. These machines have usually been constructed with one long lever, the weight of which over a short fulcrum either precludes its lifting under several pounds pressure or else necessitates an increased and large surface of diaphragm, which requires the addition of such a heavy regulating-weight upon the lever when working at high pressure as to cause immense friction on the fulcrum, and thereby destroy its sensitiveness of movement on variation of steam-pressure, and thus destroy the most essential quality in a machine for this purpose.

The object of my invention is to provide a machine which will control automatically the draft of a furnace, and thereby the amount of steam generated, and thus prevent the steam-pressure in the boiler from fluctuating above or below the desired limit; to control the highest or lowest pressures of steam with one and the same machine; to obviate the necessity of using the excessively heavy regulating-weight commonly used in this class of machines; to obtain greater sensitiveness under high pressure than has heretofore been obtained, and thereby a more exact control of the draft, and thus the highest possible degree of economy in the consumption of fuel.

My invention consists in the application of a spring to the mechanism of an ordinary damper-regulator at a point where its force will be exerted upon the diaphragm without increasing the friction upon the fulcrum or fulcrums when in operation, and for the purpose of diminishing the amount of regulating-weight, in combination with a plate for the purpose of resisting the pressure of the diaphragm; and it also consists in the construction and arrangement of certain parts, as will be more fully described hereinafter.

In the accompanying drawings, in which similar letters of reference indicate like parts, Figure 1 is a side elevation of my device. Fig. 2 is an enlarged vertical section, showing the internal arrangement of the chamber. Fig. 3 is a detail, showing the arrangement of the movable fulcrum. Figs. 4 and 5 are modifications of my device.

A is the bed-plate, to which is fixed the bottom half of chamber B by means of screws entering supports projecting from the chamber, and also the lever-support K′, fastened by a nut upon the under side.

B is the bottom half of a hollow chamber, to which is attached the connecting-pipe I, which pipe forms a part of the chamber B, and has its outer end lower than the bottom of chamber B, and rises above the diaphragm C at the turn, then descends again and passes under the bottom side of chamber B, and opens into the center of chamber B through the bottom, thus making a siphon in form, which prevents the steam from being in contact with the diaphragm, and will at all times insure the chamber B being filled with water by the condensation, or it may be filled with water previous to letting the steam in by removing the plug Z.

B′ is the top half of the chamber, having a hole in top center, through which the connecting-rod F passes freely, and is provided with a recess for the spring E, and also the annular recess Y, which is of the height and depth just sufficient to allow the diaphragm C to roll outward the distance required in its upward movement without touching; but a slight amount of additional pressure above what is necessary to raise the diaphragm will expand the diaphragm so as to completely fill the annular recess Y, which is of the form which is assumed by the roll of the diaphragm under pressure, and thus will support the diaphragm C and prevent any further upward or lateral stretching of the diaphragm when under high pressure.

The diaphragm C is held in place by the flange passing between the upper and lower halves of chamber B B′.

The diaphragm may be of any elastic substance, or even of metal, and of any proper form. A flat disk of rubber is as effective, though not so durable.

D is the resisting-plate, which, in this case, has its outer edge made to fit the diaphragm, but may be of any proper form. A hollow cylinder extending upward from the plate would enable the spring to be applied on the outside of the chamber B′ by leaving said chamber more open. In case of using a flat diaphragm the plate should cover nearly the whole surface of the diaphragm.

F is a connecting-rod, which may be connected to the plate in any suitable manner, and is shown attached to the plate D in Fig. 2 by a screw, which is formed upon and is a part of the rod F, which enters the plate to a shoulder, or as shown in Fig. 5, where the end simply rests in a recess formed in plate D, the upward pressure of the diaphram upon the plate and the downward pressure of the lever L keeping the rod in place, and leaving the rod free to swing and follow the motion of lever L. The rod F has a thread upon its upper end, and is provided with a nut, G, to raise or lower the cap H, which fits loosely over the end of rod F. The cap H is shown in Fig. 5 with a beveled projection extending from the top into a beveled recess in lever L, which is the preferable manner when the rod F is not attached to the plate D. Cap H may be provided with a thread on the inside, dispensing with nut G.

R is a contact piece with both ends beveled, and which fits loosely in a recess in the end of lever L, and is held in place by a pin passing through the end of the lever and piece R, but so loosely as to allow a slight swinging movement to the piece R, in order to prevent any sliding or friction between the point of contact and the cap H. K is the back-support, and forms a part of hollow chamber B′. This support should be provided with two hardened bushings for bearings, and has a slot running lenghthwise, through which the lever L passes, and is held therein by the pin V, which should be beveled at the ends on the top side to reduce friction at point of contact. The pin V should be tempered hard, and is driven tightly into and through a hole in lever L, while the ends fit loosely and turn in the bushings in the support K.

The lever L is provided with notches *o* on its front end. The lever L′ has corresponding notches *o′* on the back end, in which the movable fulcrum P is placed, which is beveled at both ends to permit freedom, and also to reduce friction.

The lever L is also provided with notches *s* on its upper side, in which is placed the beveled end of connecting-piece N, which is open at the bottom end to allow it to pass over levers L L′, and is affixed to lever L′ by a pin, X, for the purpose of preventing the two levers from separating when not working and permitting the movable fulcrum to fall out of place.

The lever L′ has a hole in front end for the purpose of connecting with the rod and damper T, and is also provided with the weight W, for the purpose of regulating or adjusting.

The support K′ is for the purpose of supporting lever L′, which passes through a slot in the upper end of support K′, and is retained there by a pin, V′, upon which the lever L′ turns, while the pin fits tightly in the holes of support K′.

The spring E is shown with the rod F passing loosely through the hole left in the center of the spring, and with the spring E resting upon the plate D, leaving an open space between the spring and top of the recess on the inside of chamber B′. This space is left in order to allow the necessary amount of movement to the diaphragm to work the lever L its full range without any compression of the spring when it is desired to operate on very low steam-pressures, whereas, when working at high pressure, the nut G is turned down, so as to allow the cap H to descend, leaving a space between the cap H and the end of lever L or the contact-piece R, which necessitates the diaphragm carrying the spring E upward until it bears against the top of the recess, and then will force the spring together more or less, as the distance between the lever and the cap H is increased or decreased.

I find in practice that the spring should offer a direct resistance of about eleven hundred pounds, or equal to twenty-five pounds pressure on a seven-and-one-half-inch diaphragm, with levers of fourteen and fifteen inches in length, or a single lever of thirty inches.

It will readily be understood that in a machine or regulator for working at high pressure only there would be no change required, and therefore no free space left between the spring and the recess, and the cap H and nut G could be dispensed with by substituting a rod reaching from the resisting-plate over the diaphragm to the lever L.

It is not necessary that the spring bear directly upon the plate D, but it may exert its force upon the rod or upon a projection extending upward from the resisting-plate, or it may be connected direct with the lever L in any suitable manner, so as to counteract the pressure which the diaphragm causes to be exerted upon the fulcrum-pin V, the object of the spring being to reduce pressure, and, consequently, friction upon the working parts. The spring may be of any proper form.

Fig. 4 shows my device with a single lever.

Fig. 5 shows the rod F resting freely in a recess in plate D, and the connection with lever L direct, without the contact-piece R.

W is a weight, movable upon the lever on which it is placed, by means of a slot, and may be fixed thereon by a screw passing through one side against the lever.

The operation of my invention is as follows: The point of connection with the boiler is at I, and steam passes through the pipe I and enters the hollow chamber B at the bottom and center I′. The chamber rapidly fills with condensation, if not previously filled with water, by removing the plug Z. The pressure from the boiler, acting on the diaphragm C, presses it upward, and carries the plate D, rod F, and cap H up against the lever L, which it causes to turn, which in Fig. 4 will connect direct with the damper-arm T, while in Fig. 1 the lever L communicates movement to the lever L′, which is connected with the damper-arm T, and causes the damper in the chimney to open or shut more or less as the presssure in the boiler increases or diminishes, and thus will regulate the draft.

By changing the movable fulcrum P back into the notches *o′ o*, it will be seen that the power of lever L′ is doubled above what it is on the short leverage, as shown in Fig. 1.

To work at low presssure the nut G is raised until the cap H is brought in contact with the contact-piece R or the end of lever L, as shown in Fig. 5, and thus the whole force of the diaphragm C is exerted without meeting with any resistance from the spring which slides upon the rod F. At high pressure the nut G is turned down until cap H rests upon the end of the rod F, which leaves sufficient space between cap H and the point of contact with the lever L, so as to cause the required compression of the spring E before and during its action in lifting the lever L.

The weight W is easily moved back or forward upon the lever, thus increasing or diminishing its governing power, and affording a ready means of supplementing the power of the spring E and of regulating the closing-point of the damper with great exactitude to any desired steam-pressure.

What I claim, and desire to secure by Letters Patent, is—

1. In a draft-regulator, a spring, E, in combination with the plate D, rod F, and a diaphragm, when applied substantially as and for the purpose specified.

2. In a draft-regulator, a spring, in combination with the rod F and the lever L, diaphragm C, and plate D, substantially as and for the purpose described.

3. In a draft-regulator, the combination of the lever L, rod F, cap H, and nut G with the plate D and diaphragm C, all arranged as and for the purpose specified.

4. In a draft-regulator, the combination of the diaphragm C with the opening I′ and I, forming part of the chamber B, and all constructed and arranged substantially as specified.

5. In an automatic draft-regulator, the combination of the levers L and L′ with the connection N, movable fulcrum P, and a diaphragm, C, all arranged substantially as specified.

6. In an automatic draft-regulator, the combination of the levers L and L′ with the connection N, fulcrums V, V′, and P, diaphragm C, and spring E, all arranged as and for the purpose described.

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Witnesses:
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