(No Model.)

F. S. MASON.

FEED REGULATOR FOR OIL STOVES.

No. 376,446. Patented Jan. 17, 1888.

Fig. 1.

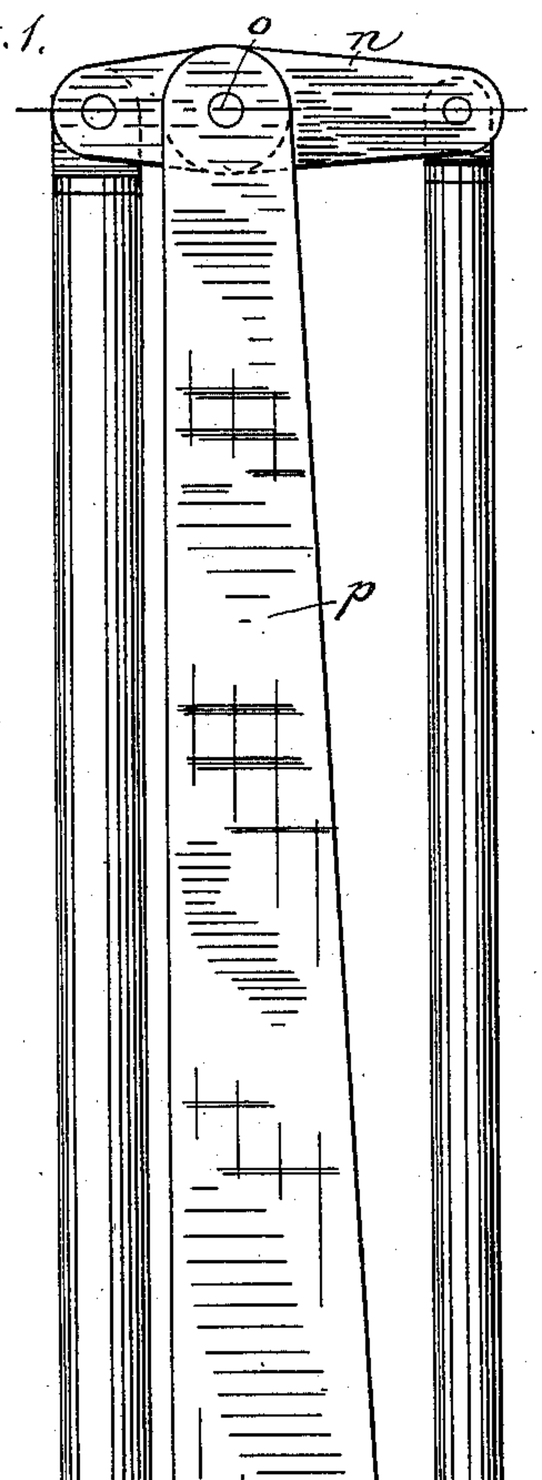


Fig. 3.

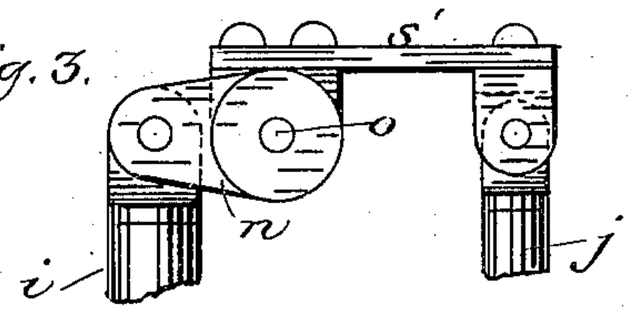


Fig. 4.

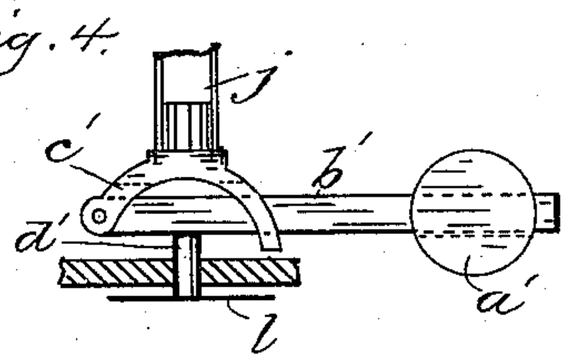
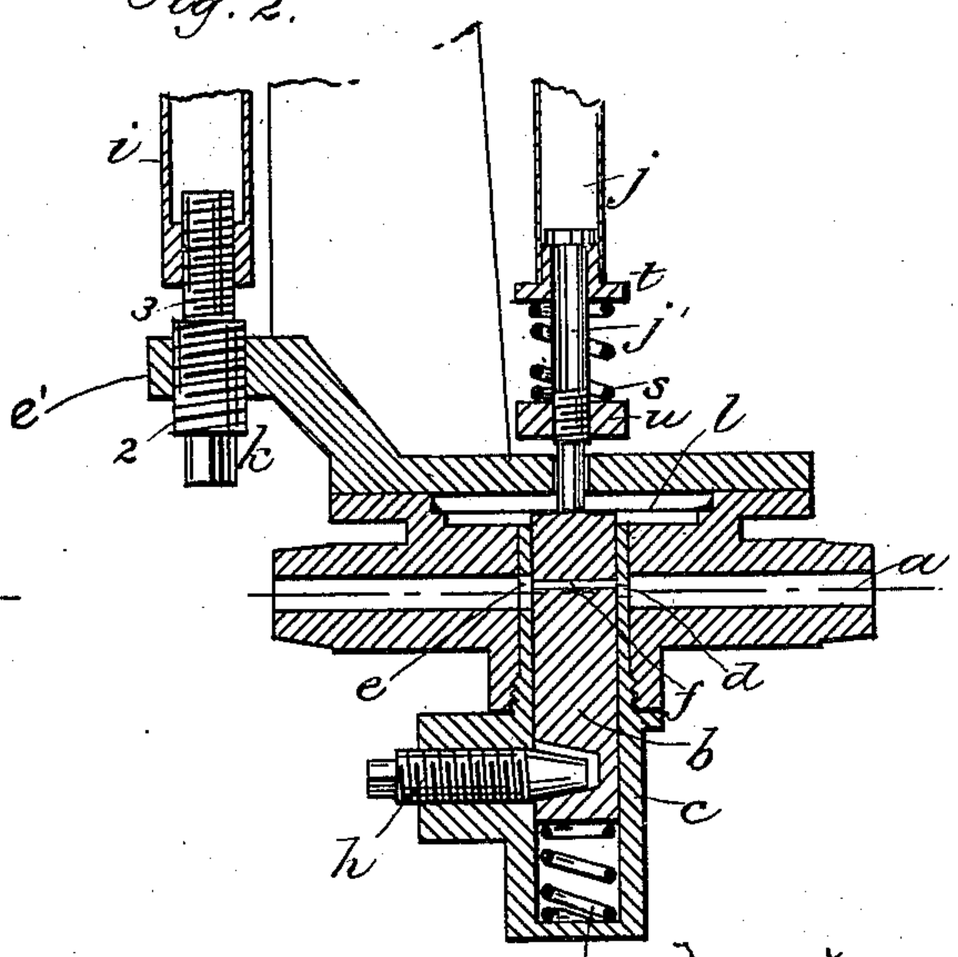


Fig. 2.



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UNITED STATES PATENT OFFICE.

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FEED-REGULATOR FOR OIL-STOVES.

SPECIFICATION forming part of Letters Patent No. 376,446, dated January 17, 1888.

Application filed January 8, 1887. Serial No. 223,720. (No model.)

To all whom it may concern:

Be it known that I, FRANK S. MASON, of Cambridge, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Feed-Regulators for Oil-Stoves, of which the following is a specification.

This invention relates to that class of automatic devices for regulating the supply of oil to oil-stoves, in which the quantity of oil supplied is governed by an expansion pair or combination acting on the valve which controls the flow of oil from a reservoir to the burner, said valve being normally held by a spring against one member of said expansion pair, and moved against the pressure of its spring by the expansion of the members of the expansion pair caused by an increase of their temperature, the valve being moved in the opposite direction by its spring when said members contract. A type of this class of automatic regulators is shown in Letters Patent of the United States (lamp-stoves,) No. 308,955, granted to William E. Eastman, December 9, 1884. In the apparatus shown in said patent one of the members of the expansion pair bears on an adjustable support or point of resistance, and the other on the spring-pressed valve, the arrangement being such that the elongation or expansive pressure of said member produced by heat causes the movement of the valve against the pressure of its spring, and, if sufficiently continued, forces the valve against a rigid stop or point of resistance which limits the movement of the valve and prevents further elongation of the members of the expansion pair. In practice this expansive pressure of the members of the combination beyond the limit of movement of the valve exceeds the point of elasticity of said members in their heated condition, so that they acquire and retain a longitudinal compression or "set," and do not thereafter regain their original length. In consequence of this set or compression the members of the expansion pair have to be frequently readjusted, said compression taking place whenever the elongation of the members is continued after the movement of the valve is arrested.

My invention has for its chief object to neutralize the extra expansion of the members of the expansion pair, or that which takes place after the valve is arrested by the fixed stop or point of resistance; and to this end the invention consists in the introduction of an elastic or yielding medium into the expansion pair between the two points of resistance, whereby when the movement of the valve is arrested the succeeding elongation of the members (if any) will be absorbed without set or longitudinal compression of said members.

The invention also consists in certain improvements in the adjustable point of resistance of the expansion pair, all of which I will now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a side elevation of an automatic heat-regulating apparatus of the class above referred to without the elastic or yielding medium which forms the subject of my invention. Fig. 2 represents a vertical section of the valve-casing and valve shown in Fig. 1, and of the lower ends of the members of the expansion pair, showing the elastic or yielding medium applied to one of said members. Figs. 3 and 4 represent modifications of the elastic or yielding medium.

The same letters of reference indicate the same parts in all the figures.

In the drawings, *a* represents the conduit through which oil passes from a tank or reservoir to the burner of the oil-stove. Said tank and burner are not shown in the drawings, as they form no part of my invention and may be of any suitable construction.

b represents the valve, which in this instance is a cylinder adapted to slide in a casing, *c*, which intersects the conduit *a*, and has apertures *d e* coinciding with said conduit, the valve having an aperture, *f*, which coincides with the aperture *d* of the casing, partially or fully, according to the condition of the members of the expansion pair. The valve-aperture is never entirely closed, the valve being held by a spring, *g*, against a fixed stop or point of resistance, *h*, as shown in Fig. 2, when the members of the expansion pair are reduced by contraction to their minimum length, in which position the valve-aperture is partially closed. When the members of the expansion pair expand, they force the valve down against the pressure of the spring *g*, thereby gradually bringing the valve-aperture

into coincidence with the aperture *d*, and permitting the passage of the maximum quantity of oil to the burner. If the expansion of said members continues beyond this point, the valve-orifice is gradually obstructed until the movement of the valve is arrested by the stop or resistance *h*, the valve-orifice being then below the aperture *d* and out of coincidence, the same as when the valve is at the other extreme of its movement.

The expansion pair is composed of two metallic tubes or rods, *i j*. One end of the member *i* rests on an adjustable point of resistance, *k*, hereinafter described, and one end of the other member, *j*, rests on a flexible metal diaphragm, *l*, which bears on the end of the valve opposite to that against which the spring *g* bears. Said diaphragm moves with the valve, and its office is simply to prevent the escape of oil from the casing containing the valve.

In the present instance the members of the expansion pair are arranged side by side and jointed at their upper ends to the ends of a lever, *n*, which is pivoted at *o* to a fixed standard, *p*. This arrangement, however, is not a part of my invention, nor do I limit myself thereto, as the said members may be arranged one within the other, as shown in the above-named Eastman patent, or in any other suitable way, without departing from the spirit of my invention.

Heretofore there has been no provision for any yielding movement of the members of the expansion pair when the valve is arrested by the stop or point of resistance *h*, and in consequence any considerable expansion of said members after the valve has reached the limit of its movement has caused a permanent set or longitudinal shortening of said members, their further elongation being prevented by the two points of resistance *h k*, so that the expansion is necessarily lateral and not longitudinal. The members of the pair are therefore permanently shortened and do not regain their former initial length, but have to be readjusted. In carrying out my invention I obviate this difficulty by giving the expansion pair a yielding movement which is capable of absorbing the expansive movements of the pair, which take place after the movement of the valve is arrested by the fixed stop or point of resistance. This yielding movement is best produced by providing the member *j* with a sliding terminal, *j'*, which bears on the diaphragm *l*, and is pressed against said diaphragm by a spring, *s*, interposed between a collar, *t*, on the main portion of the member *j*, and an adjustable nut, *u*, on the sliding terminal, the pressure of said spring *s* being opposed to that of the valve-pressing spring *g*.

It will be seen that when the expansion of the members *i j* continues after the movement of the valve is arrested by the stop *h*, such expansion is absorbed by the spring *s* without set or change in the length of said members, so that the apparatus being once properly adjusted the necessity of frequent change or readjustment heretofore existing is obviated.

By a suitable adjustment of the nut *u*, supporting one end of the spring *s*, the ratio of movement of the valve to the expansive movement of the members *i j* is regulated. If said nut be screwed up until the tension of the spring *s* is greater than that of the valve-supporting spring *g* when the valve is pushed downwardly as far as it can go, then the ratio of movement of the valve will be directly as the expansion, as it would be if the spring *s* were not employed. In this case the spring *s* acts only after the movement of the valve is arrested by the stop *h*, and absorbs the extra expansion. If, however, the tension of the spring *s* is exactly equal to that of the spring *g*, the expansion of the members *i j* will be absorbed equally by each spring, and the ratio of movement of the valve to the expansion will be one-half. If the tension of the spring *s* be less than that of the valve-supporting spring *g*, the ratio of movement of the valve to that of the expansion will be correspondingly less.

In Fig. 3 I have shown the lever *n*, which connects the members *i j*, constructed to afford the above-described yielding movement, said lever being composed in part of a spring, *s'*. Any other suitable form of spring or yielding cushion may be employed—as, for example, a tubular rubber spring may be used in place of the spiral spring *s*. I do not limit myself, however, to a spring, but may provide the yielding movement by other means—as, for example, a weight, *a'*, on a lever, *b'*, pivoted to an ear, *c'*, on the member *j*, and bearing on a sliding stud or pin, *d'*, resting on the diaphragm *l* over the valve, as shown in Fig. 4, the weighted end of the lever being raised by the extra expansion of the members *i j* after the movement of the valve is arrested. The yielding pressure may in this case be adjusted by moving the weight on the lever *b'*.

The adjusting-screw *k*, which constitutes one of the points of resistance and supports the member *i* of the expansion pair, is composed of two parts, 2 3, having threads of different pitch, one part screwing into a corresponding internally-threaded aperture in a fixed arm or lug, *e*, while the other part screws into the lower end of the member *i*. The object of this arrangement is to enable a very minute adjustment of the members *i j* to be effected without the necessity of making the threads on the adjusting-screw *k* correspondingly fine. This will be understood when the fact is borne in mind that the longitudinal movement of the member *i*, caused by the rotation of the screw *k*, is due to the difference between the pitch of the threads on the two sections. It is therefore entirely practicable to make the screw-threads sufficiently coarse for strength, and at the same time permit the necessary delicacy of adjustment.

I do not limit myself to the use of a spring to move the valve when the members of the

expansion pair contract, as it is possible to connect the valve to one member of the expansion pair, so that the valve will be moved by the contraction as well as by the expansion of said pair.

I claim—

1. In a feed-regulator for oil-stoves, the combination of a valve which controls the passage of oil to the burner, an expansion pair arranged to move said valve, a fixed support or abutment secured to one end of one member of said pair, a fixed stop arranged to arrest the movement of the other member of the pair at a given point and thereby limit the expansive movement of said pair, and a spring, or its specified equivalent, arranged to give the expansion pair a yielding movement, whereby any expansive movement of said members, after the pair has reached the limit of elongation permitted by the stop, is absorbed, as set forth.

2. In a feed-regulator for oil-stoves, the combination of a valve which controls the passage of oil to the burner, an expansion pair arranged to move said valve, a spring, as *g*, supporting the valve against the pressure exerted on it by the expansion pair, a fixed support or abutment secured to one end of one member of said pair, a fixed stop arranged to stop the movement of the other member of the pair at a given point and thereby limit the expansive movements of said pair, and a spring, *s*, or its specified equivalent, arranged to give the expansion pair a yielding movement, as and for the purpose set forth.

3. In a feed-regulator for oil-stoves, the combination of a valve which controls the passage of oil to the burner, an expansion pair, one of whose members is provided with a sliding terminal or section, as *j'*, a spring, *s*, whereby said terminal is normally projected from the other section of said member, a fixed support or abutment secured to one end of one member of said pair, and a fixed stop arranged to arrest the movement of the other member of the pair at a given point, all arranged and operating substantially as set forth.

4. The combination of the valve and its casing, the valve supporting spring, the expansion pair, one of whose members is supported at one end by a fixed abutment, while the other member has a sliding terminal bearing with a yielding pressure on the valve, and means, substantially as described, for regulating the degree of pressure of the sliding terminal on the valve, whereby the ratio of movement of the valve to the expansive movement of the members of the pair may be regulated, as set forth.

5. The combination of the valve and its casing, the expansion pair, one of whose members is supported at one end by an adjustable abutment comprising arm *e'* and differential screw, one part of which engages with a screw-thread in the arm *e'*, while the other part engages with the adjacent member, the other member having a sliding terminal bearing with a yielding pressure on the valve, substantially as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 5th day of January, 1887.

FRANK S. MASON.

Witnesses:

C. F. BROWN,

A. D. HARRISON.