(No Model.) 4 Sheets—Sheet 1.

W. NOYES.

AUTOMATIC STEAM DAMPER REGULATOR.

No. 263,802. Patented Sept. 5, 1882.

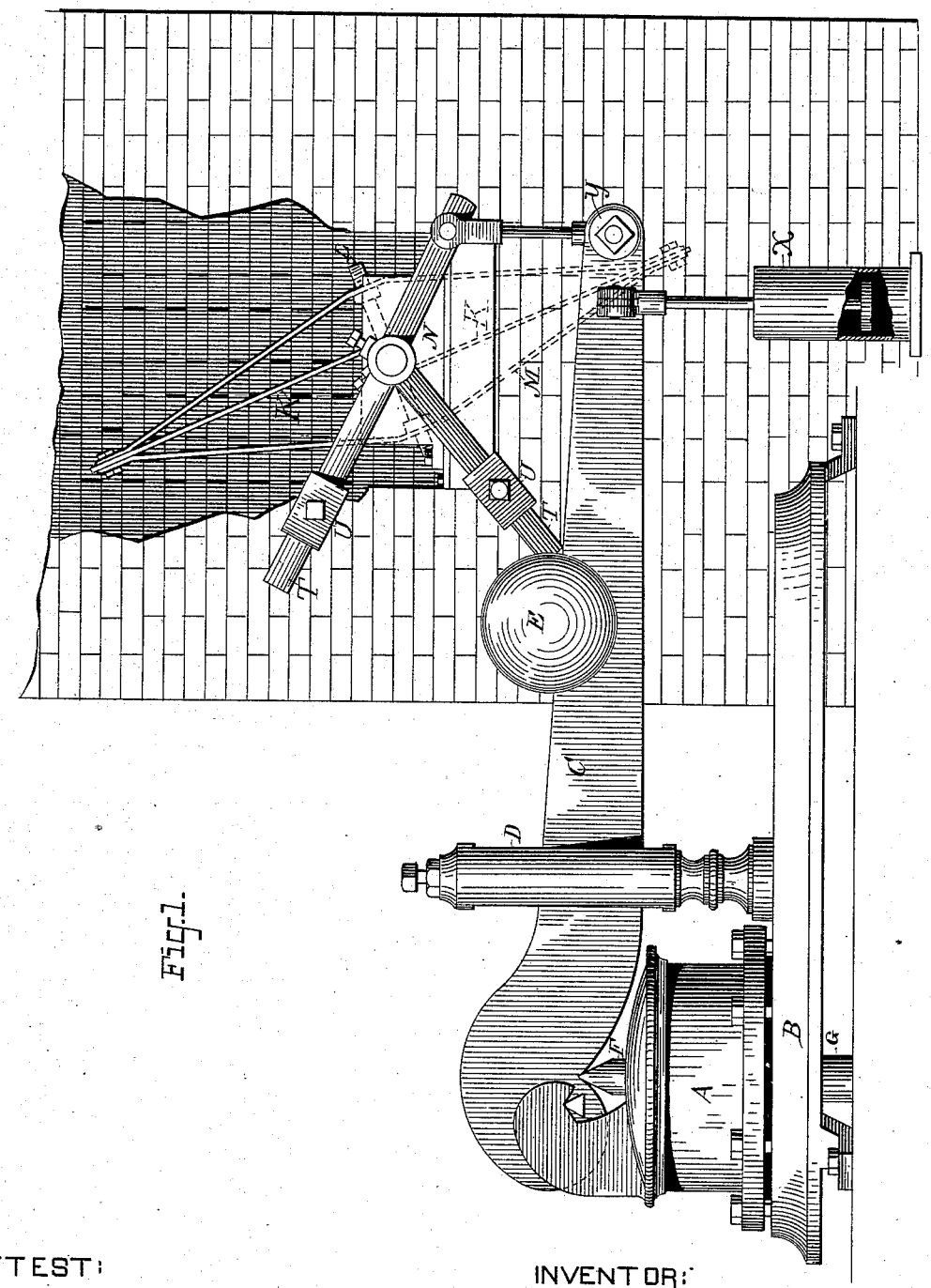


Fig. 1.

ATTEST:

J. A. Thurdle

M. L. Freeman

INVENTOR:

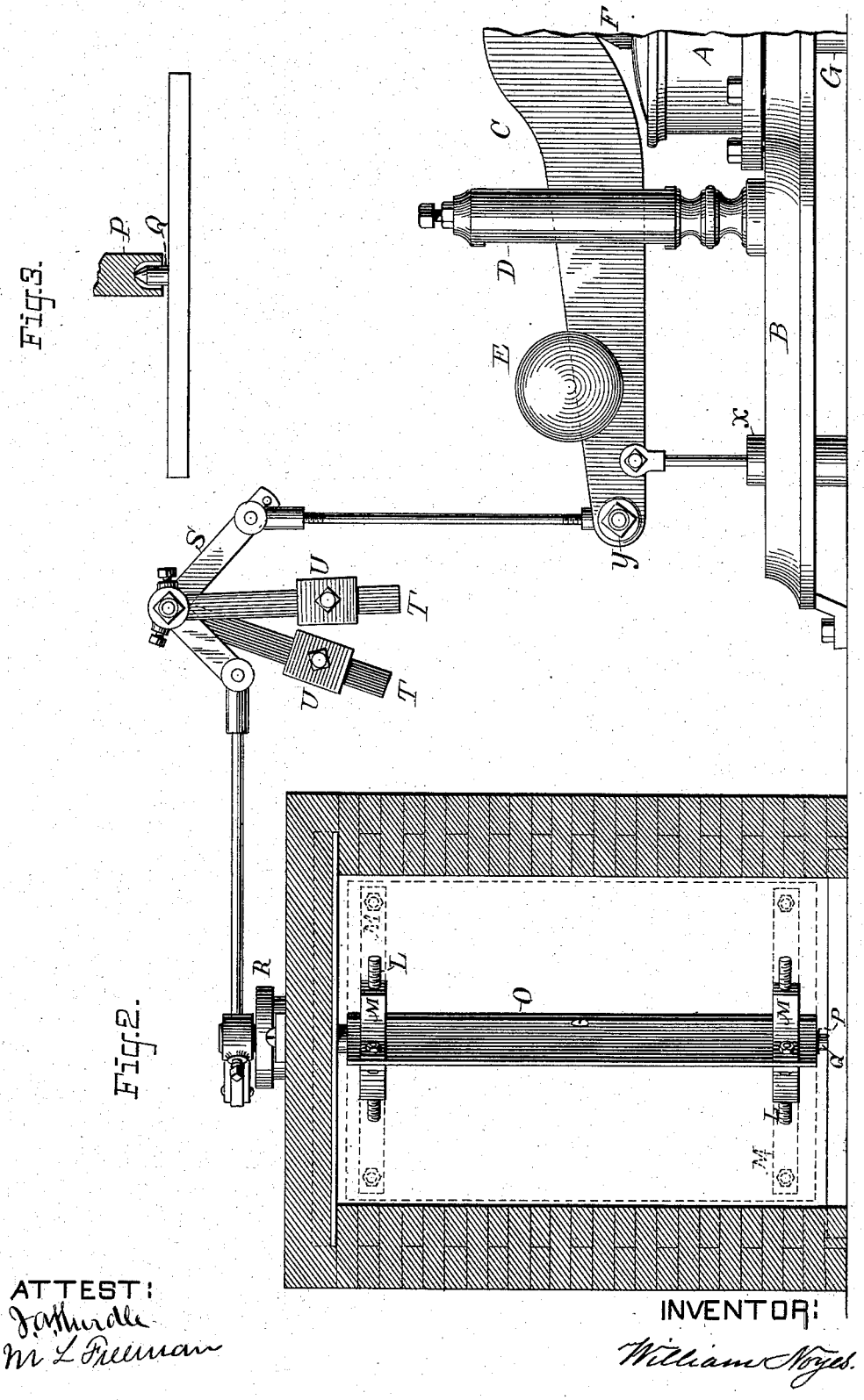
William Noyes.

(No Model.) 4 Sheets—Sheet 2.

W. NOYES.

AUTOMATIC STEAM DAMPER REGULATOR.

No. 263,802. Patented Sept. 5, 1882.



ATTEST:
J. A. Thurdle
M. L. Freeman

INVENTOR:
William Noyes.

(No Model.) 4 Sheets—Sheet 3.

W. NOYES.

AUTOMATIC STEAM DAMPER REGULATOR.

No. 263,802. Patented Sept. 5, 1882.

Fig. 4.

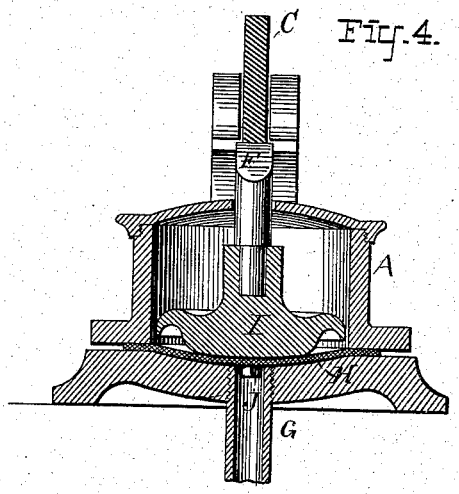


Fig. 5.

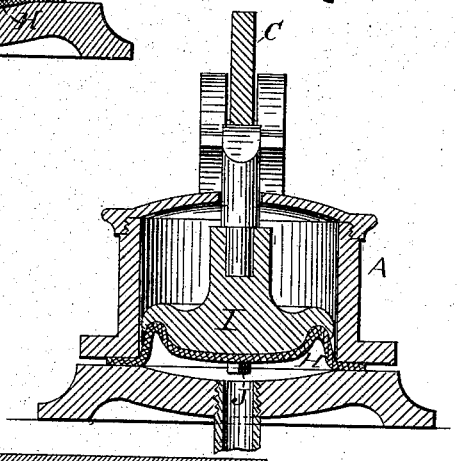
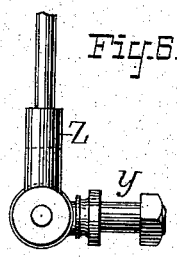


Fig. 6.



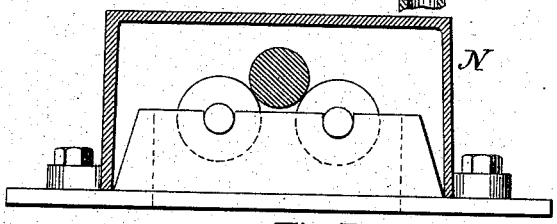


Fig. 7.

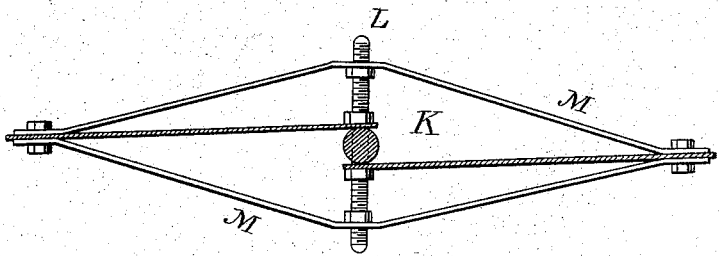


Fig. 8.

ATTEST:

J. A. Murdle

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INVENTOR:

William Noyes.

(No Model.) 4 Sheets—Sheet 4.

W. NOYES.

AUTOMATIC STEAM DAMPER REGULATOR.

No. 263,802. Patented Sept. 5, 1882.

Fig. 9.

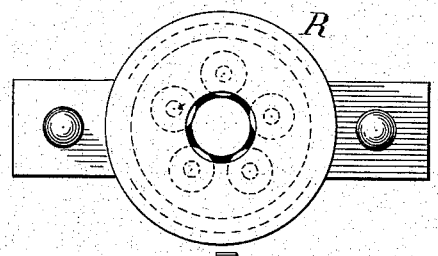


Fig. 10.

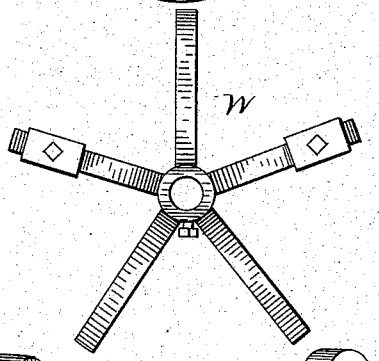


Fig. 12.

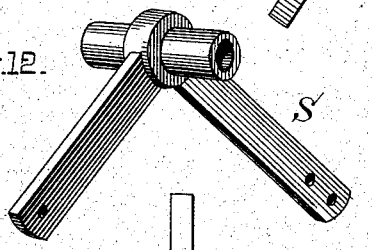


Fig. 11.

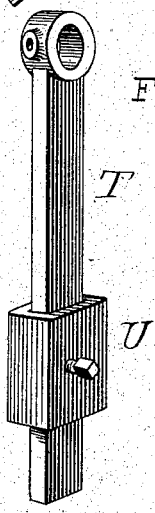
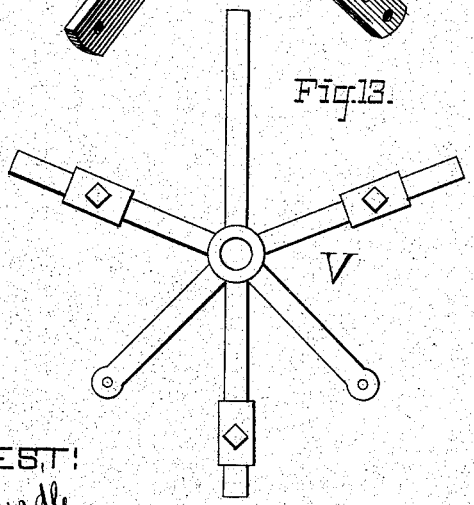


Fig. 13.



ATTEST:

J. A. Hurdle

M. L. Freeman

INVENTOR:

William Noyes.

UNITED STATES PATENT OFFICE.

WILLIAM NOYES, OF NEW YORK, N. Y.

AUTOMATIC STEAM-DAMPER REGULATOR.

SPECIFICATION forming part of Letters Patent No. 263,802, dated September 5, 1882.

Application filed July 11, 1882. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM NOYES, of the city of New York, in the county of New York and State of New York, have invented new and useful improvements in automatic steam-damper regulators used for the purpose of economizing in the fuel used in the furnaces under steam-boilers by controlling and regulating the draft in the flue or chimney, or by operating on the damper in the blower-flue, or by shipping and unshipping the belt of the blower, or by opening and closing the ash-pit door, as the case may require. I also use it to regulate the pressure on a boiler where there are two or more boilers connected, and where it is necessary to carry different amounts of pressure on the boilers, I do it by operating on a valve in the pipe which connects the boiler or boilers with the main pipe.

I am aware that several devices for regulating the draft of steam-boilers have been patented and used for many years, using diaphragms, some made of pure rubber without any cloth in their composition, and some made with cloth in order to add to its strength and durability, as it cannot have either when made of pure rubber, but has the requisite pliability and elasticity without the strength and durability necessary, and when the ordinary cloth is used in its structure it has sufficient strength and durability without the requisite pliability and elasticity necessary to allow of its working with that ease and precision which are required, in order not only to regulate the pressure accurately, but also to make the saving of the fuel used sufficient to guarantee the outlay for its purchase. My improved diaphragm possesses not only all the pliability and elasticity required, but it has the strength and durability of one made of rubber and cloth combined, and with my improvements in the form of my metallic plate resting on the diaphragm combined with the form of the fulcrum-pin and the set-screw, which holds the diaphragm firmly in the center of the metallic plate, I have succeeded in combining an accurate, perfect working, and durable diaphragm.

I have also made improvements in the structure of the damper for the flue or chimney which the regulator has to work in order to accomplish the desired results; and, also, I have invented several improvements in the mode of setting dampers, both in flues and also in chimneys; and also in the manner of attaching the dampers to the regulator in order to overcome all the friction possible; and also in the method I use to counterbalance the damper against the different drafts in the flue or chimney; and also in overcoming with my dash-pot what has been a great drawback in using regulators to work dampers in large flues and chimneys with strong drafts, and that is the tendency of a constant vibration of the damper from wide open to close shut, carrying the lever of the regulator with it, thereby preventing its being of the desired utility; but with the aid of the dash-pot I can work large dampers with strong drafts against them equally as well as small ones with ordinary drafts.

With all of my improvements combined I have succeeded in perfecting a reliable, durable, and accurate-working automatic steam-damper regulator, with all the necessary attachments; and I hereby declare that the following is a full and accurate description thereof, reference being had to the accompanying drawings, and to the letters of reference thereon.

In the accompanying drawings, Figure 1 is a view in side elevation of a chimney, partly broken away, provided with my improved damper and its steam-regulating devices. Fig. 2 is a view in transverse section of a horizontal flue provided with my improved damper and automatic regulating devices for automatically regulating the position of the damper. Fig. 3 is a detached view of the step-bearing for the damper shown in Fig. 2. Figs. 4 and 5 are views in vertical section of the steam-cylinder, pressure-plate, and diaphragm, Fig. 4 showing the position of the diaphragm when pressure is not exerted thereon, and Fig. 5 illustrating the position of the diaphragm under pressure. Fig. 6 is a detached view of the swivel-joint. Fig. 7 is a vertical section of the damper-shaft bearing employed in the construction of parts illustrated in Fig. 1. Fig. 8 is a transverse section of one of the dampers. Fig. 9 is a plan view of the shaft-bearing employed in the construction of parts shown in Fig. 2. Fig. 10 is one form of counterbalance-rods. Fig. 11 is a view in perspective of an

adjustable counterbalance-lever. Fig. 12 illustrates the bell-crank lever having a hub made integral therewith. Fig. 13 shows the bell-crank and the counterbalance-levers made integral with each other.

Letter A in Figs. 1, 4, and 5 in the drawings represents the cylinder with a hole in center of the top large enough to admit of the travel of the steel fulcrum-pin F to pass through it without touching the sides; also, it has a pair of lugs or ears on the top, with an inverted-V slot for the triangular pin in the large end of the lever to rest or bear upon; also, it has a flange on the bottom for the purpose of allowing bolts to pass through it, in order to secure the diaphragm between it and the bed-plate B, and to make a water-tight joint between the cylinder and bed-plate joint.

Letter B in Figs. 1 and 2 in the drawings represents the bed-plate, to which the cylinder A is bolted, with the diaphragm H in between, which forms a water-tight joint. It also has a hole in its center and near the outer edge of the flange on the cylinder A, when bolted on the bed-plate, to receive the standard or guide D. It also has a hole in the center of it which is to receive the pipe which admits the pressure from the boiler.

Letter C in Figs. 1 and 3 in the drawings represents the lever with a triangular pin in its larger end, which bears or rests in the inverted-V slot in the lugs or ears on the top of the cylinder A. It also has two holes in the smaller end, one of which is to admit the stud or swivel Y and the other one is to receive the connection end of the piston-rod of the dash-pot X to connect it with the lever. It also has an inverted-V bearing about one and a half inches from the triangular steel pin in its larger end for the bearing of the fulcrum-pin F.

Letter D in Figs. 1 and 2 is the standard or guide, which is securely bolted to the bed-plate B about two inches from the outer flange of the cylinder A when bolted down on the bed-plate B. It has a set-screw in its top for the purpose of regulating the extreme travel of the lever C; also, it has a bearing on which the lever rests when there is not sufficient pressure on the boiler to raise the lever; also, it prevents any undue pressure on the top of the diaphragm if the lever, with the weights upon it, from any cause should be let down suddenly.

Letter E in Figs. 1 and 2 represents the adjustable ball or weight, having a slot of sufficient width to receive the lever C with ease. It also has a lug or ear, in which is a set-screw to secure it at any desired point on the lever C.

Letter F in Figs. 1 and 4 represents the fulcrum-pin. It is made of steel, and sufficiently less in size in diameter than the hole in the top of the cylinder A, through which it passes, to allow of its free travel up and down without its coming in contact with the sides of the hole, as that would cause unnecessary friction. I fit the fulcrum-pin F in a hole in the top of the hub of the metallic plate I, to which the diaphragm H is bolted, making a close fit, with a shoulder for it to rest upon, so as not to make a bind, so it can easily be taken out when it is necessary to take the machine apart, and when the fulcrum-pin is set in the hole in the hub of the metallic plate I it acts the same as if the pin and plate were made solid and as one piece; and with the top of the fulcrum bearing on the notch in the lever C, with the pressure on the metallic plate, enables both the diaphragm and the diaphragm metallic plate to travel or move up and down perfectly level and even and avoids making a close fit of the fulcrum-pin F and the hole in the top of the cylinder A, thereby avoiding much friction. The top part of the fulcrum-pin is made in a wedge shape and brought to a nice bearing-edge, the lever C resting upon it.

Letter G in Figs. 1, 2, and 4 represents the pipe through which the pressure is applied from the boiler to the regulator. I put a siphon near where it is screwed to the machine, to keep water on the diaphragm, as steam would injure it.

Letter H in Figs. 4 and 5 in the drawings represents the diaphragm. I make it of a fabric called "stockinet," which is very elastic and somewhat similar to a material used for underwear, but is much thicker and stronger, weighing about a pound to the yard, and is not only covered on both sides with the best Para rubber, but the rubber is worked by hand into and through the meshes of the stockinet, and when finished and vulcanized it not only has the elasticity and flexibility required, but it also has the strength and durability of a rubber diaphragm made with cloth in its structure to add to its strength. It is from three-sixteenths of an inch to a quarter of an inch in thickness, and is secured firmly in between the flange of the cylinder A and the top of the bed-plate B with bolts. I also have three grooves in the top of the bed-plate, where the joint or bearing comes, and also three tongues (to fit into the grooves) in the bottom of the flange of the cylinder A, which hold the diaphragm firmly when the bolts are in place and screwed up, and prevent any amount of pressure upon the diaphragm from drawing it out of the packing-joint. I also have a hole in the center of the diaphragm, through which I put a screw-bolt to hold it firmly in the center of the metallic diaphragm-plate.

Letter I in Figs. 4 and 5 in the drawings represents the metallic diaphragm-plate, which I make of iron, and nearly an eighth of an inch less in diameter than the inner side of the cylinder A; but I do not confine myself to any exact size, but make it sufficiently less in size to prevent its rubbing or hitting the sides of the cylinder A in its travel up and down. The bottom where it rests on the diaphragm is convex, and it has a hole in its center, tapped in order to admit of a half-inch screw-bolt, which has an iron washer next its head, and a

rubber one between the iron one and the diaphragm, in order to make it water-pressure tight. The object of this screw-bolt is to keep the metallic diaphragm-plate in the center of the diaphragm, which prevents its outer edge from coming in contact with the cylinder A, thereby promoting unnecessary friction. It also has a hub on its top and in its center about an inch and a half in diameter and from three to four inches high, with a hole about three-quarters of an inch in diameter in its top, and from two to three inches deep, to admit of the bottom of the steel fulcrum-pin F going into it. I also have a recess or groove near its outer edge about three-quarters of an inch deep and about the same in width in the bottom of the metallic diaphragm-plate, with its outer edge about one-eighth of an inch from the extreme diameter of the plate, the outer edge of the plate not coming down as low as the lower face of the plate into about a half of an inch. The object of this recess or groove is to give room for the diaphragm H to stretch sufficient for it to travel up and down with the metallic plate, (which is not over from three-eighths to a half of an inch,) and by its coming against the face of the recess or groove prevents it from bursting from extreme pressure.

Letter J in Figs. 4 and 5 represents the diaphragm set-screw or bolt, which I make about an inch long and a half of an inch in diameter, and with an iron washer next its head and one of rubber under it. I put it in a hole in the center of the diaphragm H and screw it firmly to the diaphragm metallic plate I, which makes it water-pressure tight, also keeps the metallic plate in the center of the diaphragm, and keeps its place as it travels up and down.

Letter K in Figs. 1 and 8 represents the horizontal damper for a chimney or flue, which I make of No. 10 sheet-iron, being about an eighth of an inch thick, and is made in two equal parts, bolted together on opposite sides of the shaft, in order to have them balance each other when in any position.

Letter L in Figs. 2 and 8 represents the damper-studs, which I make of half-inch round iron, or larger, if required, and about eighteen inches long, with a thread cut its whole length, and pass them through the damper wings and shaft, with nuts on either side of the damper-wings, which makes the studs answer the place of bolts, and near the ends of the studs I have nuts with washers over them, in order to set out the braces M stiff and tight.

Letter M in Figs. 1, 2, and 8 represents the damper-braces, which I make of iron one and a quarter inch wide and about an eighth of an inch thick, but do not confine myself to any required thickness or width, with a hole in the middle to receive the studs; also a hole about one inch from either end to admit of a bolt, which passes through them and the damper K. The braces having been bent so as to let their ends lie flat on the damper-wings, and then bolted to the wings, and the nuts on the studs L set up firmly against the braces, the damper-wings are made firm, stiff, and rigid, and prevented from being warped by the heat or bending from their own weight. With the aid of the damper-studs L and the damper-braces M, I am enabled to construct my damper K with one-half the weight of iron I would have to without them, thereby saving the friction which would be caused by the extra weight of iron. I put from two to sixteen braces on a damper, as the case may require, and on very large dampers I put inside braces, making two braces on either side of the damper to each damper-stud.

Letter N in Figs. 1 and 7 represents the anti-friction-roller-box cover, which I make of cast-iron, with holes on either side large enough to admit of the damper-shaft to rest upon the rollers in the boxes, and also to revolve without touching the sides of the holes. The cover N being bolted down upon the roller-stand, and the roller-box being bricked firmly into the inside of the chimney and flush with the inside face, prevents the soot and dirt from getting upon the shaft and rollers, which would cause friction. The roller-box being flush with the face of the chimney, allows me to put washers on the shaft to keep the damper-wings from rubbing on the face of the chimney; also prevents the washers from rubbing on the sides of the rollers as the damper-shaft and washers turn, the shape of the roller-box being such as to allow of it, with the roller-stand being bricked firmly in the chimney, coming flush with the brick-work.

Letter O in Fig. 2 represents in the drawings a vertical damper for a flue where a damper in a horizontal position could not work, which I make and brace the same as a horizontal damper, with the exception of the lower end of the shaft, which is of the same length of the width or bottom of the wings of the damper.

Letter P in Figs. 2 and 3 in the drawings represents the steel bearing in the bottom of the shaft for the steel pin Q, which is inserted in a hole in the bottom or lower end of the damper-shaft, the hole being about seven-eighths of an inch in diameter and about one and a half inch deep. The bearing or center is not brought to a point, but is concave, is about a half of an inch thick, and is placed firmly in the bottom of the shaft.

Letter Q in Figs. 2 and 3 in the drawings represents a steel pin, which I use to support the lower end of a horizontal damper to rest upon and to revolve upon. I make it of round steel, about two inches long and from five-eighths to three-quarters of an inch in diameter, with a thread about a half of an inch long cut on its lower end in order to screw it into a flat bar of iron in its middle, the bar resting on the bottom of the flue with its ends firmly bricked into the sides of the flue. The top of the steel pin is turned up to a sharp prick-punch center, and being hardened allows

the hardened steel-pin bearing in the bottom of the damper-shaft to rest upon it and move with the least possible friction, and by being made as described prevents the ashes, soot, or dirt from getting on the bearing, thereby causing friction.

Letter R in Figs. 2 and 9 in the drawings represents the sheave, which is made in a circular shape with projections extending out four or five inches, in order to secure it in place; being made of iron, has five rollers of an inch and a half in diameter, more or less in number and size, as the case may require. The rollers being placed in a circular form, with space enough in the center of them to admit of the shaft passing through and turning without binding, allow the damper to open and close with very little friction on its several bearings, which is very necessary in order to insure of its perfect working. I also place a piece of pipe on the top of the sheave, (the sheave being bricked firmly on the top of the flue,) the pipe being sufficiently large to let the damper-shaft turn without rubbing or hitting it as it turns, thereby preventing any dirt getting down upon the rollers, which might cause undue friction or an unnecessary bind. I also use the sheave on the outside of chimneys for a bearing for horizontal damper-shafts, and also it keeps the shaft steady and prevents vibration, as the chimneys are sometimes four and five feet through their walls to the inner sides and require an outside bearing.

Letter S in Figs. 2 and 12 in the drawings represents the bell-crank, which is made of iron with the arms or levers at right angles in the usual form, and about nine inches long. I have a hub on either side of the journal-hole, which is about an inch and a half long and about the same in diameter and round, and they are for the purpose of putting the levers T T upon in any required position.

Letters T T in Figs. 1, 2, and 11 in the drawings represent the adjustable counterbalance-levers, which I make of iron with a set-screw on the hub to keep them in any required position. I make them from twelve to eighteen inches long, and place them (with the adjustable weights upon them) upon either the bell-crank hubs, which I use in order to work vertical dampers, and also upon horizontal damper-shafts to counterbalance the dampers against uneven drafts, which must be done in order that the damper-regulator may work with precision.

Letters U U in Figs. 1, 2, 10, 11, and 13 in the drawings represent the adjustable weights, which are of iron with holes through their centers to admit of the adjustable levers passing through them easily, and with a set-screw to retain them in any required position on the levers, in order to counterbalance the dampers in the flues or chimneys against unequal and uneven drafts.

Letter V in Fig. 13 in the drawings represents a counterbalance bell-crank, which is a combination of a bell-crank, together with adjustable weights and levers, which is of iron, cast all in one piece, and has, besides the bell-crank levers, one, two, three, or more levers with adjustable weights, which can be used in place of the separate adjustable levers and weights for the same purpose.

Letter W in Fig. 10 in the drawings represents stationary levers, cast solid on one hub, with adjustable weights, which can be used on a bell crank or on a horizontal damper-shaft, to counterbalance against unequal drafts in the flue or chimney in place of the adjustable levers and weights and for the same purpose.

Letter X in Figs. 1 and 2 in the drawings represents the dash-pot, which I make of a piece of iron pipe about two and a half feet long and three and a half or four inches in diameter, with a cap or plug on the lower end, and with a piston about a sixteenth of an inch less in diameter than the inner side of the cylinder, with a rod connecting the piston with the end of the lever of the damper-regulator, the dash-pot setting directly under the lever so as to avoid friction. I fill the dash-pot with water, oil, or any liquid I see fit, or I may use air for the piston to cushion on, and in that case I turn out the inner side of the cylinder or make it of some smooth metal; also turn the piston so as to make a good but not too close a fit, which answers the same purpose as the liquid in the cylinder. The object of the dash-pot is to overcome a constant vibration or a constant opening and shutting of a damper, caused by strong drafts and high winds in flues and chimneys, occurring much more frequently in large chimneys than in small ones, and where it does occur I have found no device which would prevent the vibration but the dash-pot, and without it an automatic damper-regulator is entirely useless where the vibration occurs.

Letter Y in Figs. 1, 2, and 6 in the drawings represents the stud or swivel, which is in the extreme end of the lever C, and used for the purpose of attaching the connection end on one end of the connecting-rod to the lever C. It is round at one end and passes through a hole in the end of the lever C sufficiently large so as to allow the stud or swivel Y to turn in it without binding, and has a nut on its end to keep it in place, but not set up, so as to make a bind on the lever C. The other end of the stud or swivel Y is flat, with a hole in its center to receive a bolt, which passes through a connection end, Z, which straddles the stud Y, which allows of a movement of the connecting-rod at any angle without making any bind or causing any undue friction.

I have thus described my various improvements in automatic damper and pressure regulators; also my improvements in the mode of making and setting the dampers in the flues and chimneys; also in the different attachments

of the regulator to the damper, both in a horizontal and vertical position; and also in my modes of counterbalancing against strong drafts and the advantages to be derived from them, which will plainly be seen on referring to my drawings, with the explanations, in the foregoing specification.

I am aware that accidents to water-mains, resulting from the too sudden closing of the main or governor valve, have been prevented by connecting a dash-pot with the valve-lever, and hence I make no claim to such construction and combination of parts. In my improvement a dash-pot is connected with a counterbalanced damper and an automatic steam-regulator for the purpose of preventing the vibrations of the damper.

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

1. A diaphragm for steam-damper regulators, said diaphragm consisting of stockinet fabric having its meshes or interstices filled and its opposite surfaces coated or covered with vulcanized rubber, substantially as set forth.

2. The combination, with the cylinder and yielding diaphragm, of the diaphragm-plate constructed of slightly less diameter than the cylinders and provided with an annular groove on its under face and located in close proximity to its outer edge, substantially as set forth.

3. The combination, with the cylinder, yielding diaphragm, and diaphragm-plate, the latter constructed of slightly less diameter than the cylinder, and fulcrum-pin connected with the diaphragm plate or disk and adapted to work loosely through an opening in the upper end of the cylinder, of a screw for attaching the diaphragm to the center of the diaphragm-plate and retaining the latter against lateral displacement, substantially as set forth.

4. The combination, with a counterbalanced damper and an automatic steam-regulator connected therewith, of a dash-pot for preventing the vibrations of the damper, substantially as set forth.

5. The combination, with the damper and the lever of the steam-regulator, of a dash-pot having its piston-rod connected to the long arm of the steam-regulator lever, substantially as set forth.

6. A damper made in sections located on opposite sides of the damper-shaft, and brace or truss rods or bars secured to the outer ends of the damper-sections, and devices for securing them to the inner ends of the damper-sections, substantially as set forth.

7. The combination, with the damper and damper-shaft, of damper-braces attached to the outer ends of the damper, and screw-threaded studs secured to the damper-shaft and central portions of said damper-braces, substantially as set forth.

8. The combination, with the damper-shaft, of a horizontal bearing-box provided with anti-friction rollers, substantially as set forth.

9. The combination, with the bell-crank having hubs formed integral therewith, of arms or levers adapted to fit on said hubs, set-screws for securing them in any desired rotary adjustment, and adjustable weights connected with said arms or levers, substantially as set forth.

10. The combination, with the damper-shaft, of a journal-bearing consisting of anti-friction rollers for supporting the shaft and a box or housing for inclosing the anti-friction rollers, said box or housing adapted to be secured within an opening or recess in the chimney, substantially as set forth.

WILLIAM NOYES.

Witnesses:
WM. S. ARCHIBALD,
GEO. B. MYER.