W. A. KITTS.

DRAFT REGULATOR FOR STEAM BOILERS.

APPLICATION FILED SEPT. 26, 1904.

903,729. **Patented Nov. 10, 1908.**

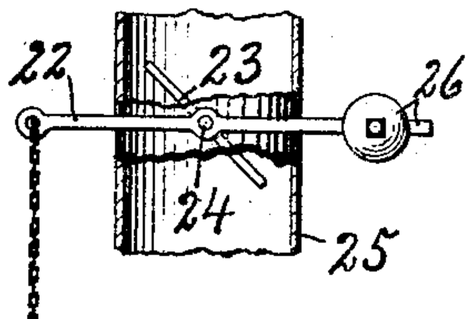


Fig. 1.

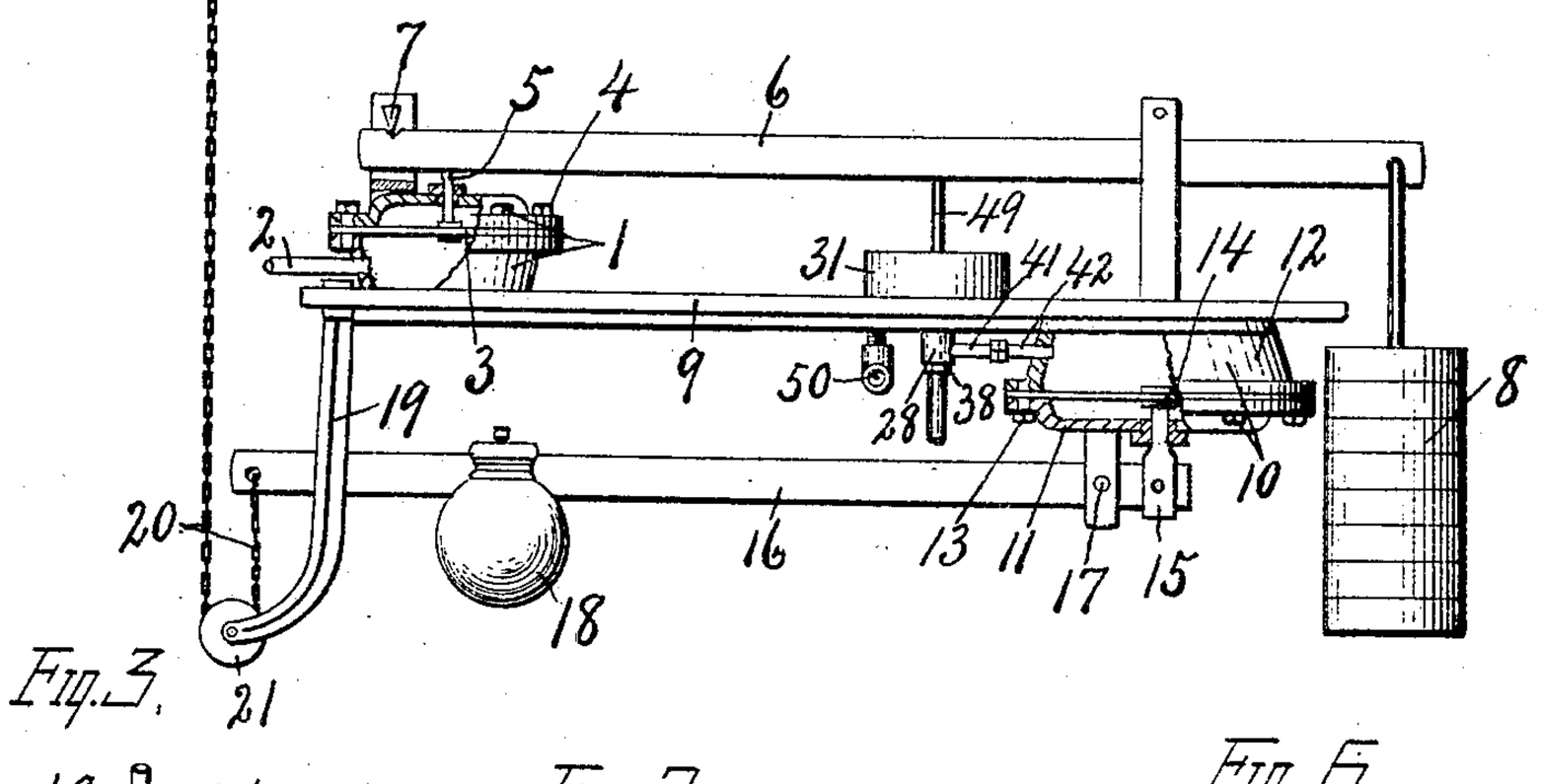


Fig. 3.

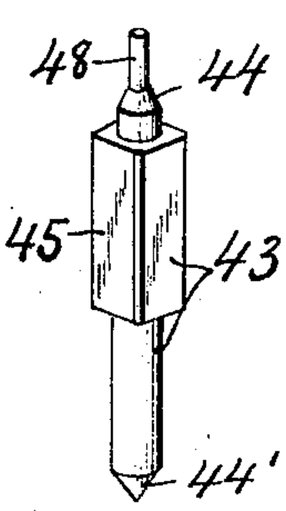
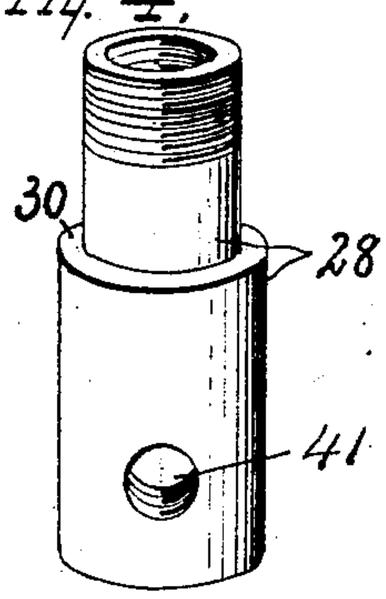


Fig. 4.



Witnesses,
C. Hieington
B. C. Robinson.

Fig. 2.

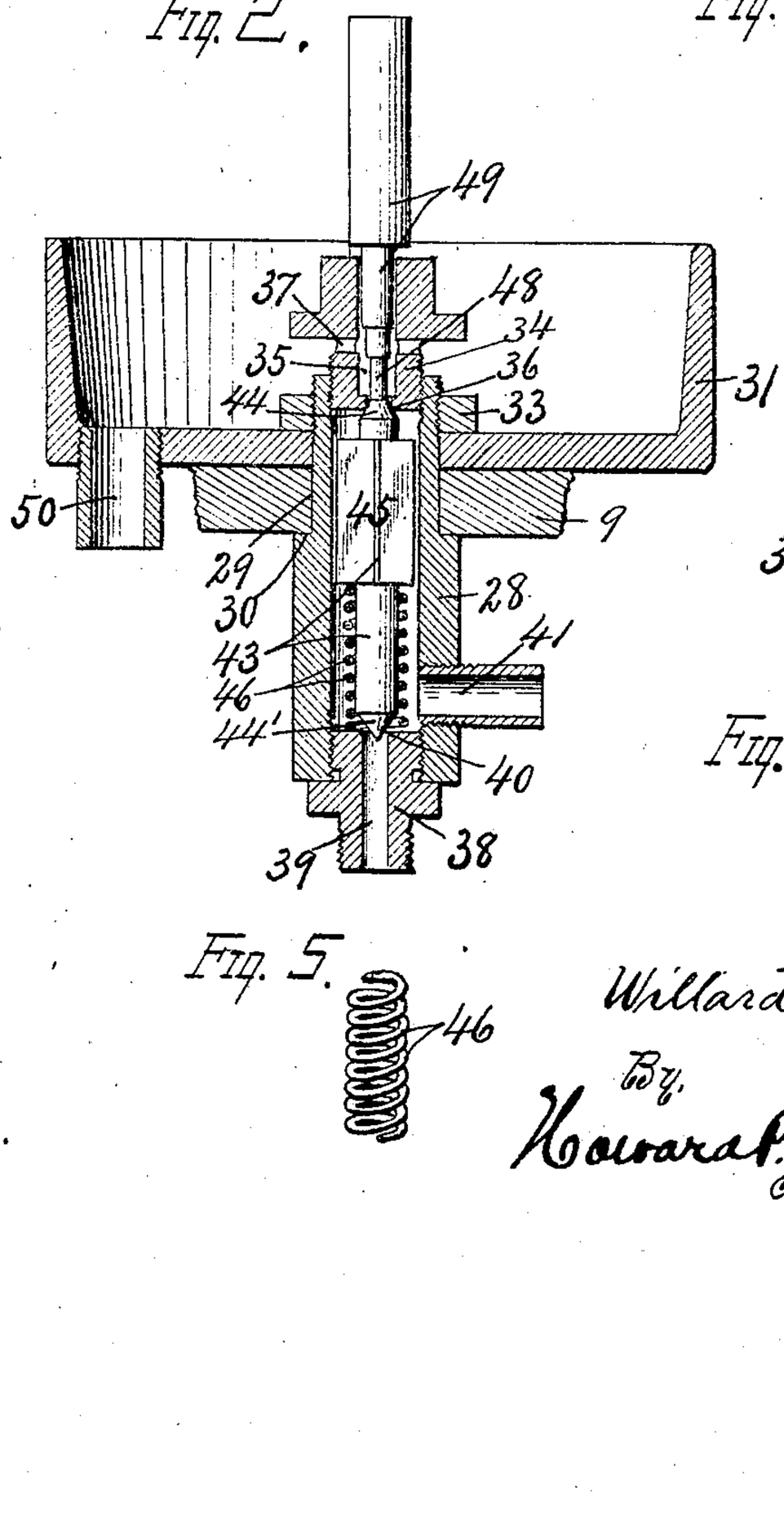


Fig. 5.

Fig. 6.

Fig. 7.

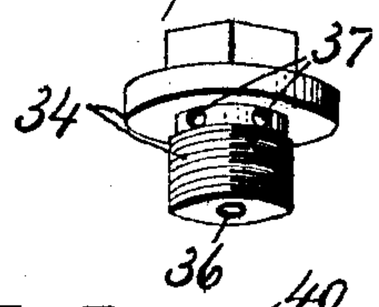
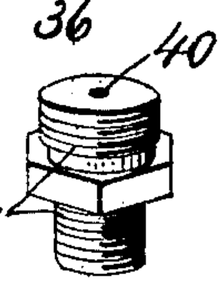


Fig. 8.



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UNITED STATES PATENT OFFICE.

WILLARD A. KITTS, OF OSWEGO, NEW YORK, ASSIGNOR TO KITTS MANUFACTURING COMPANY, OF OSWEGO, NEW YORK, A CORPORATION OF NEW YORK.

DRAFT-REGULATOR FOR STEAM-BOILERS.

No. 903,729. Specification of Letters Patent. Patented Nov. 10, 1908.

Application filed September 26, 1904. Serial No. 225,967.

To all whom it may concern:

Be it known that I, WILLARD A. KITTS, of Oswego, in the county of Oswego, in the State of New York, have invented new and useful Improvements in Draft-Regulators for Steam-Boilers, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to improvements in draft regulators for steam boilers in which the draft of a steam boiler is indirectly controlled by the rise and fall of the steam pressure in the boiler.

I am aware that dampers have been controlled automatically by steam pressure from the boiler through the medium of a diaphragm operable under the steam pressure from the boiler and connected to a suitable lever, which in turn, is connected to the draft regulating damper. I have discovered, however, that this form of damper and controller is slow in action owing to the gradual rise and fall of the steam pressure, and the object of my invention is to control the action of the damper directly by means of a constant fluid pressure, which in turn, is controlled by the steam pressure through the medium of a suitable valve for controlling the flow of the fluid. In other words, I have sought to provide means controlled by the steam pressure for moving the draft regulating damper positively from one extreme to the other as the steam pressure rises and falls above or below a predetermined degree.

In the drawings—Figure 1 is a side elevation of my invention shown as operatively connected to a draft regulating damper of a steam boiler. Fig. 2 is an enlarged sectional view of the valve chamber and valve for controlling the flow of fluid to and from the fluid reservoir. Figs. 3 and 4 are perspective views respectively of the valve and valve casing. Fig. 5 is a perspective view of the spring which operates the valve in one direction to open communication between the valve chamber and fluid reservoir. Fig. 6 is a perspective view of the valve operating stem. Figs. 7 and 8 are perspective views respectively of the caps for the upper and lower ends of the valve casing.

In carrying out the objects of my invention, I provide a suitable steam chamber —1— with a steam inlet pipe —2— and a movable diaphragm —3—. The steam chamber —1— is composed of lower and upper dish-shaped sections secured together face to face, by suitable clamping bolts —4— and the diaphragm —3— is secured between the meeting faces of the steam chamber sections and constitutes a flexible partition which divides the interior of the chamber —1— into lower and upper compartments, the inlet conduit —2— communicating with the lower compartment, as best seen in Fig. 1. This diaphragm is provided with a stem —5— which projects through a suitable aperture in the upper section of the chamber —1— and is engaged by a weighted lever —6— having one end fulcrumed at —7— at one side of the stem —5— and its other end connected to a suitable weight —8—.

The steam chamber —1— is mounted upon the top face and at one end of a suitable bed or plate —9—, and secured to the lower face of the opposite end of said plate is a fluid or water chamber —10—, which is composed of lower and upper sections —11— and —12— which are secured together face to face by suitable bolts —13—, and interposed between these sections is a flexible diaphragm —14— which divides the interior of the chamber —10— into upper and lower compartments.

The diaphragm —14— is provided with a depending stem —15— which projects through an aperture in the lower section —11— and is connected to one end of a lever —16—. This lever is fulcrumed at —17— at one side of the stem —15— and is provided with a weight —18— at the same side of the stem as the fulcrum —17—.

The weighted end of the lever —16— is guided in a bracket —19— and is connected to one end of a chain or cable —20— which is passed around a suitable idler —21— and has its opposite end connected to an arm —22— of a draft regulating damper —23—. This damper is pivoted at —24— in a suitable smoke conduit —25— of a steam boiler, not shown, and is moved to its open position as seen in Fig. 1, by a weighted arm —26—, which in this instance, forms a continuation of the arm —22—.

A valve casing —28— is inserted from the underside of and through an opening —29— in the plate —9— and is provided with a shoulder —30— which engages the lower face of said plate to limit the upward movement of the valve casing. The upper end of

this valve casing extends some distance above the upper face of the plate —9— and receives a reservoir —31— which rests upon the top face of the plate —9—. The upper end of the valve casing —28— is threaded exteriorly and is engaged by a nut —33— which also engages the bottom of the reservoir —31— and operates to clamp the valve casing and reservoir to the plate —9—. The upper and lower ends of the valve casing are also threaded interiorly, and in the upper end is adjustably mounted a screw-cap —34— having a central water-way —35— terminating at its lower end in the valve-seat —36— and having one or more branch passages —37— leading laterally through the sides of the main passage —35— and communicating with the interior of the reservoir —31—. A similar cap —38— is adjustably secured in the lower end of the valve casing —28— and is provided with a lengthwise passage —39— which terminates at its upper end in a valve-seat —40— and constitutes a water-inlet-passage which may be connected to any desired source of supply, not necessary to herein illustrate or describe—further than to state, that the water supply must be under a pressure sufficient to move the diaphragm —14— and damper which is connected thereto against the weight by which the damper is opened.

The valve casing —28— is provided with a laterally projecting nipple or water passage —41— which is located directly above the valve-seat —40— and is connected by a conduit —42— to the upper compartment of the chamber —10— or above the diaphragm —14—.

A valve stem —43— is movable vertically in the valve casing —28— and is provided at its upper and lower ends respectively with valves —44— and —44′—. The upper portion of the valve-stem is angular in cross section at —45— and constitutes a guide for centering the valves —44— and —44′— with their respective seats, and at the same time affording a water-passage between the valve stem and walls of the valve-casing —28— to permit the escape of water from the pipe —41— through the passage —35— and into the reservoir —31— when the valve —44— is opened. This valve-stem —43— is elevated by means of a spring —46— which surrounds the valve-stem and is interposed between the upper end of the cap —38— and the lower end of the angular portion —45— of the valve-stem, said spring serving to close the valve —44— against its seat —36— and at the same time to open the valve —44′— from its seat —40—, thereby establishing communication between the inlet passage —39— and branch passage —41— to the upper compartment of the water chamber —10—. This is the normal position of the valves when the steam pressure in the boiler is above a predetermined degree, and therefore, the water under a constant pressure is admitted through the passages —39— and —41— into the water chamber —10— thus filling the upper compartment of the chamber —10— and depressing the central portion of the diaphragm —14—. This action of the diaphragm depresses the adjacent end of the lever —16— and elevates its weighted end, which—through the chain connection —20—, operates to close the damper —23—, thereby shutting off the draft until the steam pressure in the boiler drops below the predetermined degree.

The valve —44— has an upwardly projecting reduced stem —48— which is smaller in diameter than the passage —35— and valve-seat —36—, but serves as an additional guide playing in the valve-seat —36— to center the valve —44—, but its main purpose is to form an abutment for a vertically movable stem —49— which is separate from, but has its lower end resting upon the upper end of the stem —48— while its upper end is engaged by the lower edge or face of the lever —6—. The lower end of this stem or plunger —49— is guided in the upper end of the passage —35— above the branch passages —37—, but is somewhat smaller in diameter than the portion of the passage —35— below the branch passages —37— so as to prevent the closing of the passages —35— and —37— when the plunger —49— is depressed in the act of unseating the valve 44.

The spring —46— is of sufficient tension to elevate the stem —43— to close the valve —44— against its seat —36—, but is compressed by the superior gravity of the weight —8— when the steam pressure in the chamber —1— is below the predetermined degree, or insufficient to elevate the weighted lever —6—.

In the operation of my device—assuming that the steam pressure in the chamber —1— is above the predetermined degree—say 75 pounds, and that the weighted lever —6— is slightly elevated to permit the spring —46— to close the valve —44— and that the draft regulating damper —23— is still open, as seen in Fig. 1—then the valve —44′— is open and the water under a certain pressure is permitted to pass through the passages —39— and —41— into the chamber —10—, thereby depressing the diaphragm —14— and elevating the weighted end of the lever —16— to close the damper —23—.

Now, when the steam in the chamber —1— falls below the predetermined pressure of 75 pounds, the pressure on the diaphragm —3— is relaxed and permits the weighted end of the lever —6— to drop, which in turn, causes the depression of the plunger —49— and valve stem —43— to open the valve —44— and to close the valve —44′— against

the action of the spring 46—. This opening of the valve —44— and closing of the valve —44′— cuts off communication between the passages —39— and 41—. This cuts off the pressure of the water upon the diaphragm 14 whereupon the weighted end of the lever —16— is permitted to drop to release the damper —23— and permit the weighted arm —26— to return it to its open position. At the same time that the weighted end of the lever 16— is depressed the diaphragm 14— is being elevated and the water in the chamber —10— is expelled from said chamber through the passage —41— into the valve casing —28— from which it escapes through the passages —35— and —37— into the reservoir —31— and is allowed to drain off through a conduit —50— in the bottom of the reservoir, said conduit being usually connected to a sewer or other waste-pipe.

The object of making the cap —34— adjustable is to vary the amount of opening of the valve —44′— so that when the water pressure is high and the feed more rapid the cap —34— may be screwed down to reduce the amount of opening of the valve —44′— and when the water pressure is low and the feed slower said cap may be unscrewed to move its seat —36— upward and thereby allow the valve —44′— to open a greater distance so that the feed to the chamber —12— will be kept substantially uniform and thereby maintain a uniform action of the lever —16—.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

In a damper draft regulator for steam boilers, the combination with the draft regulating damper of a boiler, and means to open the damper, of a steam receiving chamber having an inlet and a movable diaphragm operable by the steam pressure in said chamber, a weighted lever operatively connected to and actuated by said diaphragm, a second chamber constituting a water receiving chamber to receive water under pressure and having an inlet and a movable diaphragm operable under the pressure of the water in said water chamber, a common support for said steam receiving chamber and said water receiving chamber, a valve casing suspended from said support and a reservoir surrounding the upper end of said valve casing and mounted on said support, a weighted lever operatively connected at its one end to and actuated by the diaphragm in the said water chamber, a connection between the weighted end of said last named lever and the damper and disposed to close the latter when the weighted end of said lever is elevated, said valve casing being in communication with the said water receiving chamber, a valve seat in said casing below the point of communication with the receiving chamber, a valve seat in said casing above said point of communication, a valve in said valve casing for vertical movement therein and adapted to engage said seats to close communication respectively between the valve chamber and the reservoir and between the inlet of the valve chamber and the water receiving chamber, a spring adapted to hold the valve released from the lowermost seat and seated against the uppermost seat, a cap threaded into the upper end of said valve casing for regulating the amount of movement of said valve and having an axial port, and lateral ports establishing communication between the axial port and the reservoir, and a stem in said cap resting on the upper end of the valve and guided by said cap and having its upper end engaged by the first mentioned weighted lever.

In witness whereof I have hereunto set my hand on this 14th day of September 1904.

WILLARD A. KITTS.

Witnesses:
H. E. CHASE,
J. M. HAMMEKEN.