N. G. COPLEY.

DAMPER REGULATOR.

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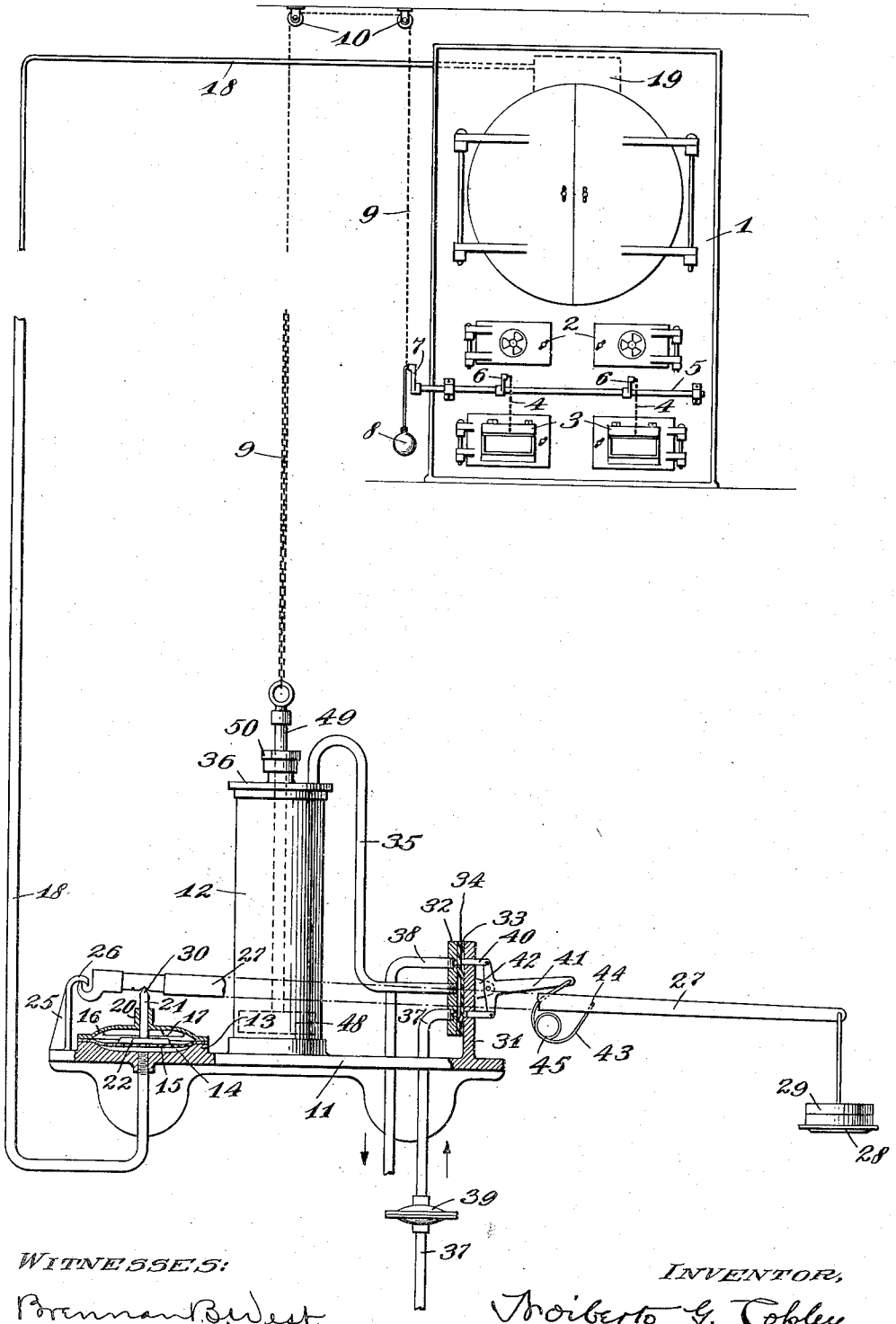
1,034,084. **Patented July 30, 1912.**



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DAMPER-REGULATOR.

1,034,084. Specification of Letters Patent. Patented July 30, 1912.

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To all whom it may concern:

Be it known that I, NOIBERTO G. COPLEY, a citizen of the United States, residing at Fostoria, in the county of Seneca and State of Ohio, have invented a certain new and useful Improvement in Damper-Regulators, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to automatic damper regulators for steam boilers whereby the amount of draft permitted to the fire is dependent upon the steam pressure, being increased as the pressure falls and decreased as the pressure increases. Devices of this type have long been in use in steam boilers used for heating systems, and to a limited extent in power plants, but the previous devices with which I am familiar have been unsatisfactory, either because of their too great complexity, their lack of sensitiveness, or their failure to operate.

The object of this invention is the provision of a device of the type mentioned of the very highest possible degree of sensitiveness and simplicity and of the smallest liability to get out of order or fail to operate as required.

Another object is to combine with the pressure-operated mechanism a pilot valve of effective type, which shall be positive in its action, and shall operate with a speed and certainty not dependent upon the rapidity of motion of the pressure operated mechanism.

Generally speaking, the invention may be defined as consisting of the combination of elements embodied in the claims hereto annexed and illustrated in the drawing forming part hereof, which illustrates a steam boiler of conventional type provided with my improved draft regulator. The regulator is shown in side elevation, with certain parts of it in section.

Describing the parts by reference characters, 1 indicates the front plate of a boiler-setting having fire doors 2 and draft dampers 3, the latter being hinged so as to be drawn upwardly by pulling the chains 4—4. Journaled upon this plate is a horizontal rock shaft 5 provided with arms 6—6 to which the chains 4—4 are attached and having at one end the actuating arm 7 to which is attached the weight 8 which tends to hold the shaft in a position allowing the draft dampers to remain closed. To this arm is also connected a chain 9 which passes over pulleys 10 and is connected with my regulator, which may be located at any convenient point in the engine room.

In the embodiment illustrated herein, my damper regulator comprises a base plate 11 having upon its upper surface a vertical cylinder 12 and an annular upwardly extending flange 13 defining a saucer shaped recess 14. A circular flexible diaphragm 15 of rubber, leather, thin metal, or other flexible material, is clamped upon the top of this flange by means of a dished cap 16, portions of said cap being cut away as at 17 to permit the pressure of the atmosphere to act upon the upper surface of the diaphragm. A U-shaped pipe 18 communicates with the recess 14 and is connected at its other end with the steam dome 19 of the boiler. The top of the cap is provided with a sleeve 20 in which is mounted the slidable stem 21, having at its lower end an enlarged head or plate 22 resting upon the diaphragm. Carried by the plate 11 is a bracket 25 to which is pivoted, as at 26, an elongated weight-arm 27 which carries at its farther end a pan 28 upon which are placed the weights 29. The upper end of the stem 21 is preferably beveled as at 30 and seated in a notch formed in the lower surface of the arm. Formed upon the upper surface of the plate 11 adjacent the arm 27 is a second bracket 31, which carries the pilot valve. This valve consists of a flat plate 32 secured to the side of the bracket 31 and spaced therefrom by means of a washer 33, and between said plate and washer a flexible diaphragm 34 is interposed. To the central portion of this plate is secured a pipe 35 communicating with the head 36 of the cylinder 12, and at each side of the pipe 35 other pipes 37 and 38 are attached. The pipe 37 is connected to a source of fluid pressure supply, such as a water main, a strainer 39 being preferably interposed therein, and the pipe 38 is employed as a waste. Slidably mounted in the bracket 31 opposite each of the pipes 37 and 38 is a slidable plunger 40, each of which is ar-

ticulated to one arm of a T-shaped lever 41 pivoted to an ear 42 formed on the outside of the bracket 31 between the plungers. To the elongated stem of this lever is connected one of the arms of a U-shaped or looped spring 43, the other arm of which is pivoted at 44 to the weight arm 27. This spring preferably has one or more complete loops 45 formed intermediately, as shown.

Inside the cylinder 12 is mounted the snugly fitting piston 48 secured to the end of a piston rod 49 which passes through a packing gland 50 carried by the cylinder head 36. The chain 9 is secured to the end of this piston rod in such a manner that when the piston is at the lowermost point of its travel, as illustrated, the dampers 3 are raised, and when the piston 48 is allowed to ascend the dampers are closed.

The operation of the device is as follows: The weights 29 are adjusted so as exactly to counterbalance the upward pressure upon the diaphragm 15 when the steam pressure is at the desired point. If now the steam pressure falls, the unbalanced effect of the weights 29 will cause the arm 27 to descend until it passes across the arm 41, at which time the spring 43 will be under maximum compression. As soon as the dead center is passed, the spring 43 will assert itself by throwing the arm 41 sharply upward into the position shown in the drawings, allowing the water or other fluid to enter from the pipe 37 to the pipe 35 and thence to the cylinder 12, depressing the piston 48 and opening the dampers. As soon as the steam pressure rises again to a point sufficient to overbalance the weights 29, the arm 27 is raised past the arm 41, whereupon the spring 43 throws the latter arm sharply downward, closing the communication between the pipe 37 and the pipe 35 and opening communication between pipes 35 and 38. The weight 8 now rocks the shaft 5, permitting the dampers to close and drawing the piston 48 toward the top of the cylinder, the fluid being discharged from the cylinder by way of pipes 35 and 38.

It will be seen that the rapidity with which the pilot valve is actuated depends entirely upon the spring 43 and not upon the rapidity of movement of the arm 27, thus insuring a quick and positive actuation of the dampers. Furthermore, both the pipes 37 and 38 cannot be open at the same time, since this would require that the arm 41 be held in its central position, which is totally impossible. In this way, leakage through the pilot valve and loss of water or other pressure fluid is prevented. The bent nature of the pipe 18 assures its being full of water at its lowest point, thus preventing the access of hot steam to the diaphragm, which would tend to deteriorate it.

While I have described my invention in detail, I do not propose to be limited to such details, except as the same may be positively included in the claims hereto annexed or may be rendered necessary by the prior state of the art.

Having thus described my invention, what I claim is:

1. A damper regulator for steam boilers comprising in combination, a cylinder having a piston therein adapted to be connected to a damper, a pilot valve having a pipe communicating with said cylinder, and having outlet and inlet pipes connected thereto, a weighted arm adapted to be raised and lowered upon variations in the steam pressure, valve members adapted to close said inlet pipe and open said outlet pipe or vice-versa, and a double acting spring operatively connecting said pilot valve members and said weighted arm.

2. In a device of the character described, the combination of a cylinder having a piston, a pipe connected to said cylinder for conducting actuating fluid to and from the same, a pilot valve with which said pipe communicates, inlet and outlet pipes communicating with said pilot valve, means for establishing communication between said first pipe and either of said last pipes and for simultaneously cutting off communication between said first pipe and the other of said last pipes, a member to be moved in reverse directions upon variations in the steam pressure above and below a predetermined point, and a double acting spring connecting said member and pilot valve for suddenly operating said valve in the proper direction upon variations in the steam pressure.

3. A damper regulator for steam boilers comprising in combination, a cylinder having a piston therein adapted to be connected to a damper, a pipe connected to said cylinder for conducting actuating fluid to and from the same, an inlet and a discharge pipe, valve members adapted to establish communication between said first pipe and either of said last pipes to the exclusion of the other of said last pipes, a tiltable lever having an arm connected to each of said valve members and having an extended operating arm, a member adapted to be moved past said arm upon variations in the steam pressure above a given point, a compression spring pivoted to said arm and said member and adapted to tilt said arm in the opposite direction from the direction of movement of said member.

4. A damper regulator for steam boilers comprising in combination, a cylinder having a piston therein adapted to be connected to a damper, a pipe connected to said cylinder for conducting actuating fluid to and from the same, an inlet and a discharge pipe, valve members adapted to establish com-

munication between said first pipe and either of said last pipes to the exclusion of the other of said last pipes, a tiltable lever having an arm connected to each of said valve members and having an extended operating arm, a diaphragm having one side in communication with the steam pressure, a weighted arm operatively connected to said diaphragm and adapted to be moved past said arm upon variations in the steam pressure above and below a given point, a compression spring pivoted to said arm and said member and adapted to tilt said arm in the opposite direction from the direction of movement of said member.

5. A damper regulator for steam boilers comprising, in combination, a cylinder having a piston therein adapted to be connected to a damper, a pipe connected to said cylinder for conducting actuating fluid to and from the same, an inlet and a discharge pipe, a valve member associated with each of said last pipes and adapted to establish communication between said first pipe and either of said last pipes to the exclusion of the other of said last pipes, a tiltable lever pivoted intermediate of said valve members and having an arm connected to each of said valve members and also having an operating arm, a member adapted to be moved past said operating arm upon variations in the steam pressure above and below a predetermined pressure, and a compression spring pivoted to said member and to said operating arm and adapted to tilt said arm in one direction or the other upon the movement of the pivotal points of said spring past each other.

6. A damper regulator for steam boilers comprising, in combination, a cylinder having a piston therein adapted to be connected to a damper, a pipe communicating with said cylinder for conducting actuating fluid to and from the same, a valve plate to which said pipe is connected, an inlet and a discharge pipe connected to said valve plate, a second valve plate spaced from said first plate and having slidable valve members projecting therethrough and adapted to close the mouths of either of said last mentioned pipes, a lever pivoted between said valve members and having an arm connected to each of the same whereby one valve member will be open when the other is closed, an operating arm carried by said lever, a member adapted to be moved past said operating arm upon a variation of the steam pressure above or below a predetermined pressure, and a spring connected to said member and to said operating arm and adapted to tilt said operating arm abruptly in one direction or the other and hold it firm in final position upon the movement of the anchorage points of the spring past their position of nearest approach to each other.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

NOIBERTO G. COPLEY.

Witnesses:
ALBERT H. BATES,
J. B. HULL.