

(No Model.)

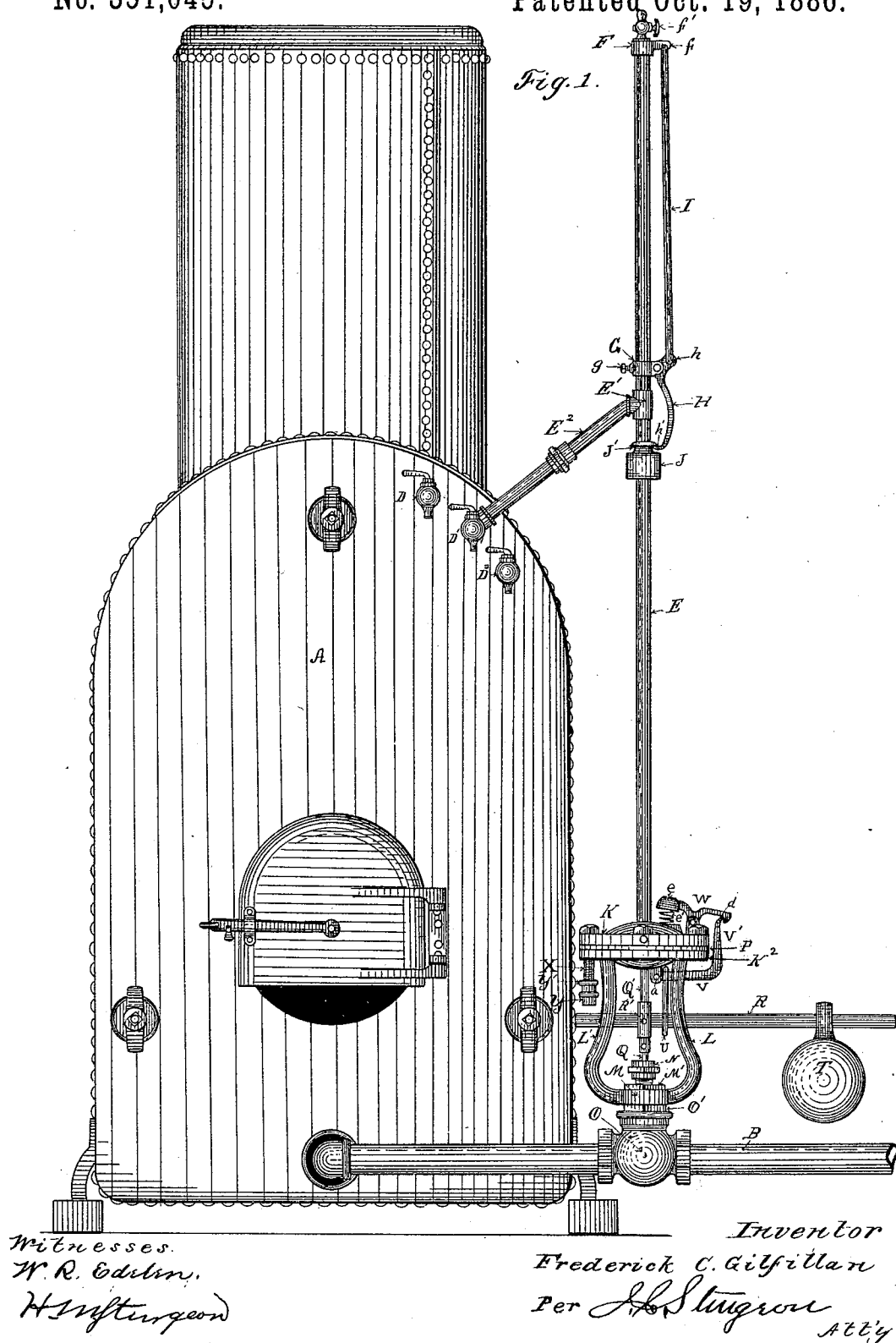
2 Sheets—Sheet 1.

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AUTOMATIC GAS FUEL REGULATOR.

No. 351,045.

Patented Oct. 19, 1886.



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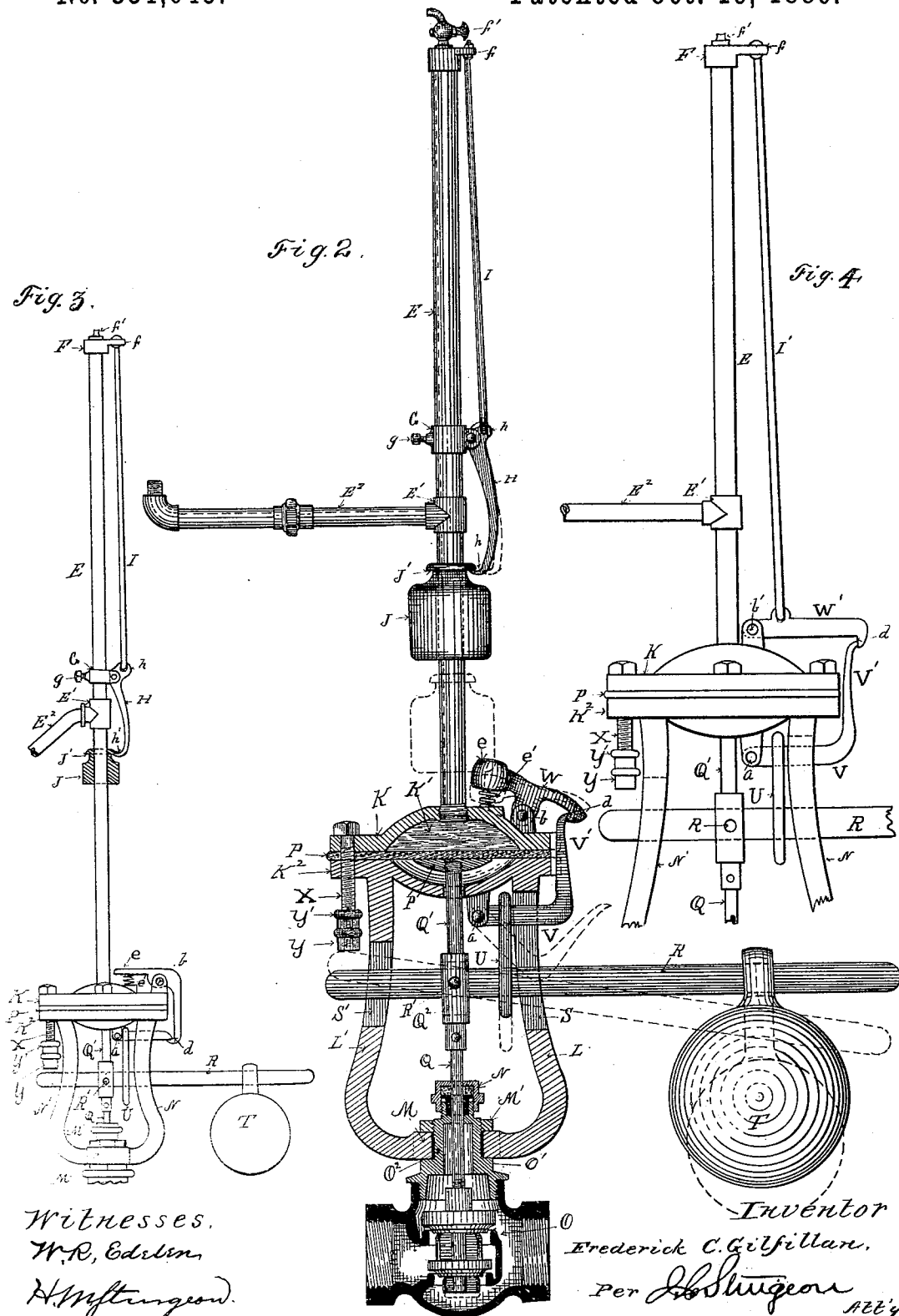
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UNITED STATES PATENT OFFICE.

FREDERIC C. GILFILLAN, OF DUKE CENTRE, PENNSYLVANIA.

AUTOMATIC GAS-FUEL REGULATOR.

SPECIFICATION forming part of Letters Patent No. 351,045, dated October 19, 1886.

Application filed April 26, 1886. Serial No. 200,386. (No model.)

To all whom it may concern:

Be it known that I, FREDERIC C. GILFILLAN, a citizen of the United States, residing at Duke Centre, in the county of McKean and State of Pennsylvania, have invented certain new and useful Improvements in Automatic Gas-Fuel Regulators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, forming part of this specification.

My invention relates to automatic gas-fuel regulators; and it consists in the improvements hereinafter set forth and explained.

My invention is illustrated in the accompanying drawings, in which Figure 1 is a view in elevation of my improved device, showing the same attached to a steam-boiler. Fig. 2 is a view of my device, showing the upper portion in elevation and the lower part in section. Fig. 3 is a view in elevation showing a modified construction of the same. Fig. 4 is a view in elevation showing another modification of the same.

Like letters refer to like parts in all the figures.

In the construction shown in Fig. 1 A is a steam-boiler, and B a pipe for supplying gas fuel to the boiler, and D D' D² are respectively the high, medium, and low water gage-cocks in the boiler, my regulator being adapted to be coupled to the boiler at or above the low-water line and the gas-fuel pipe B outside of the fire-box, substantially as and for the purpose hereinafter set forth.

In constructing my improved gas-fuel regulator, E is an upright pipe provided with a T, E', and a branch pipe, E², communicating with the boiler A at or near the low-water line.

On the upper end of the pipe E is a cap, F, provided with a lug, *f*, and a petcock, *f'*. Upon the section of the pipe E, above the T E', I place an adjustable collar, G, adapted to be secured in place by a set-screw, *g*, and hinged to the collar G is a bell-crank lever, H, one arm of which is hooked at *h*, and the other arm of which, *h'*, is connected to the lug *f* on the cap F by a wire, I. On the lower section of the pipe E, I place a hollow weight, J, which

is adapted to slide up and down on the pipe E. Around the upper end of the weight J is a groove, J', with which the hooked end *h'* of the bell-crank lever H engages, for supporting the weight J in the position shown in Figs. 1, 2, and 3.

The lower end of the pipe E is screwed into the cap K of a chamber, K', secured upon the top of an upright frame, L L', which is provided at its lower end with a collar, M, of suitable size to fit over the projecting portion O² of the valve-cap O', where it is secured by a nut, M', screwed on the projecting portion O² of the valve-cap O' above the collar M, so that the frame L L' may be turned around in any direction without disturbing the other mechanism. In the top of the valve-cap O', I place an ordinary valve-rod stuffing-box, N, through which the valve-rod Q operates.

The chamber K' is formed of the cap K and the flexible diaphragm P, secured between the cap K and the collar K² on the top of the upright frame L L', so that the space above the diaphragm P is water-tight.

The valve-stem Q of the valve O passes upward through the stuffing-box N, to where it is coupled to an extension thereof, Q', which extends upward through an opening in the center of the cap or collar K² to the lower side of the diaphragm P, where it is provided with a disk, P', which is secured thereto by a screw-thread, so as to be somewhat adjustable up and down, so as to keep the disk P' at all times in contact with the lower side of the diaphragm P. The extension Q' of the valve-stem is also provided, nearly midway of its length, with a slot or mortise, Q², through which a lever, R, passes, it being secured therein by a pintle, R'. This lever R also passes through slots or mortises S and S', in the upright frames L L', and is provided with a sliding weight, T. The lever R is fulcrumed in a stirrup or link, U, which is hung upon a bell-crank lever, V V', which operates in the slot S in the upright frame L, one arm, V, of the bell-crank lever V V' being pivoted to the under side of the cap or collar K² by means of a pintle, *a*, while the end of the arm V' engages with a hooked lever, W, pivoted near its center upon the cap K of the chamber K' by means of a pintle, *b*, one end of the lever W being provided with a hook, *d*, and the other with a

head, *e*, suitable to receive the impact of the weight *J*. A spiral spring, *e'*, is also placed under the head *e* to prevent the hook *d* from becoming detached from the arm *V'* of the bell-crank lever *V V'* without a blow from the weight *J*. Projecting downward from the cap or collar *K*², opposite the slot *S'* in the arm *L'* of the frame, is a stud-bolt, *X*, having thereon a screw-sleeve, *Y*, and check-nut *Y'*, adapted to be adjusted up or down to regulate the distance of the movement of the lever *R*, so that the valve can only be opened a certain distance, according to the adjustment up and down of the screw-sleeve *Y*. For example, if any of the connections or the diaphragm *P* should become disabled, the sleeve *Y* operates to limit the distance to which the valve *O* will open, the end of the lever *R* coming in contact therewith.

The valve *O*, (shown in section in Fig. 2,) which I use with my improved regulator, is a double-seated valve, nearly balanced, so that the pressure of the gas in the pipe has little or no effect upon its operation. However, I can use any form of plug or other valve merely by modifying the manner of connecting the diaphragm and lever mechanism thereto.

In Fig. 3 I show a modified form of the bell-crank lever *V V'*, and catch mechanism *W*, for supporting the stirrup or link *U*. The operation of this mechanism is, however, substantially the same as that described and shown in Figs. 1 and 2.

In Fig. 4 I show another modification of the lever mechanism for supporting the stirrup or link *U*. In this case the weight *J* and bell-crank-lever mechanism *H* (shown in Figs. 1, 2, and 3) are dispensed with, and the wire *I'* extends from the lug *f* on the cap *F* directly to the hooked lever *W'*, the back end of this lever being pivoted to the cap *K* at *b'*, near the upright pipe *E*, so that the wire *I'* connects the lever *W'* between the point *b'*, where it is pivoted to the cap *K*, and the hooked end thereof engaging with the arm *V'* of the bell-crank lever *V V'*.

The operation of my device is as follows: The branch pipe *E*² is coupled to the boiler at or above the low-water line, and the valve *O* is coupled into the gas-feed supply pipe outside of the boiler, substantially as illustrated in Fig. 1. The weight *T*, operating upon the valve *O*, opens it, allowing the gas fuel to enter the fire-box. When steam is generated to some extent in the boiler, the petcock *f'* is opened long enough to blow out the air from the pipe *E*, when it is closed, the water from the boiler then entirely filling the pipes *E*² and *E*, and also the chamber *K'* over the diaphragm *P*. As the steam in the boiler rises, the pressure is communicated through the column of water in the pipes *E*² and *E* to the diaphragm *P*, pressing it down upon the disk *P'* on the valve-stem *Q'*, which operates on the lever *R* to counterbalance the weight *T* and close the valve *O*. The weight *T* is then adjusted on the lever *R*, so as to keep the

valve *O* open sufficiently to furnish gas fuel enough to maintain the normal pressure of steam desired. The device then operates automatically to somewhat close the valve, thereby diminishing the supply of gas entering the fire-box when the pressure of steam rises above the amount normally required, thereby overcoming the weight *T*; and when the pressure of steam runs down below the normal amount required the weight *T* overcomes the pressure on the diaphragm *P* and opens the valve *O* wider, admitting an additional amount of gas to the fire-box. This regulation of the gas supply is therefore automatic and entirely governed by the pressure of the steam in the boiler acting upon the diaphragm *P* through the column of water in the pipes *E*² and *E*. When, however, the water in the boiler falls to the point where the pipe *E*² enters the boiler the water flows from the pipe *E*² and the pipe *E* above the *T E'*, and hot steam takes its place, and, acting to expand that part of the pipe *E* above the *T E'*, causes the wire *I* to withdraw the hook *h* of the bell-crank lever *H* from the catch *J'* on the weight *J*, allowing the weight *J* to fall upon the arm *e* of the lever-catch *W*, releasing the bell-crank lever *V V'*, allowing it to fall down, thereby removing the stirrup *U* and transferring the fulcrum of the lever *R* to the pintle *R'* on the valve-stem *Q'*, thereby reversing the action of the lever *R* on the valve *O*, as shown in the dotted lines in Fig. 2, so that the pressure of the column of water on the diaphragm *P* and the pressure of the lever *R* and weight *T* co-operate to close the valve *O*, completely shutting off the supply of gas entering the fire-box, and thereby putting out the fire, the valve *O* being kept securely closed by the co-operation of the pressure of the water on the diaphragm *P* and the weight of the lever *R* and its weight *T* on the valve until the parts have been rearranged by the engineer.

I have thus fully shown and described suitable mechanism for utilizing my invention, and also described the operation thereof, so as to enable others skilled in the art to which it appertains to construct and use the same. I am aware, however, that in the construction of my improved automatic gas-fuel regulator many modifications may be made both in the construction and in the arrangement of the parts thereof, which will readily suggest themselves to others skilled in the art to which my invention appertains and good results obtained therefrom. Therefore I do not desire to confine myself to the particular form or arrangement of the parts of the mechanism shown and described, as—

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In an automatic gas-fuel regulator, the combination of a pipe through which pressure is communicated to a diaphragm which acts upon a valve-stem with a lever and weight so fulcrumed as to act on said valve-stem against the pressure of the diaphragm to regu-

late the supply of gas passing the valve, and also co operate with the diaphragm in closing the valve for entirely shutting off the flow of gas, substantially as set forth.

5 2. In an automatic gas-fuel regulator, the combination of a pipe communicating with the water in a steam-boiler at the low-water line thereof, having an expansion-pipe connected therewith provided with lever mechanism for
10 sustaining a weight and dropping it when steam enters and expands said pipe, and a pipe communicating with a diaphragm-chamber, the diaphragm of which operates on the stem of a valve in the gas-fuel-supply pipe of said boiler,
15 with a lever mechanism connected to and actuating the valve against the pressure on the diaphragm, substantially as and for the purpose set forth.

3. In an automatic gas-fuel regulator, the
20 combination of a pipe communicating with the water in a steam-boiler and with a pressure-chamber having a diaphragm therein, and also with an expansion-pipe provided with lever mechanism for sustaining a weight and dropping
25 it when steam enters and expands said expansion-pipe, with the valve in the gas-fuel-supply pipe of the boiler, the stem of which valve is acted upon by said diaphragm to close the valve, and a lever and weight thereon
30 adapted to act upon said valve against the force exerted by the pressure on the diaphragm and coact with said diaphragm in regulating the supply of gas passing into the fire-box of the boiler, said lever and weight being provided
35 with a fulcrum so arranged as to be dropped down by the action of the steam on said expansion-pipe and the action of the lever and weight on the valve reversed, substantially as and for the purpose set forth.

4. In an automatic gas-fuel regulator, the
40 combination, with a lever and weight connected with the stem of a shut-off valve in a gas-supply pipe, of a removable fulcrum adapted to be dropped down, whereby the action of the lever
45 and weight upon the valve is reversed, substantially as and for the purpose set forth.

5. In an automatic gas-fuel regulator, the combination, with a water-pressure pipe com-

municating with the water in a steam-boiler and with a diaphragm-chamber, the diaphragm
50 of which is connected with the stem of the valve in the gas-fuel-supply pipe of said boiler, and an expansion-pipe and mechanism attached thereto for sustaining a weight and dropping it when the steam expands the pipe, of a lever
55 connected to the valve-stem, the fulcrum of which is suspended upon a lever held up by a catch adapted to be released by the dropping of said weight, substantially as and for the purpose set forth.

6. The combination, in an automatic gas-fuel regulator, of the pipes E² and E, the weight J, and lever mechanism I H, with the lever-catch W, lever V V', fulcrum-stirrup U, and lever R,
60 substantially as and for the purpose set forth.

7. The combination, in an automatic gas-fuel regulator, of the valve O, valve-stem Q Q', disk P' thereon, diaphragm P, and water-supply pipe E E², weight J, and mechanism, substantially as shown and described, for operating
70 said weight, with the lever R, connected to the valve-stem Q' at R', stirrup-fulcrum U, lever V V', and lever-catch W, substantially as and for the purpose set forth.

8. The combination, in an automatic gas-fuel
75 regulator, of the lever R, the removable fulcrum U, and the adjustable stop-sleeve Y with the valve-stem Q', substantially as and for the purpose set forth.

9. In an automatic gas-fuel regulator, the
80 combination of the diaphragm P, adapted to close the valve O by pressure thereon, with the lever R, the weight T, operating on the valve-rod Q to open the valve O against the pressure of the diaphragm P for regulating the flow
85 of gas, and the removable fulcrum U and its sustaining mechanism V V' W, adapted to drop the fulcrum U and reverse the action of the lever R upon the valve O, substantially as and for the purpose set forth.

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

FREDERIC C. GILFILLAN.

Witnesses:

F. A. SAWDEX,
H. J. CURTZE.