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HYDROCARBON BURNER.

No. 522,158. Patented June 26, 1894.

Fig. 2.

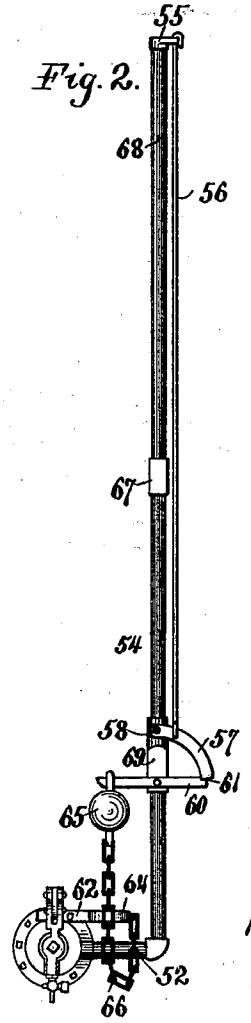


Fig. 1.

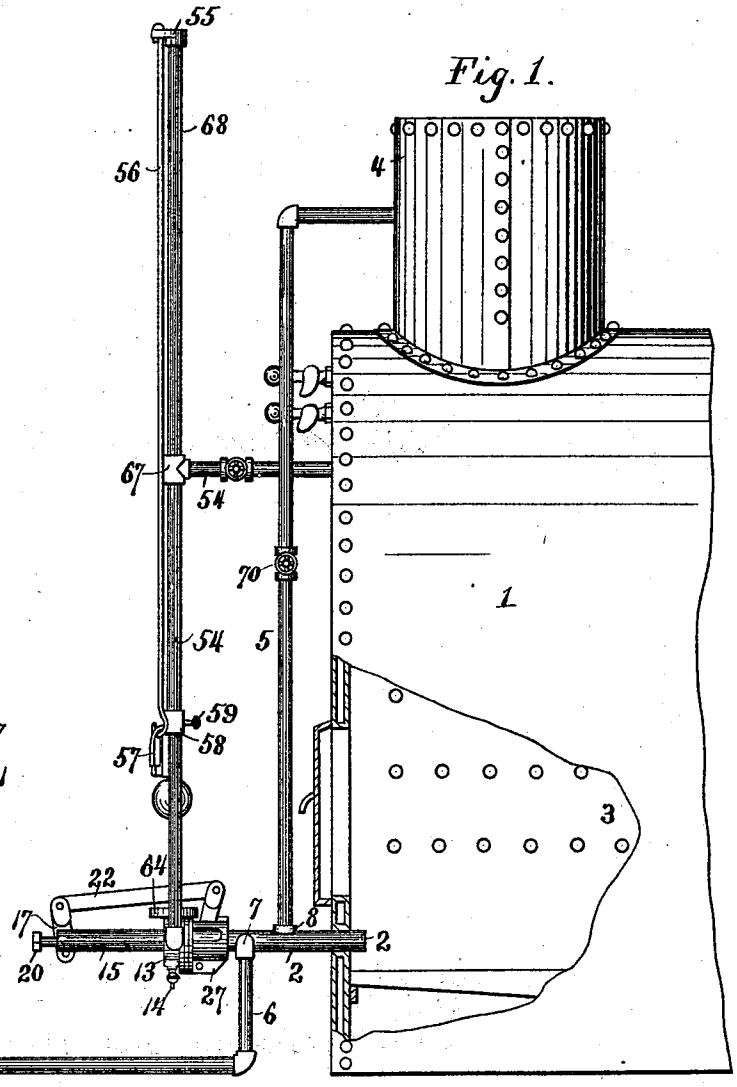
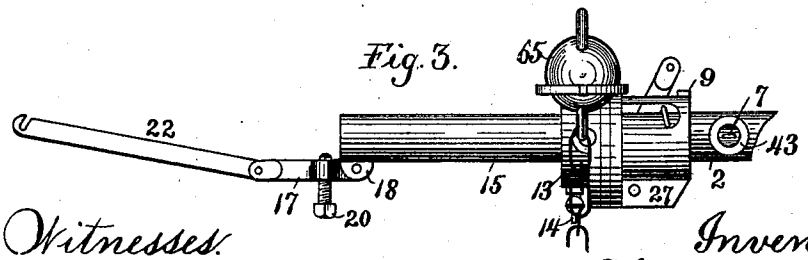


Fig. 3.



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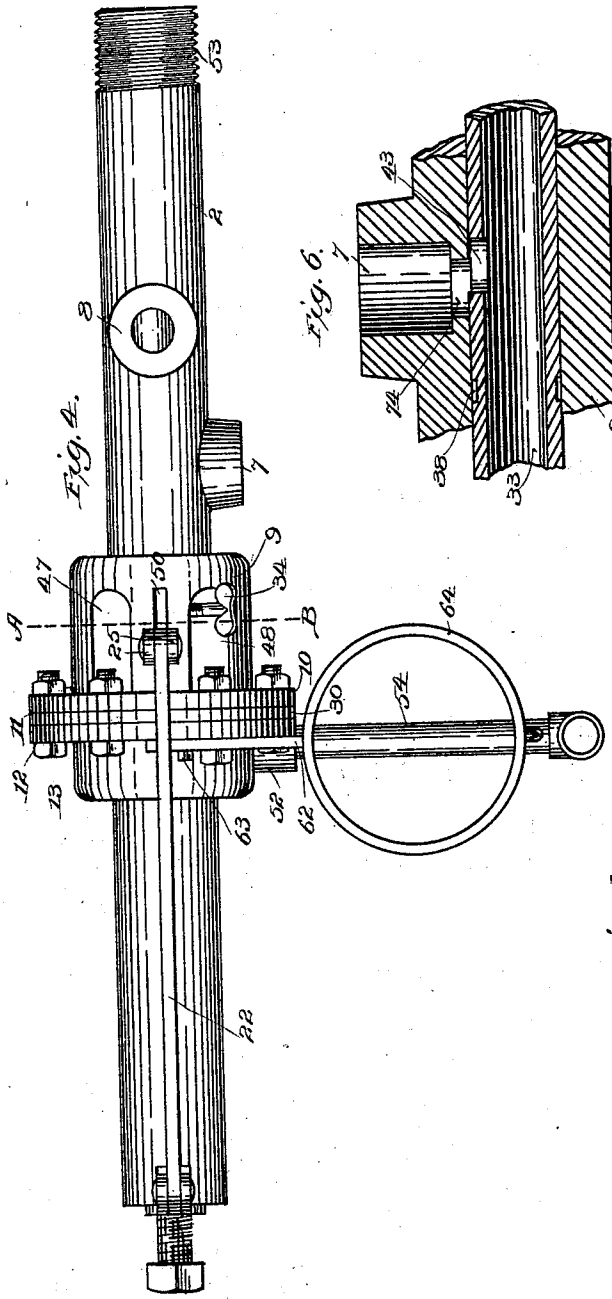

Fig. 4.

Fig. 6.

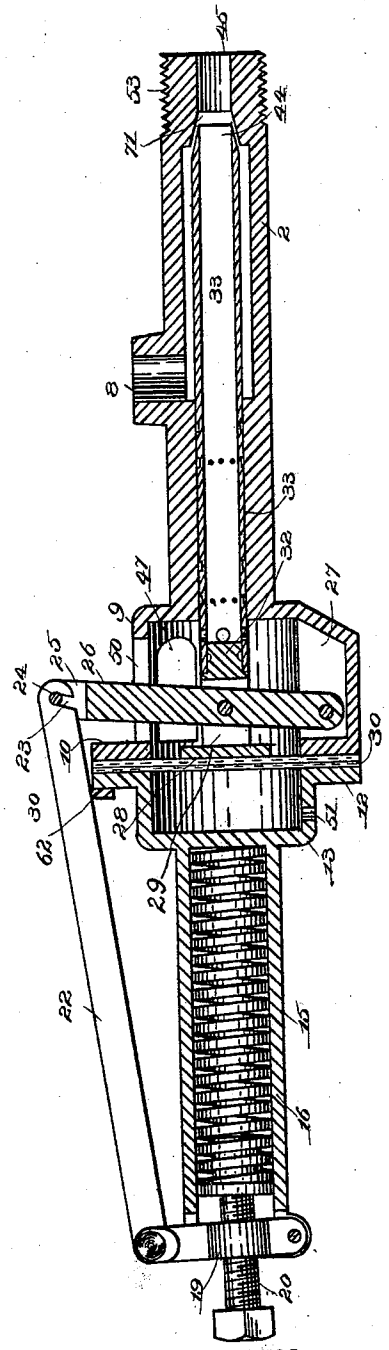

Fig. 5.

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Fig. 7.

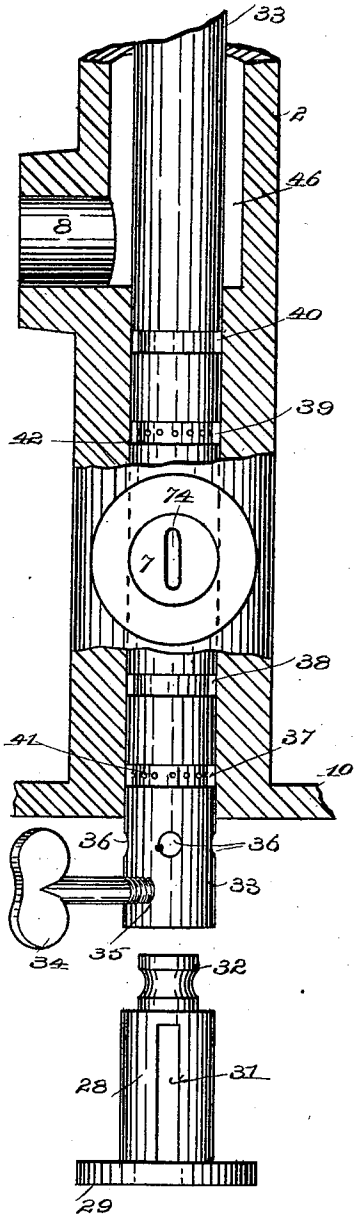

Fig. 8.

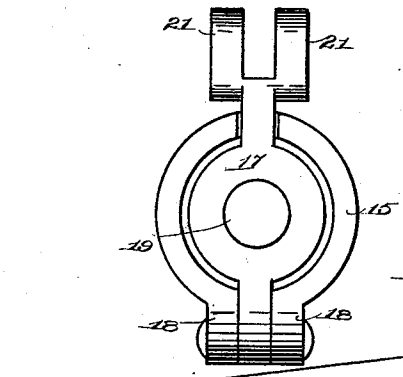

Fig. 9.

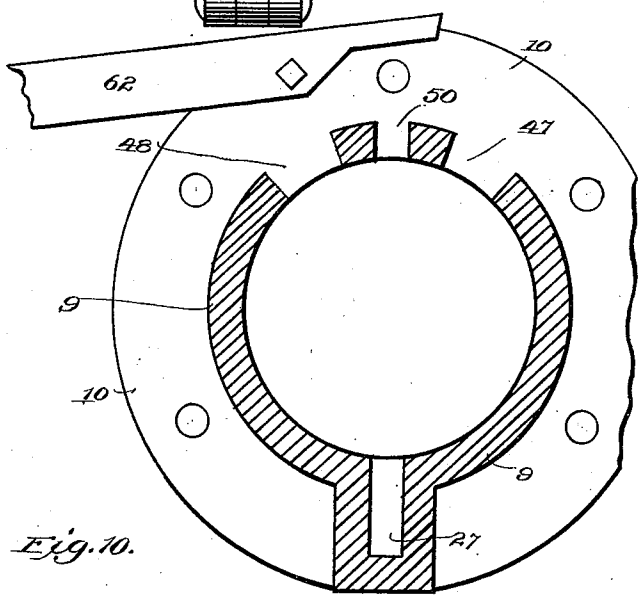

Fig. 10.

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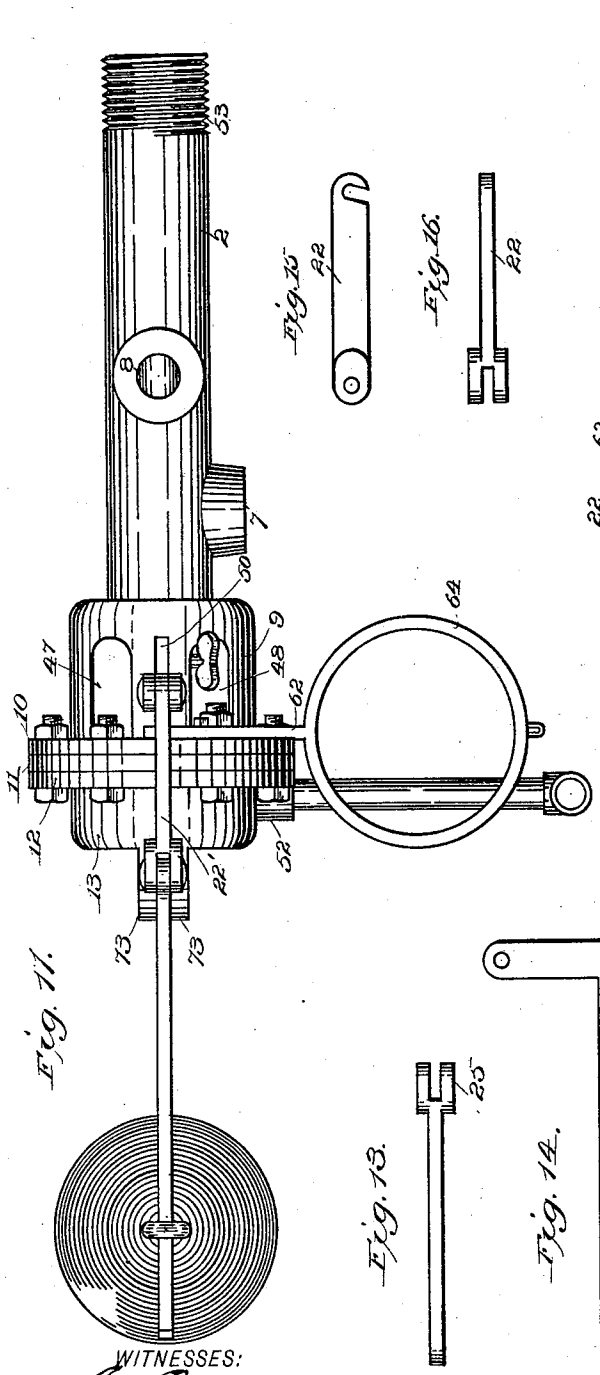

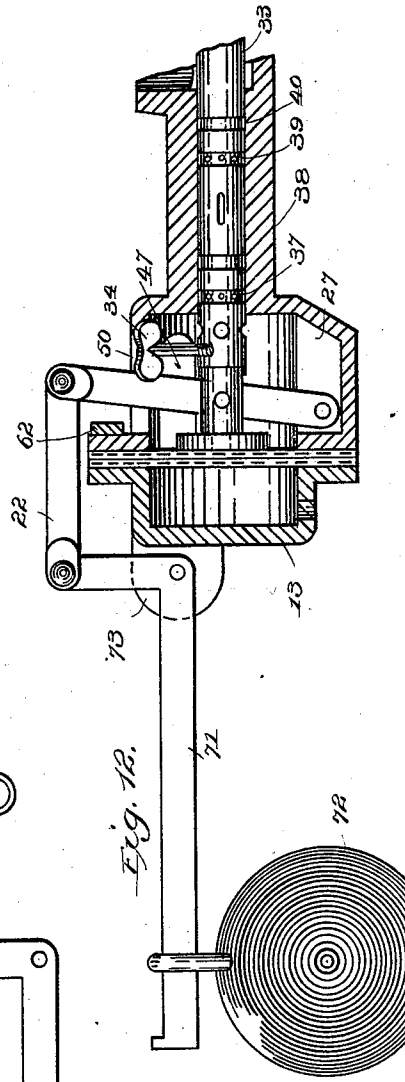

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UNITED STATES PATENT OFFICE.

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HYDROCARBON-BURNER.

SPECIFICATION forming part of Letters Patent No. 522,158, dated June 26, 1894.

Application filed July 27, 1893. Serial No. 481,664. (No model.)

To all whom it may concern:

Be it known that I, CHARLES S. EDMONDS, a citizen of the United States, residing at Bradford, in the county of McKean and State of Pennsylvania, have invented certain new and useful Improvements in Hydrocarbon-Burners, of which the following is a specification.

The objects of my invention are to provide a hydro-carbon burner that will automatically feed the air, steam and oil to the fire-box or furnace and that will also act as a low water indicator. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 represents a view of the hydro-carbon burner in working order, connected to a steam boiler. Fig. 2 represents a view of the rear end of the burner as shown in Fig. 1 together with the thermostatic pipe and its connection. Fig. 3 represents a view of a portion of the hydro-carbon burner as shown in Fig. 1, and shows the position of the weight and levers after the connecting bar has been released. Fig. 4 represents an enlarged top view of the hydro-carbon burner. Fig. 5 represents a cross-section of a side view of the hydro-carbon burner. Fig. 6 represents a longitudinal cross-sectional view of a portion of the nozzle through the recess in which the oil pipe is secured, and shows the elongated slots for the passage of the oil into the sliding tube partially closed in a longitudinal direction. Fig. 7 represents a cross-section of a portion of the nozzle and shows a side elevation of a portion of the sliding tube, and a top view of the diaphragm plunger. Fig. 8 represents an enlarged view of the rear end of the burner, provided with lugs, in which is pivotally secured the set-screw lever. Fig. 9 represents a cross-section view of the air chamber through the line A. B. of Fig. 4. Fig. 10 represents a view of the flanged plug which is used for compressing the spring. Fig. 11 represents a top view of the burner with a bent lever and weight, substituted in place of the spring, as shown in Figs. 1, 2, 3, 4, and 5. Fig. 12 represents a side view of a portion of the hydro-carbon burner as shown in Fig. 11, and shows the weight and levers, with a longitudinal cross-section of the diaphragm cup, diaphragm, air chamber and a portion of the nozzle, together with the sliding-tube, joined to the diaphragm plunger, and secured thereto by means of the thumb-screw. Fig. 13 represents a view of a side of the diaphragm-plunger lever, at right angles to that shown in Fig. 11. Fig. 14 represents a side view of the angle lever which supports the weight as shown in Figs. 10, and 11. Fig. 15 represents a side elevation of the bar that connects the angle-lever and the diaphragm-plunger lever. Fig. 16 represents a top view of Fig. 14.

Similar numerals refer to similar parts throughout the several views.

1 is the rear end of a steam boiler with the shell broken away and showing the nozzle 2 of the hydro-carbon-burner inserted in the fire-box 3. Connecting the nozzle 2 at the orifice 8 with the steam dome 4 is the pipe 5. The oil pipe 6 is also connected to the nozzle 2 at the recess 7. The recess 7 penetrates nearly through the shell of the nozzle 2 (see Fig. 6) the end of which is provided with the elongated slot 74 through which the oil passes.

9 is an air chamber fixedly secured to or integral with the nozzle 2, and provided with the flange 10.

Between the flange 10 and the flange 12 of the diaphragm cup 13, is secured the diaphragm 11.

14 is a pet-cock secured to the bottom of the diaphragm cup 13 for the purpose of draining said cup and its pipe connection from the water therein whenever it may be considered necessary.

15 is a tubular case fixedly secured to or integral with the diaphragm cup 13, in which is the spiral spring 16, (see Fig. 5.)

17 is a lever pivotally secured between the lugs 18 of the shell or case 15. It is provided with a disk-shaped center, in which is the screw-threaded orifice 19, (see Fig. 8,) for receiving the set-screw 20, and it is also provided with the lugs 21, at its upper end, in which the connecting bar 22 is pivotally secured, (see Figs. 1, 2, 3, 4, and 5.) The other end of the connecting bar 22 is provided with a slot 23, (see Fig. 5) for the purpose of engaging with the pin 24 in the lugs 25 of the

diaphragm-plunger lever 26. The lower end of the diaphragm-plunger lever 26 is pivoted in the recess 27 of the air-chamber 9.

28 is the diaphragm-plunger (see Fig. 7). It is provided with the flange 29 at one end which bears against the diaphragm 30, and the slot 31, through which the diaphragm-plunger lever 26 passes and to which it is pivotally secured. Its other end is provided with a pin 32, having an annular groove. The pin 32 enters into the sliding tube 33, and is there secured by means of the thumb-screw 34, as shown in Figs. 5 and 12.

The sliding-tube 33 is provided with a screw-threaded orifice 35 for receiving the thumb-screw 34, the air holes 36, and the external annular recesses 37, 38, 39, 40, the recesses 37, 39 being provided with the small orifices 41, 42, respectively. The object of the annular recesses 38 and 40 is to pack the sliding-tube 33 with a fluid packing, and the annular recesses 37 and 39 with their perforations is to permit the escape of the surplus fluid. Thus, under pressure the steam in the chamber 46, will work back into the annular recess 40 where it condenses and becomes a fluid packing. Any surplus that is forced to the annular recess 39 is drawn through the small orifices 42 by the draft of the burner. Should the oil work forward to the annular recess 39 the result is the same, but on moving back to the annular recess 38 it acts as a fluid packing and any surplus working back to the annular recess 37 is drawn by the draft of the burner into the sliding-tube 33. It is further provided with the longitudinal slot 43 and the end 44 which is tapered and fitted to make a tight joint, in the tapering end in the discharge orifice of the nozzle 2.

46 is an inner chamber in the nozzle 2, and 53 is an external thread for the purpose of making pipe connections so that the position of the burner can be changed if necessary, or the distance of the burner from the boiler can be adjusted to suit a more preferable location of the same.

47 and 48 are longitudinal openings in the air chamber 9, for the ingress of air which is fed through the air-holes 36 of the sliding-tube 33. The chamber 9 is also provided with the longitudinal slot 50, in which the diaphragm-plunger lever 26, works.

The diaphragm cup 13 is provided with the orifice 51 for receiving the pet-cock 14, also the internally screw-threaded boss 52 (see Figs. 4 and 11). A trip lever 62 is fulcrumed to the flange 12 by means of a bolt 63, and is provided at its outer end with a ring or cup 64, its inner end projecting under and bearing against the lower side of the connecting bar 22, (see Figs. 4 and 5.)

In the screw-threaded boss 52, is secured the thermostatic pipe connections 54 which are also connected from the T 67 to the steam-boiler 1 at one of the gage cock orifices. (Fig. 1 shows the lower gage cock orifice.)

Connected to the T 67, is the thermostatic pipe 68, on the upper end of which is the cap 55 which has the projecting lug to which is attached the rod 56. The lower end of the rod 56 being movably secured to the dog 57, which is pivotally secured to the sleeve 58, this latter is secured to the pipe 54 by means of the set-screw 59. The sleeve 58 is provided with a downwardly projecting extension 69 to which is fulcrumed the lever 60. The lever 60 is provided with a notch 61 in which the outer end of the dog 57 is fitted at its one end and at its other end a movable weight 65 is hung. A chain 66 attached to the weight 65, and the trip lever 62 insures the safety of the weight 65 from being lost, and also the operating of the trip lever 62, should the weight drop outside of the ring 64.

The operation of my hydro-carbon burner is as follows, it being connected up and attached to the boiler as shown in Fig. 1: The oil is furnished to the burner through the pipe 6 at its connecting recess 7 and passes through the elongated slots 74 and 43 into the sliding-tube 33. The amount of the flow of oil is regulated by revolving the sliding-tube 33 by means of the thumb-screw 34, which has its seat in the annular slot of the pin 32 and can be set at any point in its circumference (see Fig. 6), by moving the thumb-screw downward the elongated slot 43 can be partially closed or it can be moved entirely away from and thereby close the slot 74 so that no oil can pass into the sliding-tube 33. The sliding-tube has also a longitudinal movement, when the steam pressure on the diaphragm is exerted on the diaphragm-plunger. After the diaphragm-plunger has been relieved from the counter-balancing strain of the spring, the sliding-tube moves forward carrying the elongated slot 43 beyond the orifice 7, thereby preventing the further discharge of oil, and forcing the tapered end 43 into its seat in the discharge orifice 45, which prevents a further escape of the steam while the air holes 36 pass into the nozzle, thus shutting off the supply of the fuel to the boiler. Dry steam is fed to the burner through the pipe 5, from the steam dome 4 to the orifice 8, passing into the chamber 46 and discharging through the annular aperture 71, (see Fig. 5.) The air is fed through the sliding-tube air-holes 36 in the air chamber 9. Thus, the oil furnishes the carbon, the steam, the hydrogen, and the air the oxygen, which, when united in my hydro-carbon burner in their proper proportions, which is done by the correct adjustment of the sliding tube, makes a perfectly combustible hydro-carbon fuel. By manipulating the set-screw 20, the spring 16 can be made to exert any desired strain on the diaphragm plunger lever 26, and thereby equalize the steam pressure of the boiler on the diaphragm, which pressure is conveyed thereto by means of the water in the thermostatic pipe connections. Supposing that it is necessary to carry one hundred pounds of steam on the boiler, the spring must be com-

pressed by means of the set-screw to such an extent as to bring the diaphragm-plunger to bear against the diaphragm with force enough to draw the sliding tube away from its seat in the discharge orifice of the nozzle to such a distance, as to allow a continuous feed of hydro-carbon fuel in the fire-box or furnace, and in such a quantity as to create heat enough to keep the steam at the desired pressure, the amount of the flow of the oil as stated above, being regulated by the thumb-screw. If the water in the boiler becomes exhausted below the point at which the thermostatic pipe 68 is connected, then the said thermostatic pipe will become filled with steam at a high temperature, this causes a longitudinal expansion of the same, and thereby raises the rod 56 which also lifts the dog 57, this action disengages the lever 60 and it drops the weight 65 into the ring 64 causing the trip-lever 62 to disconnect the connecting bar 22 from the diaphragm-plunger lever 26, this relieves the diaphragm-plunger lever 26 strain of the spring, and the steam pressure of the diaphragm acting on it, compels it to move the sliding-tube longitudinally so as to close the oil, steam and air apertures as described above.

In Figs. 11 and 12, the burner is shown devoid of the tubular case 15 and the spring 16, the angle-lever 71 and the adjustable weight 72, being substituted therefor. With this construction, the shell of the diaphragm cup 13, is provided with the two lugs 73 in which the angle lever 71 is pivoted, and the connecting bar 22 is shortened.

In the oil regions where small stationary boilers are used, the weight and lever can be used to better advantage than the spring for counter-balancing the steam pressure of the diaphragm, as they can be made at a less cost than the spring and can be more readily adjusted, the boilers being stationary, the weight when placed in its position on the lever need not be disturbed, but when the burners are utilized on steam-boats, locomotives and portable boilers, then the spring only can be used.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. In a hydro-carbon burner, the combination of the burner-casing formed with the steam and oil inlets, the sliding-tube provided with the air-inlets working within said casing, a pressure diaphragm for projecting said sliding-tube, means for retaining the tube normally against the diaphragm, and a thermostatic device actuating said retaining device, substantially as and for the purpose set forth.

2. In a hydro-carbon burner, the combination of the burner-casing provided with the steam and oil inlets, the sliding-tube provided with the air-inlets, working in said casing to control the steam and oil inlets, a diaphragm also within the said casing, and suitable means for keeping the tube against the diaphragm consisting of a lever secured to the sliding-tube and pivoted within the casing, and connected with a second lever provided with a counter-balance and pivoted on the casing, substantially as shown and described.

3. In a hydro-carbon burner, the combination of the burner-casing formed with the steam and oil inlets, the diaphragm secured within the casing and the sliding-tube adapted to bear against the diaphragm and formed with the air-inlets and the slot through which the oil passes into the tube, substantially as shown and described.

4. In a hydro-carbon burner, the combination of the burner-casing provided with the steam and oil inlets, the diaphragm secured within the casing and the sliding-tube provided with the air-inlets and the series of annular recesses into which the fluid passes to serve as a packing for the tube, substantially as and for the purpose set forth.

5. In a hydro-carbon burner, the combination of the burner-casing, provided with the steam and oil inlets, the diaphragm mounted within the casing, and the sliding-tube adapted to bear against the diaphragm and provided with the series of annular recesses, into which the fluid passes to serve as a packing for the tube, and openings in some of said recesses through which any surplus fluid passes, substantially as shown and described.

6. In a hydro-carbon burner, the combination of the burner-casing, provided with the steam and oil inlets, the sliding-tube provided with the air and oil openings, working within the casing, and suitable means for turning the tube to regulate the supply of oil to the burner and the diaphragm against which the tube bears for moving the same longitudinally, substantially as shown and described.

7. In a hydro-carbon burner, the combination of the burner-casing, formed with the steam and oil inlets, the sliding tube formed with the air and oil inlets and provided with the diaphragm plunger working in said casing, said plunger having an annular groove formed on it and a thumb-screw passing through the sliding tube and engaging the annular groove whereby the said sliding tube may be turned to regulate the supply of oil, substantially as shown and described.

8. In combination with a steam-boiler, having a fuel supply, a safety device connected to the boiler and fuel supply to regulate the said supply, consisting of the thermostatic pipe 54, the rod 56, dog 57, lever 60 carrying a counter-balance and the lever 62 normally in engagement with the device actuating the fuel-supply, whereby an expansion in the thermostatic pipe will cause the counter-balance to fall upon the lever 62 releasing the device controlling the fuel supply and thus close the said fuel-supply, substantially as shown and described.

9. In a hydro-carbon burner, the combina-

tion of the burner-casing formed with the steam and oil inlets, a web in said oil inlet formed with an elongated slot, and a sliding tube in said burner-casing provided with an air-inlet and an elongated slot forming an oil opening and adapted normally to register with the slot in the web, and suitable means for adjusting the slot in the tube relatively to the slot in the web for regulating the supply of oil, substantially as and for the purposes set forth.

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