No. 676,518. Patented June 18, 1901.

A. C. STEWART.

AUTOMATIC HYDROCARBON BURNER REGULATOR.

(Application filed July 11, 1900.)

(No Model.)

Fig. I.

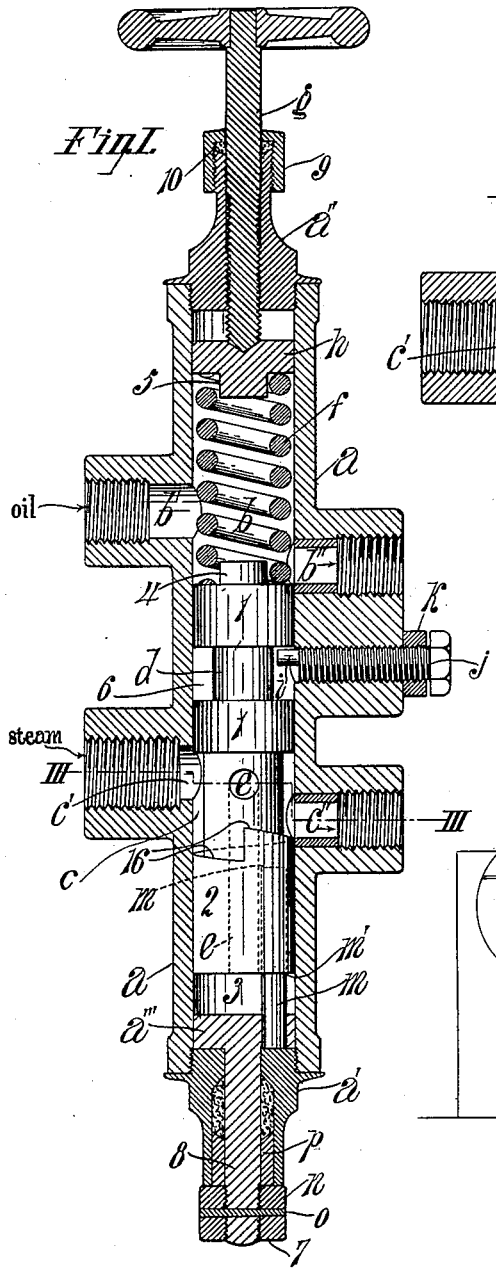


Fig. III.

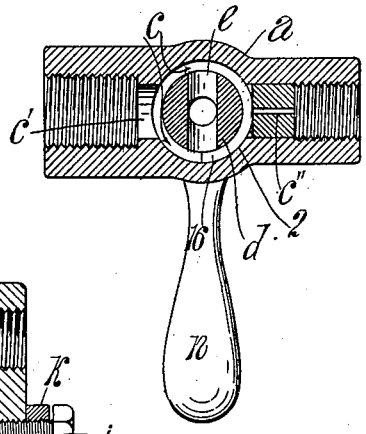


Fig. II.

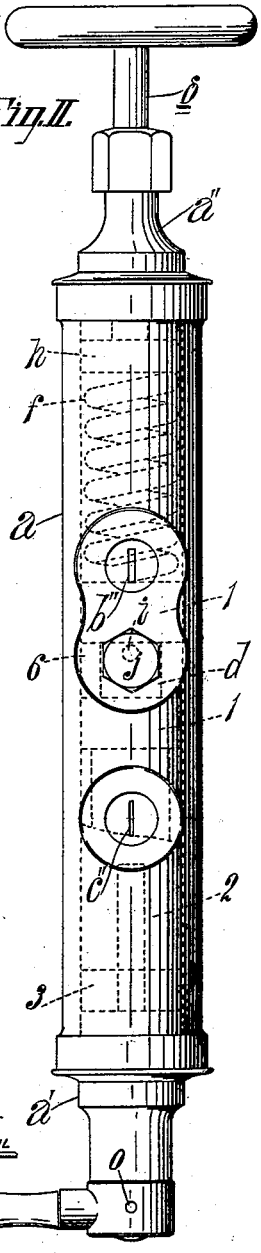
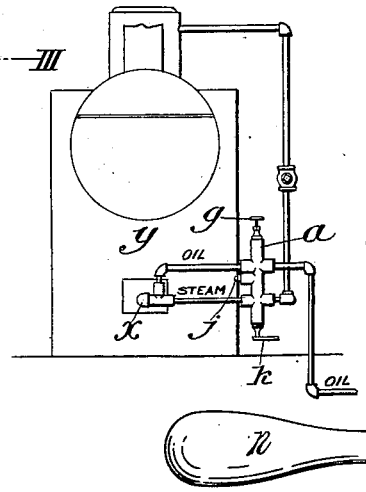


Fig. IV.



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UNITED STATES PATENT OFFICE.

ALFRED C. STEWART, OF SANTA PAULA, CALIFORNIA.

AUTOMATIC HYDROCARBON-BURNER REGULATOR.

SPECIFICATION forming part of Letters Patent No. 676,518, dated June 18, 1901.

Application filed July 11, 1900. Serial No. 23,243. (No model.)

To all whom it may concern:

Be it known that I, ALFRED C. STEWART, a citizen of the United States, residing at Santa Paula, in the county of Ventura and State of California, have invented a new and useful Automatic Hydrocarbon-Burner Regulator, of which the following is a specification.

My invention is designed for use with hydrocarbon-burners which employ a fluid under pressure for the purpose of supplying the oil to the furnace. The fluid ordinarily used is steam, and my invention is more particularly designed for the automatic regulation of the fire in the furnace by the pressure of the steam in the boiler, so that when a large amount of steam is taken from the boiler and the pressure of the boiler thereby decreased the fire will be automatically increased in order to supply a greater quantity of steam, and thereby maintain the required boiler-pressure, and vice versa.

In carrying out my invention it is desirable that a gage be provided by means of which the minimum amount of fire which will be maintained at the highest steam-pressure will be determined. It is necessary that the fire shall not become automatically extinguished when the steam rises above the required pressure, and I have provided means for adjusting the device for supplying the minimum amount of feed which will be maintained by the regulator, so that a minimum fire of any desired size may be maintained regardless of the steam-pressure.

Another object of my invention is to adjust the regulator to more or less sensitive action under the steam-pressure.

Another object is to provide adjustment for the steam-feed relative to the oil-feed.

The accompanying drawings illustrate my invention.

Figure I is an axial section of my newly-invented hydrocarbon-burner regulator cutting through the oil-passage, oil-inlet, and oil-outlet, the steam-passage, steam-inlet, and steam-outlet, and the adjusting appliances, but showing the piston and the minimum fire-gaging stop intact. Fig. II is an elevation from the right of Fig. I. Fig. III is a section on the irregular line III III, Fig. I. Fig. IV is a view showing the appliance in use with an oil-burner in a furnace.

a indicates a cylinder having an oil-passage *b*, with inlet *b'* and outlet *b''*, a steam-passage *c*, with steam-inlet *c'* and steam-outlet *c''*, a regulating-piston *d* in said cylinder provided with two heads—viz., an oil-gaging head 1 between the oil-passage *b* and the steam-passage *c* to play in the oil-passage and across the oil-outlet *b''* to regulate the flow of oil through such outlet, and a steam-gaging head 2 on the opposite side of the steam-passage *c* to play in the steam-passage and across the steam-outlet *c''* to regulate the flow of steam. Means are provided for admitting the steam to the end of the steam-gaging head 2, opposite the steam-passage *c*, and yielding means are provided for throwing the piston against the steam-pressure. Various means may be provided for introducing the steam-boiler pressure to that end of the head which is opposite the steam-passage *c*. In the drawings I have shown a steam-duct *e* passing from the steam-passage *c* into the space 3 between the steam-head *a'* of the cylinder *a* and the steam-head 2 of the piston *d*. The resilient means for throwing the piston against the pressure of the steam in the steam-space 3 is preferably a spiral spring *f* and the tension thereof is made adjustable by means of a tension-screw *g*, which screws through the oil-head *a''* of the cylinder and engages a follower *h*, which slides in the cylinder to press upon the end of the coil-spring *f* to force it against the piston *d*.

4 5 indicate centering-bosses on the piston *d* and the follower *h* for holding the coil-spring *f* centrally of the cylinder to avoid contact of the spring with the cylinder and consequent friction.

6 indicates a gain in the oil-head 1 of the piston to receive a stop-pin *i*, which projects eccentrically from a screw *j*, which screws through the cylinder to bring the pin *i* into appropriate position for limiting the movement of the piston relative to the oil and steam outlets *b'' c''*. By turning the screw *j* the eccentric-stop *i* will be thrown farther away from or nearer to the oil-outlet *b''*.

k indicates a set-nut for locking the screw *j* in any given position. In the drawings the screw *j* is shown set to hold the stop-pin *i* in position for allowing a very small minimum of oil to pass through the oil-outlet *b''*. By

turning the screw the minimum oil flow may be increased and decreased as desired.

The pressure of the spring *f* will normally throw the piston *d* from across the oil-outlet *b''* and at the same time throws the head 2 to open the steam-outlet *c''*. When the steam-pressure in the steam-space 3 becomes sufficient to overcome the pressure of the spring *f*, the piston will be thrown to close both the steam and oil outlets to a greater or less extent, depending upon the excess of pressure in the steam-space 3. When the steam-pressure is insufficient to overcome the pressure of the spring *f*, the oil-passage *b* will be opened to its fullest extent. It is desirable that the proportion of steam which will be supplied to the burner for a given amount of oil may be varied, and for this purpose the face of the piston-head 2, which forms one wall of the steam-passage *c*, is graduated and means are provided for turning the piston in the cylinder so that the graduated face 16 of the steam-head 2 of the piston will normally close or open the outlet to the desired extent.

m indicates a pin eccentrically carried by a rotary member *a'''*, mounted in the steam-head *a'* of the cylinder. The rotary member *a'''* is rotatable by means of a handle *n*, which is screwed upon the stem 7 of the member *a'''* and is fastened by a pin *o*.

p indicates a packing-follower in the steam-head *a'* for compressing the packing *q* in the steam-head *a'*. The screw-threaded eye 7 of the handle *n* is screwed upon the stem 8 of the member *a'''* to press the packing-follower *p* home and hold it in position. The pin *o* prevents the handle from unscrewing and allows the attendant to turn the piston to bring the appropriate part of the graduated face 16 into position for determining the size of the outlet through which the steam is to pass, and consequently the flow of steam relative to that of the oil.

The steam-face 16 of the piston-head 2 may be of any suitable form. In the drawings I have shown it formed in a regular spiral, the pitch of the spiral being equal to the length of the steam-outlet. The steam and oil outlets *b''* and *c''* are preferably oblong, having the greatest length extending along the cylinder, so that the movement of the piston along the cylinder for a given distance will increase or decrease the outlets in exact proportion to the length of the movement of the piston.

9 indicates a gland, and 10 indicates a packing around the tension-screw *g*.

When the burner is in operation, the engineer or attendant will turn the piston *d* by means of the handle *n* to cause the graduated face or cut-off end of the piston-head 2 to open or close the outlet *c''* more or less, as may be required, to allow the steam to flow through to produce the fire desired with a given quantity of oil flowing through the outlet *b''*. The regulator will thus be set for the maximum fire required. When the quantity of steam used is decreased and the boiler-pressure rises, the steam-pressure in the steam-space 3 will force the piston *d* to overcome the resistance of the spring *f*, and the piston-heads will thus be made to slide in the steam and oil passages, respectively, to diminish the flow of oil through such passages. The action of the device will thus cause the requisite fire to be maintained for producing the steam-pressure required.

The device can be made more or less sensitive to the action of the steam by turning the tension-screw *g* to increase or diminish the tension of the spring *f*.

In Fig. IV, *x* indicates a hydrocarbon-burner connected with the regulator and applied to a furnace *y*.

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

1. A hydrocarbon-burner regulator comprising a cylinder having an oil-passage with inlet and outlet, and a steam-passage with inlet and outlet; a regulating-piston playing in said cylinder and furnished with two heads, viz: an oil-gaging head at one side of the steam-passage and between the oil-passage and steam-passage of the cylinder to play in said oil-passage to regulate the flow of oil, and a steam-gaging head on the opposite side of the steam-passage, to play in said steam-passage to regulate the flow of steam; means for admitting the steam to the end of the steam-gaging head opposite the steam-passage; and yielding means for throwing the piston against the steam-pressure.

2. A hydrocarbon-burner regulator comprising a cylinder having an oil-passage with inlet and outlet, and a steam-passage with inlet and outlet; a regulating-piston playing in said cylinder and furnished with two heads, viz: an oil-gaging head at one side of the steam-passage and between the oil-passage and steam-passage of the cylinder to play in the oil-passage to regulate the flow of oil, and a steam-gaging head on the opposite side of the steam-passage, to play in the steam-passage to regulate the flow of steam; means for admitting the steam to the end of the steam-gaging head opposite the steam-passage; and adjustable yielding means for throwing the piston against the steam-pressure.

3. A hydrocarbon-burner regulator comprising a cylinder having an oil-passage with inlet and outlet, and a steam-passage with inlet and outlet; a regulating-piston playing in said cylinder furnished with two heads, viz: an oil-gaging head at one side of the steam-passage and between the oil-passage and steam-passage of the cylinder to play in the oil-passage to regulate the flow of oil, and a steam-gaging head on the opposite side of the steam-passage provided with a graduated face to play across the steam-outlet to regulate the size thereof; portions of said face being nearer the oil-cut-off head than other portions of said face; means for adjusting the

piston to bring different portions of said face across the steam-outlet; means for admitting the steam to the end of the steam-gaging head opposite the steam-passage; and yielding means for throwing the piston against the steam-pressure.

4. A hydrocarbon-burner regulator comprising a cylinder having an oil-passage with inlet and outlet, and a steam-passage with inlet and outlet; a regulating-piston playing in said cylinder furnished with two heads, viz: an oil-gaging head at one side of the steam-passage and between the steam-outlet and the oil-outlet to regulate the size of the oil-outlet, and a steam-gaging head on the opposite side of the steam-passage provided with a graduated face to play across the steam-outlet to regulate the size thereof; portions of said face being nearer the oil-cut-off head than other portions of said face; means for adjusting the piston to bring different portions of the face across the steam-outlet; means for admitting steam to the end of the steam-gaging head opposite the steam-passage; and adjustable yielding means for throwing the piston against the steam-pressure.

5. A hydrocarbon-burner regulator comprising a cylinder having an oil-passage with inlet and outlet, and a steam-passage with inlet and outlet; a regulating-piston playing in said cylinder and furnished with two heads, viz: an oil-gaging head at one side of the steam-passage and between the oil-passage and steam-passage of the cylinder to play in the oil-passage to regulate the flow of oil, and a steam-gaging head on the opposite side of the steam-passage, to play in the steam-passage to regulate the size thereof; means for admitting the steam to the end of the steam-gaging head opposite the steam-passage; yielding means for throwing the piston against the steam-pressure; and an adjustable stop for limiting the movement of the piston against the action of such yielding means.

6. In a hydrocarbon-burner regulator, the combination of the cylinder having an oil-passage with oil-inlet and oil-outlet, and a steam-passage with steam-inlet and steam-outlet; a piston playing in said cylinder and furnished with two heads, one for limiting the flow of oil through the oil-passage and the other for limiting the flow of steam through the steam-passage; a gain being provided around the piston; a screw screwed into the cylinder and provided with an eccentric-pin to enter said gain; and means for locking the screw in an adjustable position.

7. A hydrocarbon-burner regulator comprising a cylinder having an oil-passage with inlet and outlet, and a steam-passage with inlet and outlet; a regulating-piston playing in said cylinder and furnished with two heads, viz: an oil-gaging head at one side of the steam-passage and between the oil-passage and steam-passage of the cylinder to regulate the flow of oil through said passage, and a steam-gaging head on the opposite side of the steam-passage to play in the steam-passage to regulate the flow of steam; a duct extending through the steam-head from such steam-passage to the opposite end of the head; and yielding means for throwing the piston against the steam-pressure.

8. In a hydrocarbon-burner regulator, the combination with a cylinder having an oil-passage with inlet and outlet, and a steam-passage with inlet and outlet; a regulating-piston playing in said cylinder, and furnished with two cylindrical heads, viz: an oil-gaging head at one side of the steam-passage and between the oil-passage and steam-passage to regulate the flow of oil through the oil-passage, and a graduated steam-gaging head on the opposite side of the steam-passage to regulate the flow of steam through said passage; portions of said head being nearer the oil-cut-off head than other portions thereof; a socket being provided in the steam-gaging head; a rotary member mounted in the cylinder to rotate on the shaft coaxial with the cylinder and provided with a pin to extend into the socket in the steam-gaging head; and means for turning the rotary member, thereby to rotate the piston.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, at Los Angeles, California, this 5th day of June, 1900.

ALFRED C. STEWART.

Witnesses:
JAMES R. TOWNSEND,
JULIA TOWNSEND.