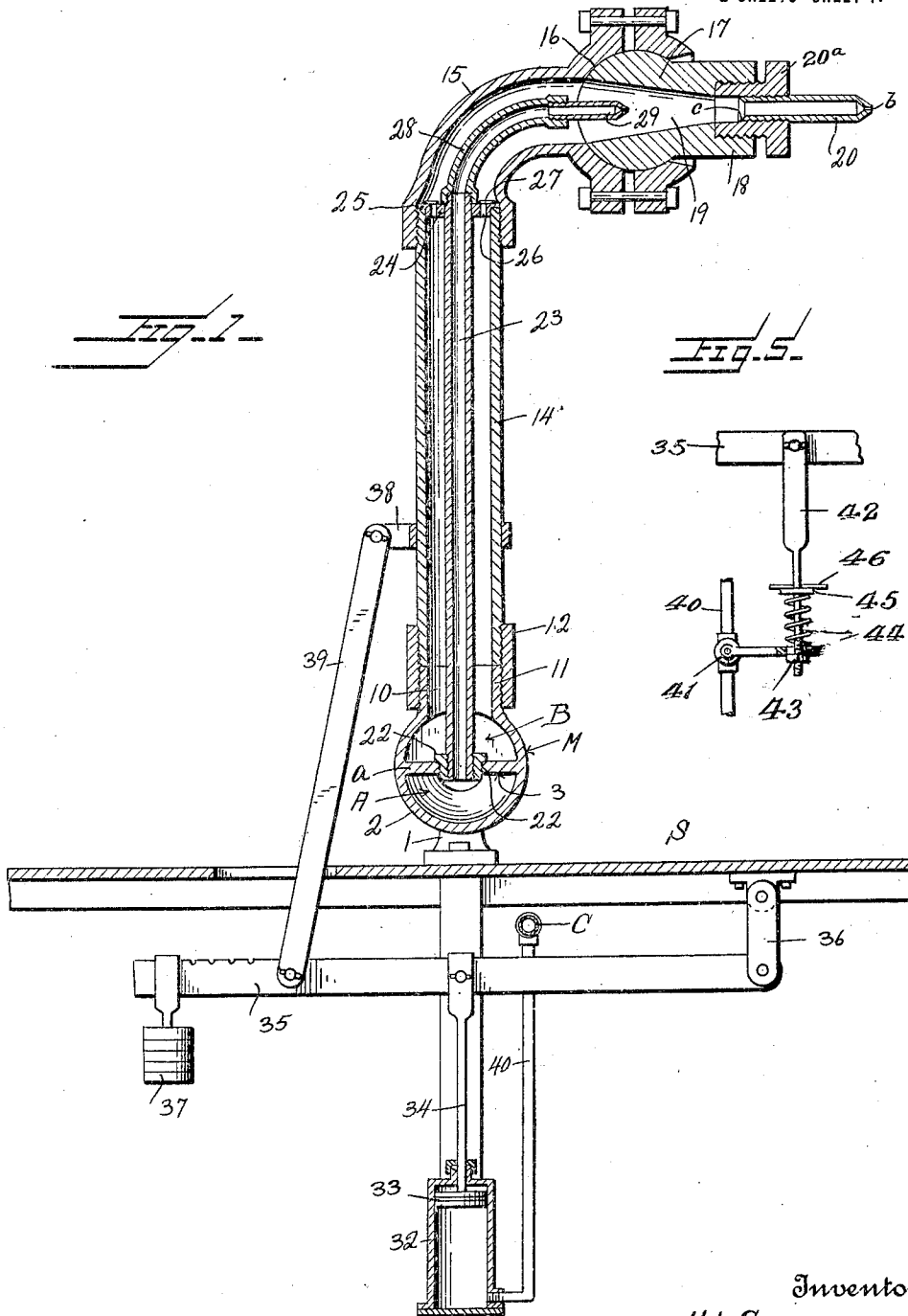


H. L. SWEENEY.
AUTOMATICALLY ACTUATED OIL BURNER.
APPLICATION FILED SEPT. 7, 1918.

1,333,785.

Patented Mar. 16, 1920.

2 SHEETS—SHEET 1.



Inventor
H. L. Sweeney

By *Watson E. Coleman*
Attorney

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UNITED STATES PATENT OFFICE.

HOWARD L. SWEENEY, OF OAKLAND, CALIFORNIA.

AUTOMATICALLY-ACTUATED OIL-BURNER.

1,333,785.

Specification of Letters Patent.

Patented Mar. 16, 1920.

Application filed September 7, 1918. Serial No. 253,033.

To all whom it may concern:

Be it known that I, HOWARD L. SWEENEY, a citizen of the United States, residing at Oakland, in the county of Alameda and State of California, have invented certain new and useful Improvements in Automatically-Actuated Oil-Burners, of which the following is a specification, reference being had to the accompanying drawings.

10 This invention relates generally to oil burners, and particularly to burners used for heating furnaces and in which a blast of air or steam is discharged with the fuel from the burner.

15 Where burners of this character are used in ordinary boiler furnaces or in dry kilns or like situations, should at any time the supply of air or steam be cut off, the oil, unless the attendant turns it off, will run into the furnace and explode. It becomes necessary, therefore, to provide some means for shutting off the oil from the burner when the steam or air is shut off. Furthermore, in open hearth furnaces, using burners of this character, the burners are mounted at opposite ends of the furnace and much time is lost by the helper pulling out the burner or burners at one end of the furnace and shoving in the burner or burners at the opposite end of the furnace. This has to be done every fifteen or twenty minutes and, furthermore, should the helper forget to pull out the burner when he reverses the air or steam supply and the oil supply to the other end of the furnace, the burner points will be melted and destroyed which are expensive.

20 With these objections in view, one of the objects of my invention is to provide a burner which, when the air or steam is cut off from the burner, will automatically cut off the supply of oil thereto and in the case of burners used for ordinary furnaces or for dry kilns in which the turning on of the oil supply will be absolutely prevented until the burner is manually returned to its original position.

25 Another object is to provide a pivoted burner of the character described wherein a decrease in the pressure of the air or steam supplied to the burner will cause the burner to shift from its projected and operative position to a retracted or inoperative position and in so shifting cut off the supply of oil to the burner while when the air or steam is

again directed into the burner, the burner will shift to its operative position and permit the passage of oil and of steam or air to the burner.

A further object is to provide a burner of this character with an improved form of combined oil chamber and air or steam chamber, and in this connection to provide means for pre-heating the oil prior to its discharge into the mixing chamber of the burner to thus cause the discharge of oil from the nozzle at a temperature many degrees hotter than is possible with burners of the ordinary construction.

A further object of the invention is to provide an improved mounting for the discharge nozzle of the burner which permits the nozzle to be set at any angle desired, thereby overcoming the necessity of twisting the pipes to set the nozzle properly which twisting action often breaks off the pipes.

A further object is to provide an improved form of mixing chamber for the atomizing fluid and the oil, so constructed that the hot oil and air or steam will be delivered with a whirling motion through the burner nozzle or point.

Other objects will appear in the course of the following description.

My invention is illustrated in the accompanying drawings, wherein:—

Figure 1 is a vertical sectional view of a burner constructed in accordance with my invention;

Fig. 2 is an elevation partly in section of the burner looking from a direction at right angles to the view in Fig. 1; and

Fig. 3 is a section on the line 3—3 of Fig. 2.

Fig. 4 is an elevation of a furnace and of the burners coacting therewith; and

Fig. 5 is a fragmentary elevation showing a valve actuating means for the pipe 40.

As disclosed in the accompanying drawings, X denotes a furnace and 14 burner pipes disposed at opposite ends of the furnace. S denotes a suitable support provided with the upstanding bearings 1 in which are oscillatably mounted the opposite end portions of the elongated tubular member M. The middle of the member M between the bearings 1 has its bore enlarged as at 2 and said enlarged portion of the bore substantially midway thereof is intersected

by the substantial sigmoidal wall or partition 3 having its middle portion *a* disposed longitudinally of the member M and occupying a plane intersecting the axis of the member. The wall 3 divides the enlarged portion 2 or a bore of the member M into two chambers or compartments A and B.

The bore of the member M outwardly of the opposite ends or the enlarged portion 2 thereof is intersected by the partitions 4 provided with the restricted openings 5. Contacting with the outer face of each of the disks or partitions 4 is the head 6 of a supply pipe 7 which extends axially of the member M. Each head 6 has a restricted opening 8 adapted to register with the corresponding opening 5 in the partition 4 when the member M is at substantially the limit of its rotation in one direction as will be described.

Each of the members 7 is stationary and is supported by a T V, passage through which is controlled by a needle valve 31. Each T communicates with a stand pipe P. One of the stand pipes P is connected by a pipe D to a source of liquid fuel, while the second stand pipe is connected by a pipe C to a suitable source of atomizing fluid under pressure, as for instance air or steam.

Disposed in the pipe C is a check valve 9. The side wall of the member M, at its middle, has an opening 10 defined by an outstanding annular flange 11. The opening 10 is opposite to the center of the wall 3 and secured to the flange 11 through the medium of a coupling 12 is a pipe 14. Secured to the outer end of the pipe 14 is an elbow 15, the outer end of which is provided with a concave socket 16 in which is arranged the ball 17 formed on the inner end of a tubular member 18, the bore of which is tapered outwardly, said bore 19 serving as a mixing chamber. A burner nozzle 20 is engaged with the member 19 by a reducing bushing 20^a.

The nozzle 20 is preferably made of one inch pipe with its outer end contracted to an opening *b*. The opposite end of the nozzle 20 is countersunk, as at *c*, to prevent the deposit of carbon from where the mixture enters the nozzle.

The center of the wall 3 has an opening 21 in alinement with the opening 10 in the member M and threaded within said opening 21 is a bushing 22, with which is engaged the inner end of a pipe 23 extending axially of the pipe 14 and having its end disposed through a collar 24 which fits within the outer end of a pipe 14 and is provided with an outstanding annular flange 25 overlying the outer end of the pipe 14 and engaged with the elbow 15 whereby the collar 24 is held in applied position. The collar 24 is formed with a plurality of restricted openings 26 and coacting with each

of said openings 26 is an outwardly opening check valve 27 whereby retrograde flow therethrough is prevented.

Arranged within the elbow 15 is an elbow 28 secured at its inner end to the outer end of the pipe 23. Engaged with the outer end of the elbow 28 is a nozzle 29 discharging within the mixing chamber 19. The pipes 7 pass through packing glands 30 on the ends of the member M to prevent escape of fuel.

The ball and socket connection between the elbow 15 and the member 18 permits the member 18 and the burner nozzle 20 carried thereby to be set at any angle and this thereby avoids the annoyance encountered by furnace men when the furnace expands or settles, and the nozzle 20 may be readily moved to any angle without disturbing the body structure of the burner.

Supported below the support S preferably at a point substantially midway of the member M is a cylinder 32 having the piston 33. The outer end of a piston rod 34 is pivotally engaged with a substantially horizontally disposed lever 35. One end of the lever 35 is pivoted to an arm 36 depending from the support S and adjustably engaged with the opposite end of the lever 35 is a counterweight 37 for a purpose to be hereinafter more particularly referred to.

Extending outwardly from the member or pipe 14 and in a direction away from the direction of the nozzle 20 is an arm 38 which is connected to the lever 35 by a link 39, at a point intermediate of the piston rod 34 and the weight 37. Leading from the supply pipe C and communicating with the lower end of the cylinder 32 is a branch pipe 40 whereby fluid pressure may be exerted upon the piston 33 to cause the lever 35 to swing the burner into working position. When the pressure within the conduit C is cut off or materially reduced, the weight 37 will force the lever 35 to swing the burner into an inoperative position. In practice the movement of the burner is substantially in an arc of 45°.

When the burner is in its inoperative position, that is, when the burner is swung outward away from the furnace, the openings 5 and 8 are out of register, thus cutting off the flow of fuel to the burner and the flow of air or steam thereto, but when the burner is swung into open position, the openings register with each other whereby the fuel is permitted to enter the chamber A and the air or steam enters the chamber B, these fluids passing up through their respective conduits and mixing within the chamber 19 and being discharged in a mixed condition through the nozzle 20.

As before stated in some cases it is desirable to provide means whereby when the air or steam pressure has been cut off and the

burner shifted automatically to its inoperative position, then the burner shall remain in its inoperative position with the fuel cut off until it is positively shifted by hand to its operative position, so that if the air or steam be again turned on, the burner will not shift to its operative position and thus allow a quantity of gas to be generated in the hot furnace which will eventually explode.

To this end and where this is desired, I have provided, as shown in Fig. 5 a valve 41 in the branch pipe 40 which is connected by a link 42 to the lever 35. This valve is a quick-opening valve and the arm of the valve, as illustrated in Fig. 5, is formed with a slot. The link 42 is preferably reduced at its lower end and passes through this slot and carries a stop nut 43. A spring 44 is disposed between the upper face of the valve arm and a washer 45 and a pin 46 extends through the rod 42 above this washer 45.

The spring 44 permits the link 42 to descend through the slot in the handle of the valve and protects the valve stem from being broken off. When the air or steam is shut off, the weight 37 pulls the horizontal lever 35 down, pushing down on the link 42 which causes the pin 46 to bear down on the washer 45, which in turn presses down on the spring 44 and this pushes downward on the valve handle causing the valve 41 to close by the time the piston 33 reaches the bottom of the cylinder, thus preventing any supply of fluid under pressure to the lower portion of the cylinder 32 until the valve 41 is again opened. The burner and mechanism is now securely locked against any automatic return to its operative position and will stay in its inoperative position until the attendant manually pushes the burner into operative position, which causes the valve 41 to open and the burner is again in action and will therefore operate automatically so long as the pressure of air or steam is practically constant. Thus all danger of accidental explosion is avoided. With this valve 41 and the valve actuating means therefor in place, should it at any time be desired that the burner should work automatically, then, the pin 46 may be driven out, the handle of the valve 41 may be pushed up and the burner will operate both ways automatically, the rod or link 42 simply sliding up and down in the slot in the valve. This safety locking valve is not ordinarily used when my burner is used in connection with open hearth furnaces, but it may be so used if desired, nor is it designed to be used where the burners are constantly moving in and out of the furnace. It is particularly necessary, however, where the burner is used for an ordinary boiler furnace or dry kiln, as in these cases if at

any time the supply of air or steam through pipe C be cut off, the burner will immediately drop back and lock. Many deaths have occurred and a great deal of damage has been done where the fireman or engineer has neglected to shut the oil off from the boiler, leaving the burner to discharge the oil into the furnace while he repairs the air pump. The oil discharging into the furnace accumulates and evolves gas and then a carelessly ignited rag or match thrown into the furnace will cause an explosion doing great damage. This is an every day occurrence in furnaces using gas and by my mechanism this chance of explosion is obviated.

The swing check valve 9 acts to prevent the oil that may run back into the air pipe from getting into the super-heating coils on top of the furnace and carbonizing and shutting these coils off and this valve is particularly necessary where oil is used as a fuel.

The tubular members 7 are preferably made of brass and the valves formed by the heads 6 and the partitions 4 not only act to cut off the supply of oil and air when the burner drops back from the furnace, as it does when the steam or air is reversed or shut off for any cause, but they perform another important duty in that when the oil boils in the heating coils, they prevent the gases generated by the boiling oil from forcing the oil out through the pipes and squirting it against the furnace causing the furnace to smoke and increasing the danger of fire.

The brass bushing 22 which holds the pipe 23 to the wall 3 can be readily removed if the threads on the pipe 23 wear out which often occurs in burners. The removal of the bushing can be readily secured by removing the coupling 12, removing the pipe 14 and taking out the pipe 23 in the bushing. It will be noted that the pipe 14 carries the hot air or steam burner point or nozzle and, therefore, the oil which enters the feed pipe 23 is kept heated by this hot air or steam so that the oil, instead of becoming cooler, as it passes toward the nozzle, is constantly heated and, as a matter of fact, the oil is delivered at the entrance to the burner nozzle many degrees hotter than with the ordinary construction. The check valves 27 prevent the oil running back into the air pipes.

The ball and socket joint between the burner nozzle and the elbow 15 is a very important feature of my invention, as it permits the nozzle to be set at any angle and allows the nozzle to be adjusted to compensate for any expansion, contraction or settling of the furnace. The bushing which supports the nozzle 20 in the member 18 permits a ready change of the nozzle or

burner point 20 which is important as these nozzles or burner points are changed two or three times a day.

The general operation of this burner mechanism will be obvious from what has gone before. When there is full pressure of air or steam or other like fluid in the supply pipe C, the pressure within the cylinder 32 will hold the piston 33 upward, thus shifting the burner to its operative position, so that the flame will be projected into the furnace, but if for any reason the supply of steam, air or other fluid under pressure is cut off or reduced below a predetermined point, then the weight 37 will cause the piston 33 to descend, thus retracting the burner from its operative to its inoperative position and cutting off communication between the ports 5 and 8, both as regards the oil supply and the air or steam supply. Thus, whenever the air pressure is directed to one end of the furnace, the burners at the opposite end are shifted to an inoperative position, while the burners at that end to which the air pressure is directed become operative thus eliminating the necessity of a helper retracting the burners or rendering them operative. Furthermore, where the locking valve, 41 is used the burner or burners to which the valve is connected will remain inoperative until the burner is shifted by hand and continually to its operative position.

The mixing chamber 19 is circular in cross section and tapered toward its outer end, and the nozzle 29 is disposed to project into the large end of the chamber 19 concentric to the wall of the chamber. Because of the projection of a fine spray of oil into the axial center of the mixing chamber, a swirling motion will be given to the oil and the atomizing fluid before its ejection from the burner nozzle which will thoroughly mix the oil with the air.

Not only will this burner eliminate the dangers of explosion and fire heretofore referred to, but it saves oil and saves 50% of the labor of the helper or fireman.

Particular attention is called to the countersink c at the inner end of the nozzle 20. It will be seen that this countersink forms an inwardly beveled end on the burner 20 and this is very important, as it prevents the gathering of carbon at the entrance to the burner point, as stated previously in this specification. If there was a shoulder at this point extending substantially at right angles to the axis of the burner point, carbon would gather and would very shortly clog the burner, requiring that the burner point be removed and that a new burner point be put in place or the old one cleaned, and further requiring that the entire interior of the mixing chamber be cleaned out.

While I have illustrated a form of my invention which I believe to be particularly

effective, it will be obvious that many changes might be made in the arrangement of parts and details of construction without departing from the spirit of the invention as defined in the appended claims.

I claim:—

1. The combination with a furnace, of burners each having a fuel supply and a fluid pressure supply and each burner being mounted for movement into or out of operative relation with the furnace, common means for supplying both of said burners with fluid pressure, means for directing the fluid pressure into one or the other of the burners, and means associated with each burner and actuated by a decrease of pressure of the fluid automatically shifting the burner out of its operative position and upon an increase of pressure shifting the burner into its operative position.

2. The combination with a furnace, of a burner movable into and out of operative relation thereto, the burner being connected to a source of fuel and to a source of atomizing fluid under pressure, and a pressure operated device connected to the source of fluid under pressure acting to shift the burner to its operative position when the atomizing fluid is acting under a predetermined pressure and simultaneously establishing connection with the source of fuel and shift the burner to an inoperative position when the pressure of the fluid is decreased below a predetermined point and simultaneously disestablishing communication between the burner and the source of fuel.

3. A burner of the character described mounted for oscillation into or out of an operative position and connected to a source of fuel and to a source of atomizing fluid under pressure, and means actuated by the pressure of the atomizing fluid acting to shift the burner to its operative position and open connection between the burner and the source of fuel and fluid supply when the atomizing fluid has a certain predetermined pressure but shifting the burner to its inoperative position and cutting off the fuel supply when the pressure of the fluid has decreased below a predetermined point.

4. A burner of the character described oscillatably mounted for movement into or out of operative position and connected to a source of fuel supply and to a source of atomizing fluid under pressure, means automatically establishing connection between the burner and said fuel and fluid sources when the burner is in its operative position and disestablishing said connection when the burner is in its inoperative position, and pressure operated means connected to the source of fluid under pressure and to the burner, shifting the burner to its operative position when the pressure of the fluid is at

a predetermined point, and swinging the burner to its inoperative position when the pressure of fluid decreases beyond a predetermined point.

5 5. A burner of the character described including a hollow body having laterally projecting trunnions supported in bearings whereby the burner may oscillate from or to an operative position and having a mixing
10 chamber, conduits entering the mixing chamber and connected respectively to a source of fuel and to a source of atomizing fluid under pressure, a supply pipe for the fluid under pressure, a cylinder connected to the supply
15 pipe, a piston operating therein, and a lever operatively connected to the piston and operatively connected to the burner, said lever being constantly urged in a direction to shift the burner to its inoperative position but
20 held in its operative position by pressure within the cylinder, and means automatically cutting off the supply of fuel to the burner upon a movement of the burner from its operative to its inoperative position.

25 6. A burner of the character described including a hollow body having hollow trunnions, bearings in which the trunnions are mounted for oscillation, a pipe connection extending from one of said trunnions to a
30 source of fuel, a pipe connection extending from the other trunnion to a source of atomizing fluid under pressure, an arm extending from the burner, a lever, a link connecting the arm and lever, a weight urging the lever
35 in a direction to shift the burner to an inoperative position, a cylinder connected to the fluid supply pipe, and a piston within the cylinder engaged with said lever, the pressure within the cylinder normally holding
40 the lever and burner in an operative position, and means automatically cutting off the supply of fuel to the burner upon a movement of the burner to its inoperative position.

45 7. A furnace having oppositely disposed burners, each shiftable into or out of operative position with relation to the furnace and each connected to a source of fuel and to a source of atomizing fluid under pressure, means for directing the atomizing
50 fluid from the burners at one end of the furnace to the opposite burners, and means act-

ing automatically upon a decrease in pressure of the atomizing fluid at one burner, shifting said burner to an inoperative position, and upon an increase of pressure in the atomizing fluid for that burner shifting it to an operative position.

8. A burner including a hollow body having a medially disposed perforated wall dividing the body into two chambers, the body having hollow trunnions extending each from one of said chambers, there being a wall extending across each trunnion and formed with a port, bearings oscillatably supporting the trunnions, and tubular members held from rotation and entering the ends of the trunnions, each tubular member having at its inner end a head provided with a port adapted in one position of the burner to register with the corresponding port in the wall and in another position to be out of register therewith, said tubular members being connected one with a source of fuel and the other with a source of atomizing fluid under pressure.

9. A burner including a mixing chamber having a discharge nozzle operatively supported in one end of the mixing chamber, said discharge nozzle having a bore of uniform diameter and having its rear end beveled outwardly and rearwardly, and a fuel discharge pipe having a contracted opening discharging into said chamber in line with said nozzle, the rear end of the chamber communicating with a source of fluid under pressure.

10. A burner including a mixing chamber tapering uniformly from one end to the other, and a discharge nozzle operatively supported in the small end of the mixing chamber and having its rear end beveled outwardly and rearwardly, and a fuel discharge pipe having a contracted opening discharging into the large portion of the chamber in line with said nozzle, the larger end of the chamber communicating with a source of fluid under pressure.

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

HOWARD L. SWEENEY.

Witnesses:

T. J. BROOKE,

CHAS. C. SWEENEY.