

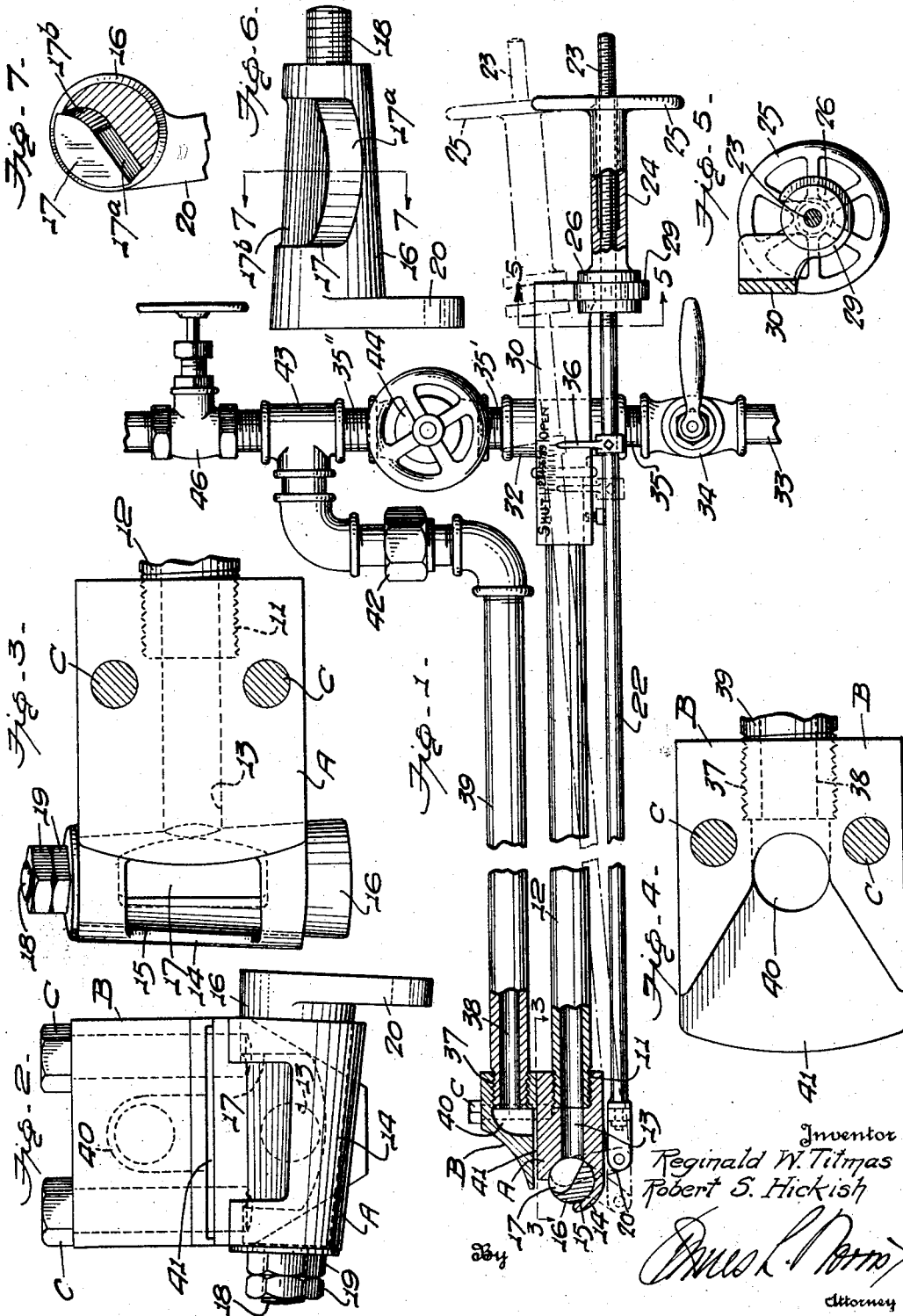
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BURNER FOR LIQUID OR SEMILIQUID FUEL

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BURNER FOR LIQUID OR SEMILIQUID FUEL

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This invention relates to burners for liquid or semi-liquid fuels such as are used in oil refineries and similar plants where very heavy fuels of high viscosity and free carbon content are used, and wherein the fuel is atomized by steam, gas or air after delivery through the burner outlet. My invention is an improvement on the type of burner shown in the Titmas and Hickish Patent, No. 1,774,953, dated September 2, 1930. In the said patent, the burner has a valve in the end of the fuel passage of conical shape, rotatably mounted in a correspondingly shaped valve seat, the axes of the cones being coincident with the axis of the fuel pipe and there is also a means for projecting this valve forwardly for cleaning purposes.

The present construction includes a rotatably mounted and transversely extending conical valve of special construction mounted in a conical valve seat, together with a simplified cleaning device.

This form of burner is particularly adapted for use in oil refineries and similar plants for burning either low grade fuels, such as acid sludge, tank bottoms and residues of all kinds which contain a very high carbon content and have very high viscosities. Trouble has always been experienced in burning such oils due to the fact that they form very heavy carbon deposits and in all the devices heretofore in use a hard carbon shell forms at the tip of the burner which nothing will remove without withdrawal of the burner from the furnace.

Due to the fact that in oil refineries the quality of the fuel is continually changing and fluctuations of oil pressure frequently occur and that gas is often used as a fuel once the stills have reached their working temperature, it is necessary to have a burner that can be easily adjusted from a high to a low capacity simply and quickly and which can be cleaned rapidly and returned to its working setting without loss of time to prevent fall of temperature.

This burner will handle any grade of fuel due to the fact that the oil orifices can be opened to the full bore of the fuel delivery tube; again because of the peculiar cutting of

the valve the fuel stream is always directed into the mouth of the steam or atomizing agent, meeting the atomizing agent at a full impact at any setting and resulting in perfect combustion. In other burners, when the capacity is increased, the oil is thrown forward, resulting in poor atomization and the heavy particles of carbon and other impurities, not being broken up by the full impact of the steam, are deposited in the furnace.

This invention attains all the objects and advantages of the invention described in our prior patent. Other advantages are pointed out in this specification.

The essential object of the present invention is the provision of a burner which has no complicated mechanism, which is capable of economical operation when burning very heavy fuels and which is capable of functioning continuously when burning said fuels without removal from the furnace for cleaning. With a simple movement the burner can be cleaned and returned immediately to its working setting without loss of temperature or shutting off the burner. Choking and clogging which are common with other burners when this kind of fuel is burned are eliminated.

Another object of the invention is to obtain a perfect combustion of heavy fuels at any setting.

Another object of the invention is to produce a burner which is capable of being accurately regulated to suit any grade of fuel by means located exteriorly of the furnace in which the burner is mounted.

My invention consists in the combinations and details of construction described and claimed in the accompanying specification and illustrated in the accompanying drawing, in which

Figure 1 is a side elevation of my burner and its supply pipes and adjusting devices partially in section,

Fig. 2 is an end elevation looking toward the burner,

Fig. 3 is a top plan view, on the line 3—3, Fig. 1, of the lower member of the burner,

Fig. 4 is a bottom plan view of the upper member,

Fig. 5 is a section on the line 5—5 of Fig. 1, Fig. 6 is a side elevation of the valve in the fuel passage, and

Fig. 7 is a section on the line 7—7 of Fig. 6.

The same characters designate the same parts throughout the specification and drawing.

The burner comprises a lower member A and an upper member B. The lower member has a screw threaded opening 11 in its rear end receiving a pipe 12 for liquid fuel. A passage 13 in the member A forms a continuation of the passage in the fuel pipe. A transverse conical valve seat 15 is formed in the forward end of the member A and a portion of the block is cut away in the middle of the forward upper part exposing valve 16 and lower and upper lips 14 and 14^a. A longitudinal groove 17 is cut out of valve 16. One wall 17^a of this groove is concaved longitudinally of the valve and the other wall 17^b, which intersects wall 17^a, as shown in Figures 6 and 7, is concaved transversely of the valve. The valve is shown in its open position in full lines in Figure 1 and in its closed position in dotted lines. It will be seen that in all open positions of the valve the bottom wall 17^a slopes upward and forward from the passage 13 and that the front concaved wall 17^b, which is substantially tangent to the wall 17^a, curves upward from the wall 17^a and forwardly of the lip 14^a so that the liquid fuel, as it issues from the valve, is deflected directly across the path of the steam or other atomizing agent issuing from the flaring opening or nozzle formed by the recess 41 in the upper member of the burner. This is an important feature of my invention since in all other devices where there is a valve the fuel issues from the opening in the valve along a line extending forwardly in the same general direction as the atomizing agent and, consequently, is not broken up as efficiently to cause complete combustion. At the smaller end of the conical valve is a screw threaded stud 18 which with the nuts 19 holds the valve in its seat. A crank 20 on the larger end of the valve is operated by means of a rod 22 having a screw threaded end 23 on which is mounted a sleeve 24 having a hand wheel 25 at one end and an enlargement 26 at the other. The sleeve 24 is internally threaded so that when the hand wheel is turned the rod is moved forward or rearward to operate the valve 16. As the valve is moved to open position, the curved wall 17^b thereof is moved toward the lip 14^a, and during the closing movement of the valve the wall 17^a moves away from said lip, whereby the discharge of fuel from the burner is regulated. This movement of the rod is due to the fact that boss 26 is peripherally grooved and the boss rests in a hook-shaped bracket 29, the hooked portion of which enters the groove and prevents longitudinal movement of the sleeve.

Bracket 29 is mounted on a plate or bar 30 which is supported by the T-coupling 32 which forms a portion of the fuel feed passage 33, 35, 12 and blower pipe 35', 35''. A valve 34 controls the flow of fuel in the feed pipe. A pointer 36 on rod 22 cooperates with a suitable scale on bar or plate 30 to indicate the extent of movement of the rod. By means of a chart corresponding to the markings on the scale and knowing the pressure of the oil the operator is able to set the orifice in the valve 17 for any required quantity of fuel.

In the rear end of the burner member B is a screw threaded opening 37 into which the pipe 39 for steam, air, gas or other atomizing agent is fixed. The passage 38 of this pipe communicates with a chamber 40 in the member B. As shown, this chamber has a curved forward wall and opens at its lower end into a recess 41 in the lower face of the member B. This recess together with the plane upper face of the lower member A forms a fan-shaped outlet or nozzle for the issuing atomizing agent. The pipe 39 communicates with a T-coupling 43 by means of suitable connections 42. The inlet for the steam or other atomizing agent is controlled by a valve 46. An extension of this inlet formed by the short pipes 35', 35'' is governed by valve 44.

In the ordinary operation of my burner, the operator adjusts the valve 16 by turning the hand wheel 25. The valve is shown in its maximum open position in Figure 1. It can readily be seen that in all positions of the valve from its setting at maximum discharge to minimum discharge the oil is brought into direct contact with the steam at the discharge end of the burner tip.

When it is necessary to clean the burner, the operator lifts the rod and with it the sleeve out of the hooked end of bracket 29 and moves the rod backward and forward by direct pulling and pushing movements. If the valve is set for maximum delivery, the operator by pulling the wheel toward him increases the area or orifice to the full bore of the oil delivery tube which purges out by means of the oil pressure through the orifice and directly in contact with the steam, any particles preventing the flow of oil through the orifice opening without putting out the flame. The control rod can be reset to its original position quickly by re-engaging it with the bracket 29. Should hard carbon have formed at the orifice movement of the valve backward or forward will break the hard shell.

Should oil pressure be very low, a small amount of steam can be admitted through the by-pass valve 44. Should the burner not be in operation a full head of steam can be by-passed through the oil delivery line.

The burner employs no complicated mechanism, is cheap and durable in construction, is economical in use, and can be operated by the cheapest form of labor. By means of the graduated scale in conjunction with an oil pressure chart the operator can set the burner instantaneously to any predetermined capacity.

By means of the cleaning device the burner can be purged by means of the fuel without shutting off the burner and returned immediately to its original setting. The movement of the valve enables any carbon formation to be broken. Should the burner be working under very low oil pressure, then the regulator by-pass steam arrangement, common practice, can be used to clear the fuel line.

I do not limit myself to the exact details of construction shown and described but the claims are intended to include all equivalent devices.

What I claim is:

1. A burner of the class described, comprising a nozzle for steam or other atomizing agent and a passage for liquid fuel, said fuel passage being located below said nozzle, a valve seat extending across said passage and having a lip located between said valve seat and said nozzle, and a valve rotatably mounted in said valve seat and having a groove presenting a bottom wall sloping forwardly from said fuel passage in the direction of said nozzle in all open positions of said valve, said valve groove also presenting a front wall extending upwardly from the front edge of said bottom wall and located forwardly beyond said lip in all open positions of the valve, the inclination of said bottom wall with relation to said fuel passage and the upward inclination of said front wall from the front edge of said bottom wall and the position of said front wall beyond said lip serving to deflect the fuel transversely into the atomizing agent in all open positions of the valve.
2. A burner of the class described, comprising a nozzle for steam or other atomizing agent and a passage for liquid fuel, said fuel passage being located below said nozzle, a valve seat extending across said passage and having a lip located between said valve seat and said nozzle, and a valve rotatably mounted in said valve seat and having a groove presenting a bottom wall sloping forwardly from said fuel passage in the direction of said nozzle in all open positions of said valve, said valve groove also presenting a front wall extending upwardly from the front edge of said bottom wall and located forwardly beyond said lip in all open positions of the valve, the inclination of said bottom wall with relation to said fuel passage and the upward inclination of said front wall from the front edge of said bottom wall and the

position of said front wall beyond said lip serving to deflect the fuel transversely into the atomizing agent in all open positions of the valve, said bottom wall being longitudinally curved and said front wall being transversely curved.

In testimony whereof we have hereunto set our hands.

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