No. 860,259. PATENTED JULY 16, 1907.

F. SMITH.

FUEL OIL BURNER.

APPLICATION FILED AUG. 31, 1906.

Fig. 1.

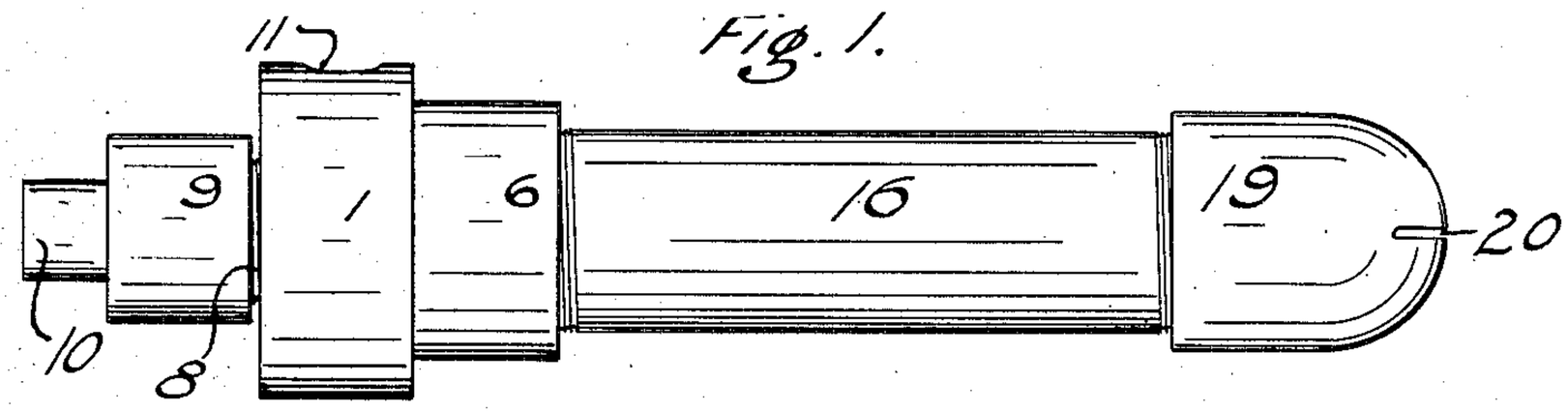


Fig. 2.

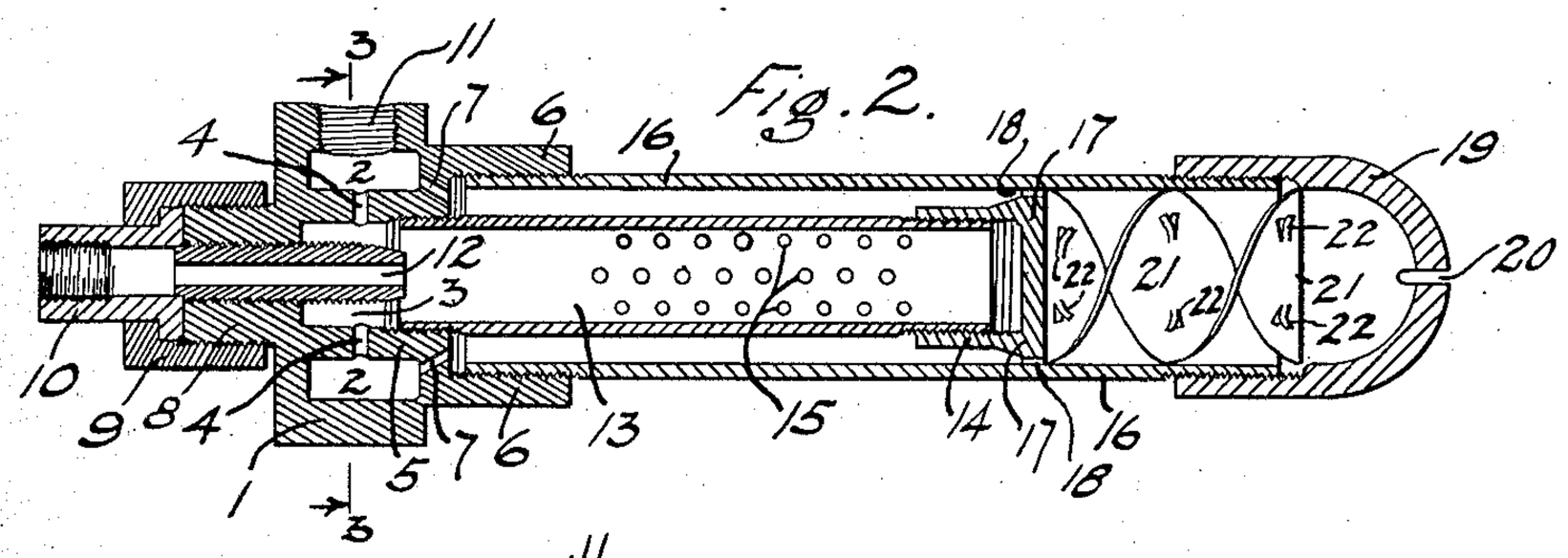


Fig. 3.

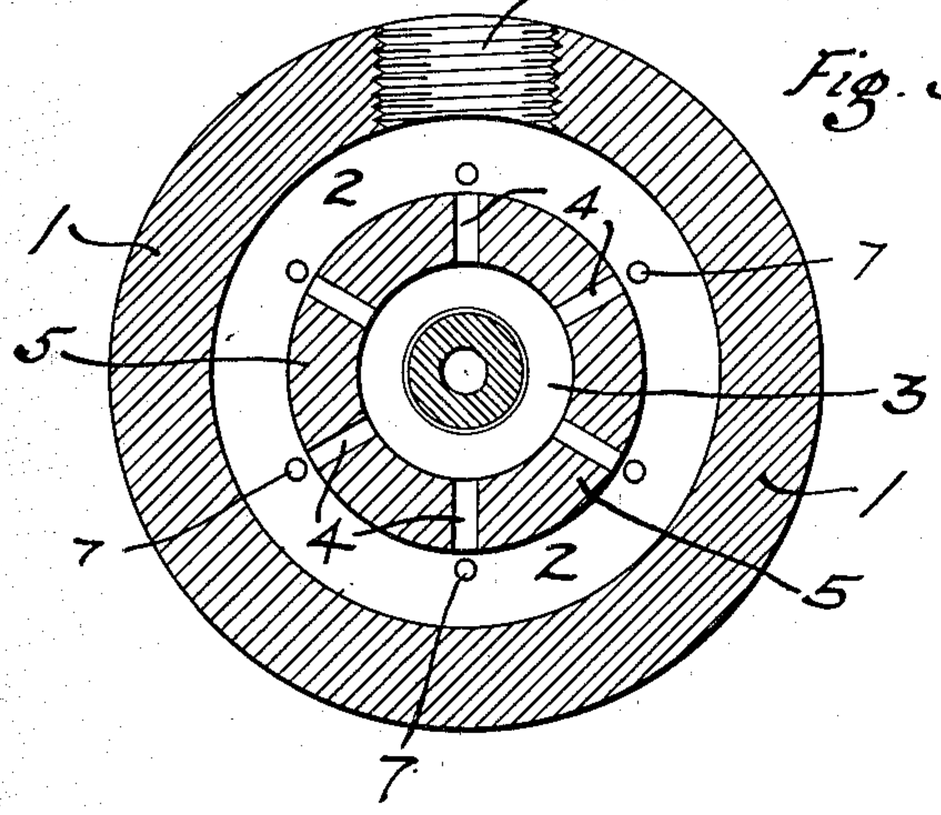
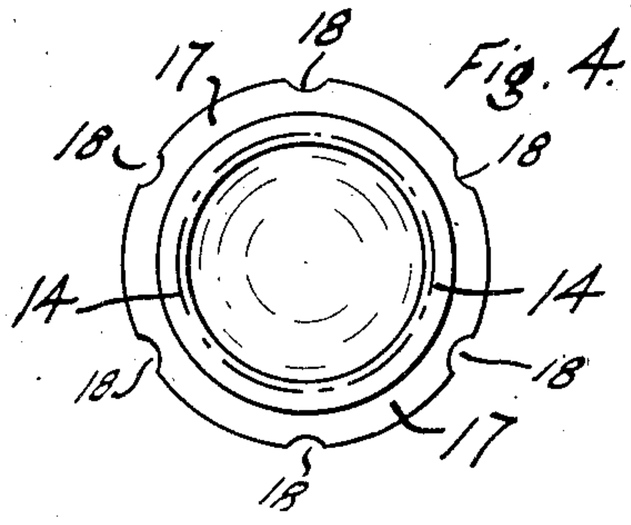


Fig. 4.



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FUEL-OIL BURNER.

No. 860,259. Specification of Letters Patent. Patented July 16, 1907.

Application filed August 31, 1906. Serial No. 332,849.

To all whom it may concern:

Be it known that I, FORBES SMITH, a citizen of the United States of America, residing at Tacoma, in the county of Pierce and State of Washington, have invented certain new and useful Improvements in Fuel-Oil Burners, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to fuel oil burners, and has for its objects to increase the efficiency of such burners and also to simplify them.

I attain these objects by the devices illustrated in the accompanying drawing, in which

Figure 1 is an elevation, and Fig. 2 is a longitudinal section of the burner. Fig. 3 is a cross-section on the line 3—3 in Fig. 2, and Fig. 4 is an end elevation of the inner oil tube cap.

Similar numerals of reference refer to similar parts throughout the several views.

The main casting "1" is circular in cross-section and has an annular closed chamber "2" around its center, and also a central chamber "3". The chambers "2" and "3" are connected together by several passages "4" passing through the wall "5" which separates them. A front extension "6" is formed on the casting "1" and has a cavity therethrough extending from the central chamber "3" and of somewhat larger diameter. Passages "7" connect the chamber "2" with the cavity in the extension "6". The chamber "3" and the cavity in extension "6" are screw-threaded to receive the inner and outer tubes of the burner, respectively. The rear of the casting "1" is also provided with an extension "8" having a screw-threaded hole therethrough entering said central chamber "3". The outer surface of said rear extension "8" is screw-threaded to receive the flanged union "9" which clamps the flanged receiving joint "10" into which the oil feed pipe screws. A tapped hole "11" passes through the casting "1" into the annular chamber "2" and is adapted to receive the pipe through which the steam or compressed air is fed under pressure. The oil supply tube "12" screws into and through the rear extension "8" and a little more than half way through the central chamber "3". A preliminary mixing chamber is formed beyond said tube "12" by screwing a tube "13" into the end of the said chamber "3", said tube being closed at its front or outer end by the cap "14", but having a series of outlet holes "15" in its sides. An intermediate mixing chamber is formed outside of the said tube "13" by an outer tube "16", which screws into the cavity in the front extension "6", said tube "16" extending over and beyond said tube "13". The cap "14" of the tube "13" is provided with a flange "17" around its end and notches "18" are made in its periphery. The cap "14" fits neatly in the tube "16" and closes the said intermediate mixing chamber except for the notches "18", through which the mixed oil and air, or steam, passes. The tube "16", as above stated, extends beyond the cap "14" and forms at its outer end the final mixing chamber by having the head "19" screwed thereon. The delivery slot "20" is made through the center of the head "19". Within this final mixing chamber I place the spiral deflector "21", which consists of a spirally twisted piece of metal through which slots have been cut and the metal "22" therefrom bent to one side or the other thereof. This spiral mixer I find to be of great value and efficiency when the oil used in the burner is heavily loaded with asphaltum or other similar semi-fluid body, especially when it is cut as above mentioned so that it has a number of sharp cutting projections "22" which break up any viscous body in the oil.

My improved burner is operated and acts in the following manner. Fuel oil is delivered under pressure to the tube "12" by way of the joint "10", and air or steam under similar pressure is delivered to the annular chamber "2" by way of the tapped hole "11". Some of the air or steam passes through the passages "4" into the chamber "3" at a point slightly to the rear of the end of the oil tube "12." This air and oil are then forced by their pressures into the preliminary mixing chamber on the inside of the tube "13." The only outlet from this chamber is by way of the holes "15" through the sides of the tube "13" so that as the outlet is at right angles to the direction of the flow at the entrance to the chamber a considerable amount of mixing takes place in this chamber and in the process of escaping therefrom. A further supply of air passes directly from the chamber "2" by the passages "7" into the intermediate mixing chamber between the tubes "13" and "16". This air travels longitudinally of said chamber, though directed by the passages "7" toward the outer surface of the tube "13", and meets at each of the holes "15" the product of the preliminary mixing on the inside of said tube "13" and mixes therewith. This mixing is quite complete since it meets the partial mixture at right angles. The mixture now passes through the notches "18" in the rim "17" of the cap "14." The tendency has been in the mixing in the above two chambers to allow the heavier parts of the mixture to fall to the lower parts of the chambers and therefore to make a slight difference between the mixtures in the upper and lower parts thereof. To further complete the mixing I impart a spiral motion to the mixture by means of the spiral metal piece "21" and I provide on its surfaces a number of sharp projections "22" which cut into any viscous body which has been carried in with the oil, but which is too slow in its movements to break up and become

properly mixed unless by some such mechanical means. The spiral mixer having given a rotary motion to the mixture, a final and complete mixing occurs within said end chamber, especially as the outlet therefrom is preferably made by a straight slot, thus causing a further charge of motion and resulting in a further mixture.

I find that when my burner is used that the blue flame starts very close to the slot "20", whereas in all the burners which I have seen the flame does not start for some distance, showing conclusively that in those instances the mixing has been very incomplete and occurs mostly after the oil has left the burner, while in my burner the oil is properly and completely mixed before leaving the burner. Further, on account of the complete mixing of the oil and air, and on account of the cutting up of the viscous matter in the oil by the sharp edges, I find that the usual deposit of powdery carbon within the burner is entirely absent in my burner, and that it does not require to be taken apart for periodical cleaning, as it keeps itself clean.

Having, therefore, fully described the construction and operation of my invention, what I claim is:

1. In a fuel oil burner, the combination of an exterior annular mixing chamber with outlet passages at its end, air supply passages entering said chamber at its other end, an interior tubular mixing chamber within said exterior chamber and having outlets thereinto by holes in its sides at right angles to the flow in said exterior chamber, an oil supply tube entering said interior mixing chamber at one end, and air supply passages entering said interior mixing chamber around said oil supply tube.

2. In a fuel oil burner, the combination of an interior tubular mixing chamber closed at its end and having outlets into an exterior chamber by holes in its sides, an oil supply tube entering said interior mixing chamber at one end, air supply passages entering said interior mixing chamber around said oil supply tube, an exterior annular mixing chamber with circumferential outlet passages at its end into an end mixing chamber, air supply passages entering said annular chamber at its other end, and the end mixing chamber having a central outlet therefrom.

3. In a fuel oil burner, the combination of an interior tubular mixing chamber closed at its end and having outlets into an exterior chamber by holes in its sides, an oil supply tube entering said interior mixing chamber at one end, air supply passages entering said interior mixing chamber around said oil supply tube, an exterior annular mixing chamber with circumferential outlet passages at its end into an end mixing chamber, air supply passages entering said annular chamber at its other end, an end mixing chamber having a central outlet therefrom, and a spiral deflector within said end chamber to impart a rotary motion to the mixture therein.

4. In a fuel oil burner, the combination of an interior tubular mixing chamber closed at its end and having outlets into an exterior chamber by holes in its sides, an oil supply tube entering said interior mixing chamber at one end, air supply passages entering said interior mixing chamber around said oil supply tube, an exterior annular mixing chamber with circumferential outlet passages at its end into an end mixing chamber, air supply passages entering said annular chamber at its other end, an end mixing chamber having a central outlet therefrom, a spiral deflector within said chamber to impart a rotary motion to the mixture therein, and cutting projections formed on said spiral deflector to intercept and cut viscous matter in the oil.

5. In a fuel oil burner, the combination of a casting formed with an annular air chamber and a central chamber with passages leading from said annular chamber to said central chamber and passages leading from said annular chamber to a cavity outside said central chamber; an outer tube outside of said second passages; an inner tube inside said outer tube and entering said central chamber and having outlet holes in its sides but a closed end; a spiral deflector in said outer tube beyond said inner tube; and a burner head on said outer tube with a central outlet for the mixture.

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

FORBES SMITH.

Witnesses:
M. H. COREY,
W. M. KENNEDY.