

J. McDONALD AND G. P. HAYNES.
 STEAM ATOMIZING FUEL OIL BURNER.
 APPLICATION FILED JULY 30, 1921.

1,428,896.

Patented Sept. 12, 1922.

Fig. 1.

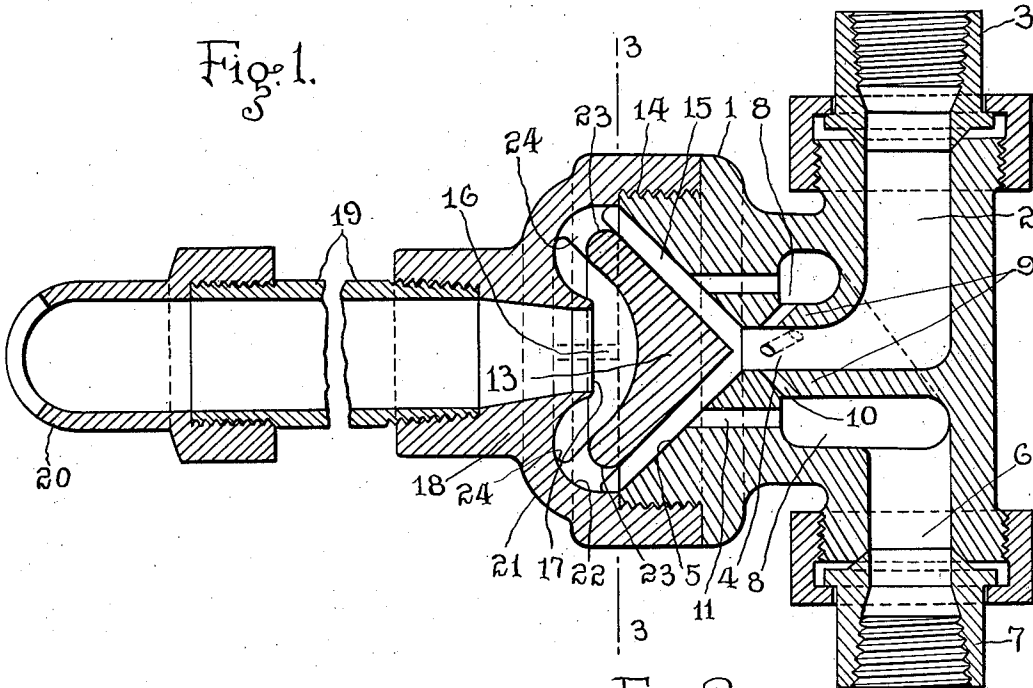


Fig. 2.

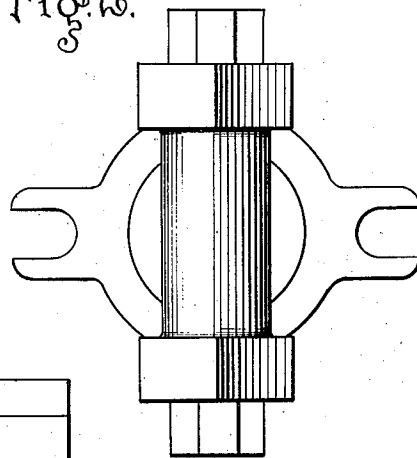
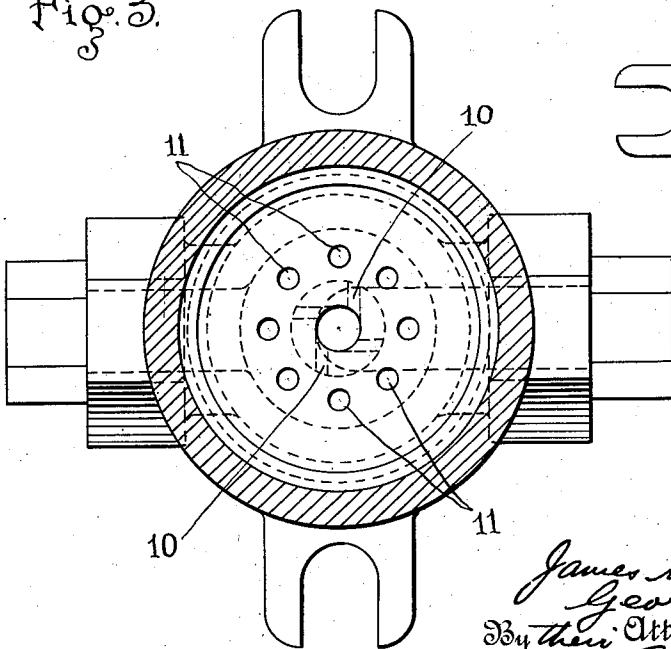


Fig. 3.



James M. McDonald and
 George P. Haynes,
 By their Attorney
 Peterstonkangh R.

UNITED STATES PATENT OFFICE.

JAMES McDONALD AND GEORGE P. HAYNES, OF NEW YORK, N. Y., ASSIGNORS TO TODD SHIPYARDS CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

STEAM-ATOMIZING FUEL-OIL BURNER.

Application filed July 30, 1921. Serial No. 488,735.

To all whom it may concern:

Be it known that we, JAMES McDONALD and GEORGE P. HAYNES, citizens of the United States, residing at 742 East 12th Street, in the city, county, and State of New York, have invented certain new and useful Improvements in Steam-Atomizing Fuel-Oil Burners, of which the following is a clear and exact specification, reference being had to the drawings which form a part of this specification.

This invention relates to atomizers for use with oil burning furnaces, and our improvements are directed particularly to the type of atomizer with which steam, air or other fluid pressure agent is employed in breaking up the liquid fuel for delivery in combustible condition.

The object of our invention is to provide a burner structure of such character that efficient atomization of liquid fuel, supplied under moderate pressure, may be achieved with the use of a minimum quantity of steam, air or other fluid pressure agent.

To these ends our invention consists of a burner structure which includes a conoidal surface opposed to the flow of liquid fuel, pressure agent directing means whereby the liquid fuel is caused to spread in a thin, whirling film over the conoidal surface, and other pressure agent directing means which cause impingement of such agent angularly upon the film, having the effect of breaking it up into tiny particles. Another feature of the burner structure is a return path for the atomized mixture, whereby it is guided centeringly against a rearwardly recessed surface, opposed to the delivery end of the burner, and is subjected to a battering action against said recessed surface which effectively reduces any globules or large particles of liquid fuel that may have carried past the conoidal surface, so that the stream of mixture as it is delivered from the burner nozzle includes liquid fuel atomized to a state of fine sub-division, capable of combustion with high efficiency.

Other features and advantages of our invention will hereinafter appear.

In the drawing:—

Figure 1 is a side sectional elevation of our improved burner.

Fig. 2 is an end view thereof, and

Fig. 3 is a section on the line 3—3 of Figure 1.

In said figures let 1 indicate the body portion of the burner, having transverse oil passage 2, to which there is removably fitted a connection 3 for the supply of liquid fuel, said passage 2 being angled and having an axial extension 4 whose outlet lies at the apex of a conoidal depression 5 formed in the forward part of body portion 1.

The body portion 1 is also provided with a transverse passage 6, having a connection 7 whereby steam, air, or other atomizing fluid may be introduced into the burner, said passage 6 being in communication with an annular chamber 8 that surrounds the extension 4, the wall 9 which separates extension 4 from chamber 8 being pierced with a concentric series of apertures 10, that extend tangentially to the axis of extension 4, and are angled forwardly with relation thereto, for a purpose to be referred to hereinafter. Also, a concentric series of horizontal apertures 11 extend from the chamber 8 to the depression 5.

A coupling member 12, carrying a rearwardly directed conoidal element 13, is engageable with the body portion 1 as by the screw threads 14, the surface of conoidal element 13 having concentric spaced relation with the surface of depression 5, to thus provide a conoidal passage 15 in communication with the extension 4.

The conoidal element 13 has at its forward surface a concaved depression 16, to which is opposed the exit opening 17 of the delivery portion 18, here shown as forming a forward extension of coupling member 12. A pipe connection 19 is shown as engaged at one end with delivery portion 18 and engaging at its other end with a burner tip which may be of usual character for the discharge into a furnace of the atomized mixture.

The shoulder portion 21 of the coupling member 12 is provided with an annular, for-

wardly concaved recess 22, to which the perimeter 23 of conoidal element 13 is in opposed, spaced relation, thereby providing a continuation of passage 15 for the rearward, centering flow of the atomized mixture against the concaved surface 16, prior to emission.

The conoidal element 13 is here shown as supported by means of webs or bridges 24 which connect it to the shoulder portion 21 of the coupling member.

In the operation of our improved atomizer liquid fuel is supplied to the passage 2, whence it flows, axially of the device through extension 4 toward the conoidal element 13. While in transit through extension 4, just before emergence into the annular, conoidal space 15, the flow of liquid fuel is impinged upon by steam, air or other suitable atomizing agent which is introduced to the chamber 8 through passage 6 and which enters the extension 4 in a series of jets through apertures 10. It will be noted that by reason of the inclination of apertures 10, whereby they are aligned with the conoidal passage 15, the course of said jets enables them to carry the flow of liquid fuel against the surface of conoidal element 13 and since the apertures 10 are arranged tangentially, the pressure of the fluid agent introduced therethrough has the effect of whirling the liquid fuel about the conoidal element 13 in the form of a surface film thereon. Since other jets of atomizing fluid issuing under pressure from the concentric series of apertures 11 strike this whirling film at a point intermediate the extent of passage 15, the bombardment thus created serves to pulverize the liquid fuel, breaking it up into a state of fine sub-division or atomization, in which state it flows, through the remaining extent of passage 15, which latter, on account of its outwardly expanded form, has the tendency to prevent coalescing of the fuel particles. The thus atomized fuel mixture after leaving passage 15, flows into annular recess 22, whence it is given a return, converging angle and dashed against the concaved surface 16, thereby breaking up any globules or large particles of liquid fuel that may have passed unbroken through passage 15; the mixture thence continuing its flow through delivery portion 18 and pipe 19 to the burner tip 20, from which it issues in combustible form.

We deem it of prime importance that the liquid fuel is caused, as by the means shown, to be spread into an attenuated film over the conoidal surface presented and further that this film be bombarded by impinging jets of a fluid atomizing agent, because the state of atomization which is thus achieved almost entirely precludes the delivery of any portion of the fuel to the burner tip in liquid form, while the final dashing of the

atomized mixture against the concaved surface 16 renders the issuing product of the highest possible combustible efficiency and flame value.

Variations within the spirit and scope of our invention are equally comprehended by the foregoing disclosure.

We claim:—

1. An atomizer comprising a body portion having an axial passage, means for introducing liquid fuel to said passage, a conoidal element opposed to said passage, means for impinging jets of fluid in angular tangents upon the liquid fuel leaving the axial passage to direct it in a whirling film over said conoidal element, and means for directing other jets of fluid against said film, to break it into tiny particles prior to delivery.

2. An atomizer comprising a body portion having means for the flow of liquid fuel therethrough, a conoidal element opposed to the direction of fluid flow, fluid pressure means for directing the liquid fuel in the form of a whirling film against the conoidal element, and means for changing the direction of the resultant mixture, causing it to dash against the base of the conoidal element prior to delivery.

3. An atomizer comprising a body portion having means for the flow of liquid fuel therethrough, a conoidal element whose apex is opposed to the direction of fluid flow, and whose base is concaved, fluid pressure means for directing the liquid fuel in the form of a whirling film against the surface of the conoidal element, and means for changing the direction of the resultant mixture, causing it to dash convergingly against the concaved base of the conoidal element prior to delivery for combustion.

4. An atomizer comprising a body portion having an axial passage and delivery means, means for introducing liquid fuel to said passage, an element having a conoidal surface opposed to said passage and a concaved surface opposed to said delivery means, fluid pressure means for directing the liquid fuel in a whirling film over said conoidal surface, means for atomizing said film, and means for changing the direction of flow of the atomized mixture to dash it against the concaved surface prior to delivery.

5. An atomizer comprising a body portion having an axial passage, means for introducing liquid fuel to said passage, a coupling including a conoidal element held thereby in spaced relation opposed to said body portion, a chamber in said body portion surrounding said passage, means for introducing fluid under pressure to said chamber, a series of inclined, tangential passages communicating from said chamber to said axial passage, whereby fluid pressure may

- be exerted upon liquid fuel flowing through said axial passage to spread it in a whirling film over said conoidal element, and said body portion having a series of passages extended from said chamber into opposite relation with said conoidal element, to direct fluid under pressure into impinging relation with said film, to break it into tiny particles prior to delivery.
- 10 6. An atomizer comprising a body portion having an axial passage and delivery means, for introducing liquid fuel to said passage, a coupling including an element having a conoidal surface opposed in spaced relation to said body portion, and a reverse, concaved surface, opposed to said delivery means, a chamber in said body portion surrounding said passage, means for introducing fluid under pressure to said chamber, a series of inclined, tangential passages communicating from said chamber to said axial passage, whereby fluid pressure may be exerted upon liquid fuel flowing through said axial passage to spread it in a whirling film over said conoidal surface, said body portion also having a series of passages extended from said chamber into opposed relation with said conoidal surface, to direct fluid under pressure into impinging relation with said film, and said coupling being shouldered to provide a forward annular recess, whereby the direction of the flowing atomized mixture is changed and it is caused to dash convergingly against said concaved surface prior to delivery.
- 15 20

Signed at New York, in the county and State of New York, this 22nd day of July, 1921.

JAMES McDONALD. [L. S.]
GEORGE P. HAYNES. [L. S.]