

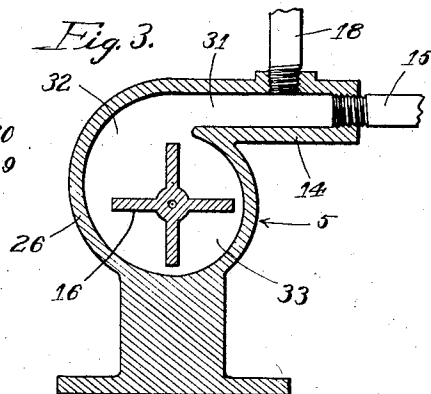
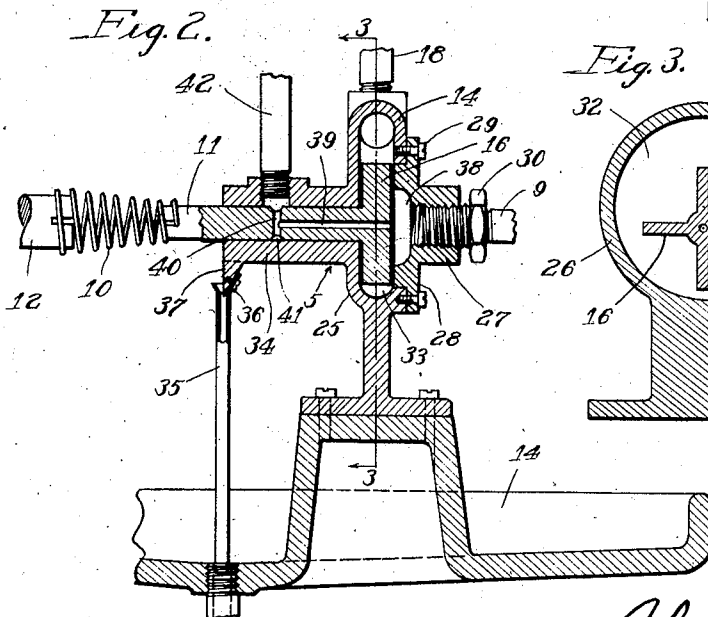
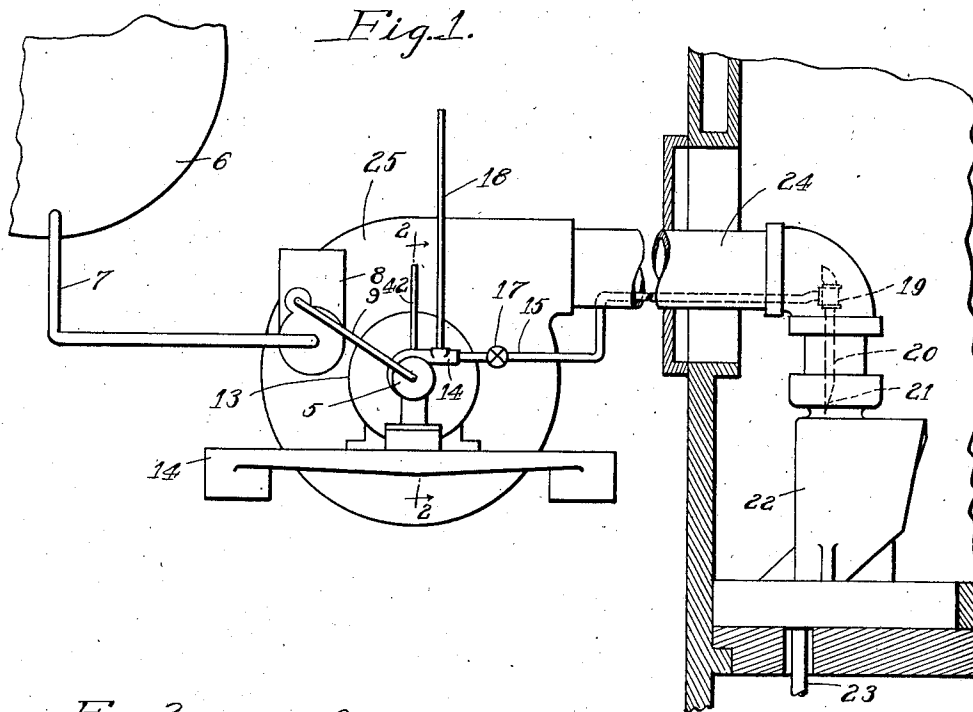
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LIQUID FUEL FEEDING APPARATUS

Original Filed Dec. 8, 1923



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UNITED STATES PATENT OFFICE.

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LIQUID-FUEL-FEEDING APPARATUS.

Original application filed December 8, 1923, Serial No. 679,467. Divided and this application filed November 23, 1925. Serial No. 70,754.

This application is a division of my co-pending application Serial No. 679,467, filed December 8, 1923, and relates to improvements in apparatus for feeding liquid fuel.

5 The present invention is particularly concerned with the provision in an apparatus of this kind of a centrifugal fuel pump supplied with fuel under a constant gravity pressure head and arranged to supply the
10 fuel in a predetermined and uniform quantity per hour to the burner, provision being made for varying or regulating the feeding of oil so as to burn a steady, low flame or to
15 feed, a correspondingly increased flame and heat production.

Among the features of novelty incorporated in the pump, may be mentioned the provision of a driving shaft for the impeller
20 which has no packing in order thereby to eliminate frictional losses and reduce to a minimum the operating cost, combined with a leakage drain pipe for conducting the oil seeping by the shaft to a suitable point
25 either to be burned in the furnace directly or to be conducted back to the gravity tank for future use.

Another important feature consists in the provision of means in connection with the
30 pump to insure a uniform feeding of oil by preventing the delivery with the oil feed of any air introduced in the oil by the churning of the impeller, the means I prefer to employ consisting of stand-pipes one of
35 which conducts air bubbles from the center of the impeller disk to insure the production of uniform pressure in the operation of the disk and the other of which is disposed in the delivery line to avoid the feeding of oil in
40 slugs or gulps to the burner.

The invention is illustrated in the accompanying drawing, wherein—

Figure 1 is a more or less diagrammatic view showing the application of my improved fuel feeding apparatus to an oil
45 burner in an ordinary furnace, the burner and its attendant fuel pump and air blower being shown in elevation with the furnace appearing in section;

50 Fig. 2 is an enlarged fragmentary section through the centrifugal fuel pump taken substantially on the line 2—2 of Fig. 1 looking in the direction of the arrows;

Fig. 3 is a vertical section through the
55 pump taken substantially on the line 3—3

of Fig. 2 looking in the direction of the arrows.

The same reference numerals are applied to corresponding parts in the three views.

In order more readily to understand and
60 appreciate the features of the centrifugal pump, designated generally by the reference numeral 5, and the provisions made in connection therewith, a brief discussion of the
65 apparatus shown in Fig. 1 will be given describing the conditions under which the pump operates in practice and showing its relation to the other devices going to make
70 up a complete liquid fuel burning apparatus of the type to which the present invention is applied. In the following discussion, the
liquid fuel will be referred to as oil, it being
75 contemplated that the present pump and apparatus shall operate with gas or fuel oil of approximately 30° Baumé. Oil is supplied
80 from any suitable source such, for example, as from a storage tank (not shown) to a service tank 6. From this tank, the oil flows by gravity through a shut-off valve and
85 strainer (not shown) and pipe 7 to a float valve 8 mounted on a suitable frame support and serving to maintain the oil at a constant
90 level in relation to the pump 5. The oil flows by gravity from the float valve to the pump 5 through a connection 9. A coiled
95 torsion spring 10 connects the impeller shaft 11 of the pump 5 with the armature shaft 12 of an electric motor 13 which is preferably of a constant speed type. Both the
100 pump and motor are mounted on a suitable frame 14. The pump 5 has its inlet through the connection 9 and has an outlet 14 connected with a delivery line 15 leading to the
furnace. The impeller 16 of the pump in revolving raises the oil pressure to a comparatively low value in proportion to the
105 square of the speed of revolution. An adjusting valve 17 is inserted in the delivery line 15 which allows the passage only of a certain amount of oil which is relatively
110 small as compared to the full capacity of the pump. As a result, a certain level is maintained in a stand-pipe 18 to which further reference will be made hereinafter. The low head of oil maintained is fed through the
line 15 to an overflow delivery point 19 from which point it drops through a vertical
delivery pipe 20. The latter has a sharp
delivery point 21 from which the oil drops
into the combustion chamber 22, substan-

tially as described in my co-pending application, Serial No. 45,448, filed July 23, 1925. The feeding is continuous rather than intermittent or in gulps and is arranged to cease when the motor 13 stops. The pipe 23, as described in the co-pending application above referred to, leads from the base of the chamber 22 suitably to a trip bucket (not shown) for actuating a safety valve to shut off the feeding of oil in the event of a failure of the flame. Concurrent with the feeding of the oil, air is fed through the delivery pipe 24 from the blower 25 which is driven by the motor 13 suitably by direct connection of the impeller with the armature shaft 12 of the motor.

The centrifugal pump, shown in Figs. 2 and 3, comprises a casing 26 having an inlet 27 in a plate 28 secured as by means of screws 29 to the side of the casing 26 and having the connection 9 leading therein through a nipple 30, as shown. The outlet 14 has the bore 31 thereof tangent to the eccentric portion 32 of the otherwise circular impeller chamber 33 in which the impeller 16 operates. The impeller is driven constantly in a clockwise direction viewing Fig. 3 with the shaft 11 and raises the pressure of the oil to a comparatively low pressure head in proportion to the square of its speed of revolution. The casing has an integral bearing 34 extending laterally therefrom which receives the impeller shaft 11. The latter is fitted in the bearing with a small clearance for easy running and has no packing so that the frictional drag which would otherwise be imposed is eliminated, thereby reducing the electric current consumption required for operating the pump. The elimination of packing and the provision of an easy fit of the shaft in its bearing allows the passage of a few drops of oil per minute about the shaft. I provide a leakage drain pipe 35 for conveying the leaking oil to any suitable receptacle either to be burned directly in the furnace or conducted back to the main oil supply for future consumption. In my co-pending application first above referred to, this pipe leads to the combustion chamber directly while in the other co-pending application last above referred to, this pipe leads to an intermediate point of the fuel delivery line. The pipe 35 is shown secured by a screw 36 on a depending tongue 37 provided on the bearing 34.

In order further to insure a uniform feeding of oil, I have provided means for preventing any air from being delivered by the pump. In experimenting, I have found that the churning of oil by the rapid revolution of the impeller causes the formation of small bubbles of air or gas some of which will escape through the delivery line and rise in the stand-pipe 18 and thus be exhaust-

ed since the pipe is open to the atmosphere. The bubbles of air or gas, being lighter than the oil, tend to hug the center of the impeller and to reduce the pressure of oil at the pump outlet. The air accumulates in the cavity or chamber 38 provided in the inner face of the plate 28 adjacent the impeller disk 16 and escapes through a hole 39, drilled axially in the shaft 11, to a point intermediate the ends of the bearing 34 at which point the axial hole is intersected by a diametric hole 40 and the latter by an annular groove 41 turned in the periphery of the shaft 11. A stand-pipe 42 communicating with the annular groove 41 allows the escape of the air to the atmosphere since the pipe is open to the atmosphere at its upper end.

It is believed that the foregoing conveys a clear understanding of the objects and principles of my invention, and it should be understood that when putting these into practice, various changes might be made in the construction and arrangement of the necessary parts and devices without departing from the spirit and scope of the invention as expressed in the appended claims, in which—

I claim:

1. In a centrifugal pump, the combination of a casing, a driven shaft extending into said casing through a bearing in one side wall thereof, an impeller on said shaft arranged to turn in said casing, said casing having a low pressure inlet opening for liquid in the other side wall communicating with a low pressure chamber provided in said casing between said wall and the face of said impeller, and having a comparatively high pressure outlet opening for liquid communicating with the periphery of said impeller, and said shaft having an air drain hole extending substantially axially thereof opening at its one end at the face of said impeller substantially centrally thereof for communication with said low pressure chamber and having communication with the atmosphere at its other end.

2. In a pump as set forth in claim 1 wherein the shaft has a diametrical hole intersecting the axial hole at a point intermediate the ends of the shaft bearing, the said shaft and bearing providing therebetween an annular passage communicating with the ends of the diametrical hole, and a standpipe mounted on said bearing in communication at its lower end with said annular passage and open to the atmosphere at its upper end.

3. In a pump as set forth in claim 1 wherein the shaft has a diametrical hole intersecting the axial hole at a point intermediate the ends of the shaft bearing, a standpipe mounted on said bearing to have communication at its lower end with said diametrical

hole and open to the atmosphere at its upper end.

4. In a pump as set forth in claim 1 wherein the shaft has a diametrical hole intersecting the axial hole at a point intermediate the ends of the shaft bearing, a standpipe mounted on said bearing to have communication at its lower end with said diametrical hole and open to the atmosphere at its upper end, said shaft operating without packing in said bearing to minimize friction losses whereby liquid is arranged to leak from the end of the bearing; a drip conducting projection on the end of said bearing beneath the shaft, and means communicating with said projection for conducting the drippage away from said bearing.

5. In a pump, the combination of a casing, a driven shaft extending into said casing through a bearing in one side wall thereof for operating the pump, said shaft operating without packing in said bearing to minimize friction losses, the construction being such that liquid may seep past the shaft through said bearing and thereby further provide for self-lubrication of the pump, a drip conducting projection on the end of said bearing beneath the shaft, and means communicating with said projection for conducting the drippage away from said bearing.

6. A pump as set forth in claim 5 wherein the projection is in the form of a tongue having an inclined back face and wherein the last mentioned means comprises a tube having a flared end wherein the end of said tongue is received, the flared end of said tube being attached to the inclined back face of the tongue.

7. A centrifugal pump comprising a cas-

ing, the body portion of which is substantially circular, said casing having an extension leading from the circular body portion substantially on a tangent, a driven shaft extending into said casing through a bearing in one side wall of the body portion, an impeller on said shaft arranged to turn in the body portion of said casing, said casing having a low pressure inlet opening for liquid in the other side wall of the body portion communicating with the face of said impeller and having a comparatively high pressure outlet opening for liquid at the outer end of the aforesaid extension, and a standpipe communicating with the top of said extension intermediate the body portion of said casing and said outlet opening.

8. In a pump as set forth in claim 7 wherein the impeller is formed integral with the driven shaft, and wherein the body portion of said casing has an opening in the one side wall thereof to permit the insertion therethrough of the shaft and impeller, a plate for closing said opening having the low pressure inlet opening provided therein.

9. In a pump, the combination of a casing, a driven shaft extending into said casing through a bearing in one side wall thereof for operating the pump, said shaft operating without packing in said bearing to minimize friction losses, the construction being such that liquid may seep past the shaft through said bearing and thereby further provide for self-lubrication of the pump, and a drip conducting part on the end of said bearing beneath the shaft.

In witness of the foregoing I affix my signature.

JOHN H. McILVAINE.