May 10, 1932. J. B. McKEOWN 1,858,102

PRESSURE FLUID GENERATOR

Filed Aug. 8, 1928 2 Sheets-Sheet 1

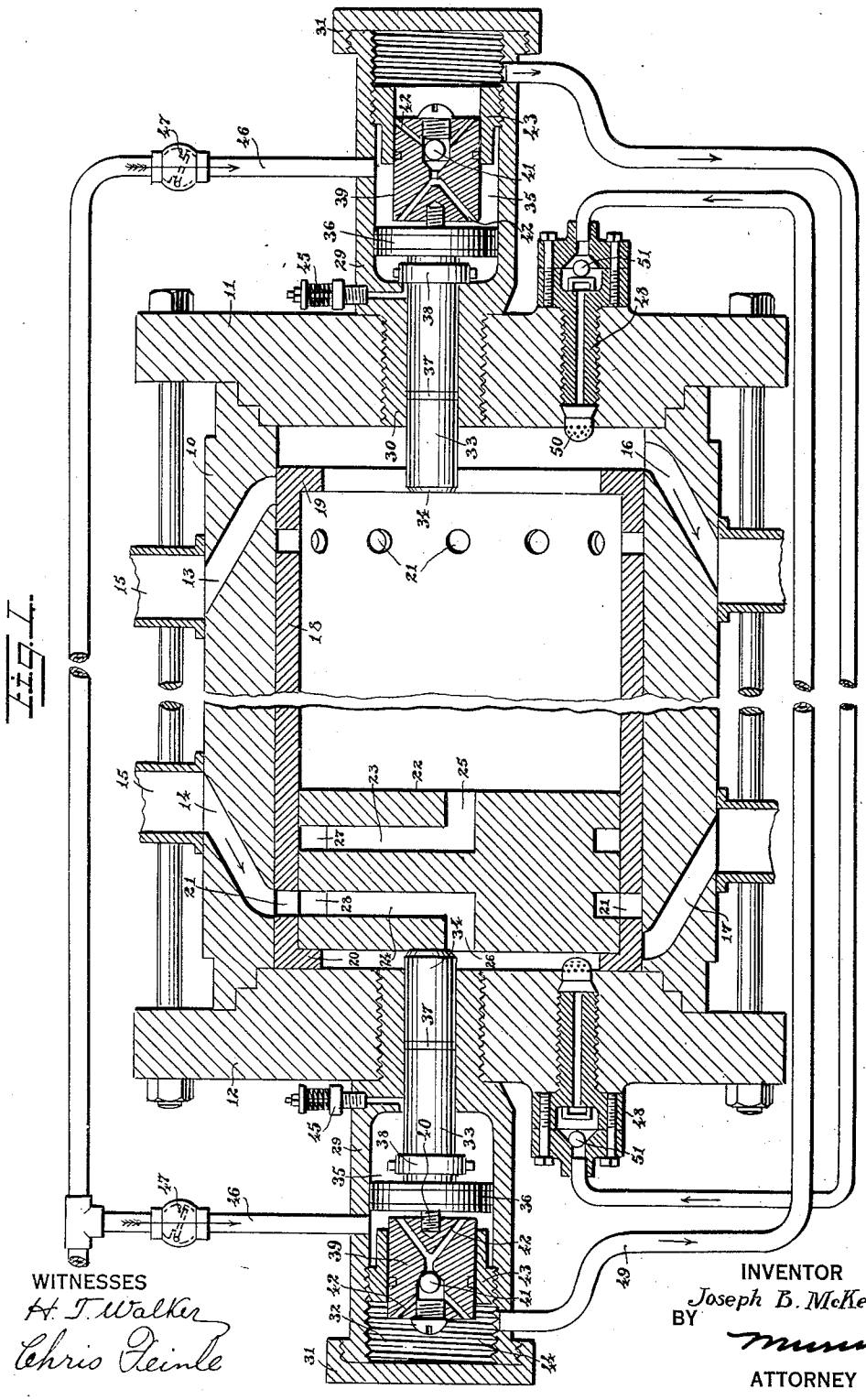


FIG. 1.

WITNESSES

H. T. Walker

Chris Deinle

INVENTOR

Joseph B. McKeown

BY

ATTORNEY

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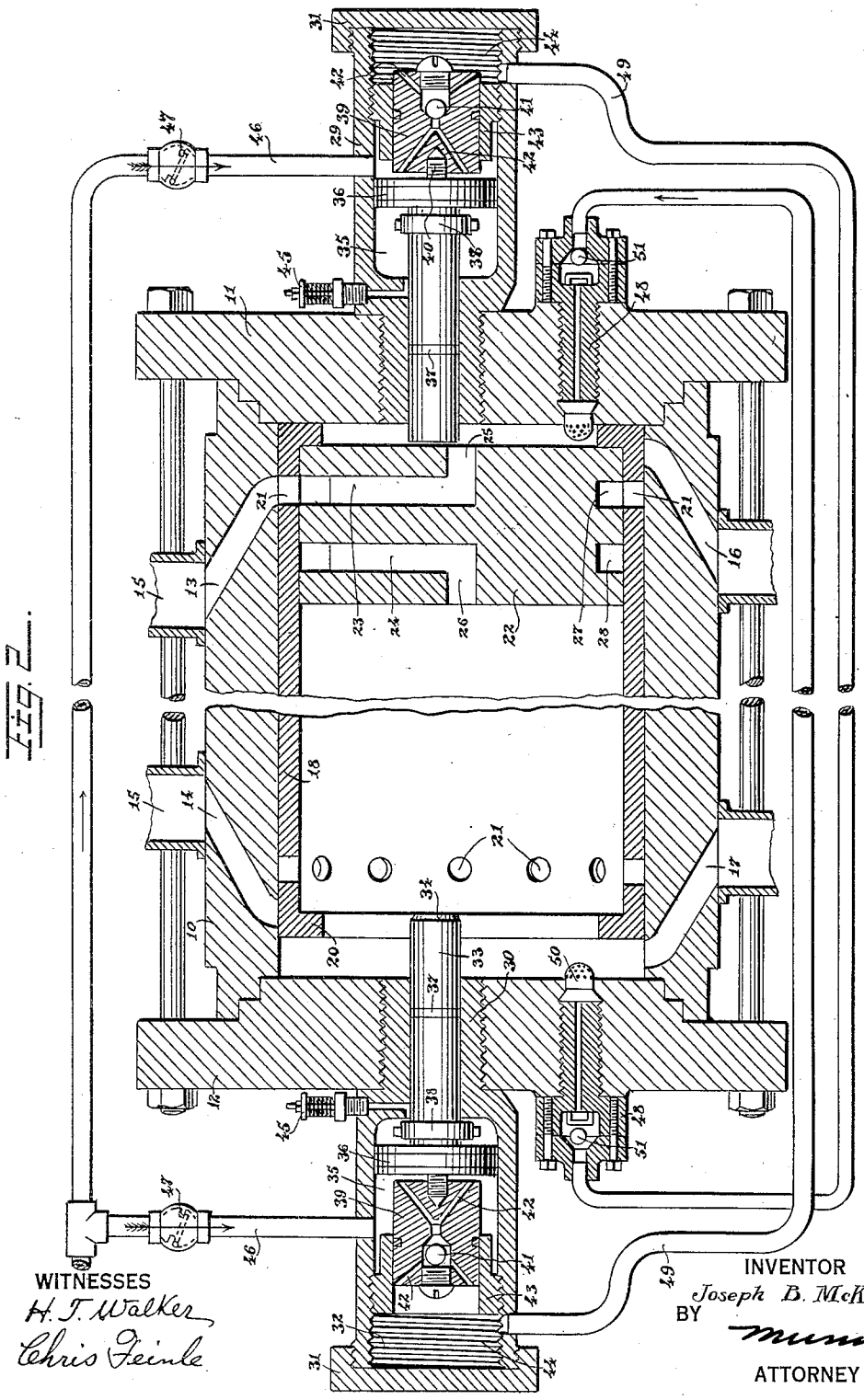


Fig. 2.

WITNESSES
H. T. Walker
Chris Feinle

INVENTOR
Joseph B. McKeown
BY Munn & Co.
ATTORNEY

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UNITED STATES PATENT OFFICE

JOSEPH B. McKEOWN, OF GRAND VIEW, NEW YORK

PRESSURE FLUID GENERATOR

Application filed August 8, 1928. Serial No. 298,270.

This invention relates to a pressure fuel feeder for a power impulse generator of the type described in United States Letters Patent No. 1,620,565, granted to me, such generator being designed and adapted for use in conjunction with any suitable types of turbines.

It is one of the objects of the invention to combine with a power impulse generator, a novel and improved form of fuel feeder, for the purpose of obtaining the desired power impulses.

It is a further object of the invention to provide a power impulse generator with a fuel feeder which is designed and adapted to obviate the use of ignition means, and which feeds charges of fuel to the expansion chamber of the generator under sufficient pressure to be ignited by the heat of air under pressure also fed to said chamber, to produce the power impulses.

With the foregoing and other objects in view, the invention resides in the details of construction, relative disposition, and operation of the parts hereinafter fully described and illustrated in the accompanying drawings, in which

Figure 1 is a longitudinal sectional view through the power generator with the fuel feeding means of the present invention applied thereto and showing one transposition of the parts.

Figure 2 is a view similar to Figure 1 but showing a transposition of the parts the reverse of that shown in Figure 1.

Referring now more particularly to the drawings, it will be apparent that there is shown an expansion chamber 10, which is preferably of cylindrical form and having removable heads 11 and 12. The side wall of the chamber 10 is provided with air intake passages 13 and 14, there being provided a manifold in communication with said passages 13 and 14 as indicated at 15. The manifold is connected with a suitable source of air supply not shown, such as a compressor which delivers air to the chamber 10 under approximately 500 pounds pressure. At points removed from the intake passages 13 and 14, and preferably diametrically opposed with respect thereto, the chamber 10 is provided with exhaust passages 16 and 17 having communication by the intervention of suitable means with an impact turbine for the purpose of operating the same by the power impulses generated. Mounted within the chamber 10 for relative sliding movement is a sleeve 18. The sleeve 18 is approximately equal in diameter to the diameter of the chamber 10 but is shorter in length than the length of said chamber. The sleeve 18 has end flanges 19 and 20. The side wall of the sleeve 18 is provided near each end with a circular series of openings 21. The passages 13 and 14 are sufficiently large to always communicate with at least one of the related series of openings 21 to insure admission of air even though the sleeve 18 should turn in chamber 10.

Mounted for relative longitudinal sliding movement within the sleeve 18 is a piston 22, and said piston is provided with ports 23 and 24 therein, the port 23 discharging through an opening 25, and the port 24 discharging through an opening 26. The port 23 is in communication with a circular groove 27 in the piston 22, and the port 24 is in communication with a circular groove 28 in the said piston.

In order to feed determinate charges of liquid fuel into the chamber 10 at the end of each stroke or travel of the piston 22, each of the heads 11 and 12 is provided with a fuel feeding means presently to be described. A cylindrical casing 29 has a gland 30 at one end which is threaded into the related head of the chamber 10 off center with respect to the longitudinal axis of said chamber. The casing 29 is provided with a removable head 31, and is internally threaded as at 32 for a purpose to appear. A timing rod 33 is positioned in each gland 30 and has relative longitudinal movement with respect thereto. One end 34 of the rod projects into the chamber 10, and the opposite end thereof projects into a chamber 35 defined by the casing 29, the last mentioned end of the rod 33 having a piston 36 secured thereto. The rod 33 is provided with a seal ring 37. The said rod 33 is also provided with an adjustable collar

38 which limits the movement of the rod 33 into the chamber 10 and said collar 38 may be adjusted to bring about the delivery of a charge of fuel into the chamber 10 at the proper time. A plunger 39 which is smaller in diameter than the piston 36 is connected as at 40 with the rod 33, and said plunger 39 is provided with a check valve 41 and communicating passages 42. The plunger 39 works in a sleeve 43 screwed into the casing 29 by virtue of the threads 32. It will now be apparent that a chamber 44 is provided between the plunger 39 and the end 34 of the casing 29. The casing 29 is provided with a vent valve 45 which allows any fluid which may enter the casing 29 behind the piston 36 to escape, and so insure the return movement of the piston 36 and therefore the plunger 39 at all times. Liquid fuel, such as crude oil, is fed to the chamber 35 of the casing 29 under approximately 500 pounds pressure by means of a feed pipe 46 having a check valve 47. The feed pipe 46 will be connected with a suitable source of liquid fuel supply which may be kept under the proper pressure by the air compressor which delivers air to the chamber 10. The chamber 44 of the casing 29 is in communication with a fuel nozzle 48 by a pipe 49. The nozzle 48 is screwed into the head of the chamber 10 opposite that having the casing 29 and related parts. The nozzle 48 is provided with a spray cap 50 which is disposed to spray the liquid fuel into the chamber 10. The said nozzle 48 is also provided with a check valve 51 to protect the fuel line during the explosion or expansion of the fuel.

The operation is as follows: With the parts in the relationship shown in Figure 1, air is admitted to the left hand end of chamber 10 by way of the intake manifold through the intake passage 14, through one or more of the holes 21 in the sleeve 18, then into the groove 28, then into the port 24, and then through opening 26 into the left hand end of chamber 10. It is to be understood that the chamber 44 of the fuel feeder casing 29 on the head 11 is filled with liquid fuel. This liquid fuel enters the chamber 44 from the chamber 35, through the passages 42 past the check valve 41. The check valve 41 prevents return flow of the liquid fuel from the chamber 44. The air under pressure admitted to the chamber 10 between the head 12 and the piston 22, forces the latter toward the opposite end of the chamber. When the piston 22 nears the end of its travel toward the right hand end of chamber 10, it encounters the end 34 of the timing rod associated with the head 11 and also with the end flange 19 of the sleeve 18. As a result, the charge of liquid fuel in the chamber 44 of the feeder casing 29 associated with the head 11 will be displaced by the plunger 39 and be forced through the pipe 49 and nozzle 48 associated with the head 12, into the left hand end of chamber 10. This will cause the explosion and expansion of the liquid fuel sprayed into the chamber 10 by the charge of air in the chamber; it being understood that the air, due to its state of compression, will be sufficiently heated to bring about ignition of the fuel in accordance with the Diesel principle. The parts will be in the relationship shown in Figure 2, in which the sleeve 18 closes the intake passage 14, and opens the exhaust passage 17, allowing the power impulse generated by the explosion of the liquid fuel to pass or discharge from the exhaust passage 17 to the rotor of a turbine not shown. At the same time, compressed air is admitted to the chamber 10 through the intake passage 13 and one or more openings 21 in the sleeve in registration with the intake passage 13, the air passing through the openings 21 into the groove 27 and from the latter through the port 23 in the piston 22 and then out of the opening 25 into the right hand end of chamber 10 between the piston 22 and the head 11. It will be obvious that the spray of fuel entering the opposite ends of the chamber 10 through the nozzles 48 by reason of the movement of the rods 33, is instantaneous, and combustion of the fuel therefore sets in immediately and continues in part in the chamber 10 and also on its way to the turbine through the outlets 16 and 17. The liquid fuel does not have any chance to flow out of the outlets 16 and 17. The piston 22 moves but a short distance after arrival at each end of the chamber 10 to displace sufficient fuel from the chambers 44 through the nozzles 48 into the chamber 10 for combustion. The timing is easily taken care of by adjusting the rods 33. Return movement of the piston 22 in each instance is accomplished by the admission of additional air into the chamber 10. On reference to Figure 1 it will be apparent that the piston 22 has moved to the left hand end of the chamber 10 to cause an injection of liquid fuel into said chamber at the right hand end thereof, which results in a pressure charge being delivered to the turbine. Compressed air at the proper intervals is admitted to the chamber 10 at the left hand end thereof through the inlet 14 and one of the openings 21 in the sleeve 18, and passage 24 in the piston 22. This air forces the piston 22 to the right hand end of the chamber 10. The operation herein above described is then repeated, the operation being continuous and automatic.

It is to be understood that the proportion of the timing rod 33 and the piston 36 is such that the pressure within the chamber will not prevent return movement of the timing rod 33 and connected parts. This return movement is effected by liquid fuel entering the casing 29 at the plunger side of the piston 36.

It is also to be understood that each plunger

39 acting on the fuel within the chamber 44 puts the fuel under greater pressure than its normal pressure, it being apparent that the related check valve 41 will close. Furthermore, while air is being admitted to one end of the chamber 10, to move the piston 22, fuel cannot enter said end of the chamber, because there will be sufficient difference of pressure of the air and fuel, due to greater resistance impeding the flow of fuel, to keep the particular check valve 51 closed to prevent the untimely flow of fuel into chamber 10.

It will also be understood that the sleeve 43 of each casing 29 may be adjusted to vary the cubical contents of chamber 44. Furthermore, when adjustment of the collar 38 of each rod 33 is made to obtain earlier or later discharge of fuel into chamber 10, the related sleeve 43 may be adjusted accordingly to obtain the desired displacement of fuel from the related chamber 44.

It is to be understood that the invention is not restricted to the precise arrangement of parts shown and described, as details of construction may be modified and rearranged without departing from the spirit of the invention, the scope of which is limited only by the terms of the appended claims.

What is claimed is:

1. The combination with a pressure generator including a combustion chamber, and a freely movable piston in said chamber; of devices associated with said chamber and operable to force charges of combustible fuel under pressure alternately into opposite ends of said chamber, for the purpose of generating pressure charges, each device including a nozzle positioned to discharge fuel into one end of said chamber, and means at the end of the chamber remote from the nozzle end thereof operated by the movement of the piston to operate the device, exhaust passages respectively in communication with the opposite ends of said chamber, and said generator also being provided with means operated by the movement of the piston, to control the discharge of the pressure charges from said chamber through said passages alternately.

2. The combination with a pressure generator including a combustion chamber, and a freely movable piston in said chamber; of a casing, a nozzle which is positioned to discharge into said chamber, said nozzle being in communication with the discharge end of said casing by a feed pipe, a rod mounted for reciprocation and one end thereof extending into said chamber, a piston and plunger spaced from each other on the opposite end of said rod, said piston and plunger being disposed in said casing for movement therein, said casing having an inlet through which combustible fuel under pressure is delivered to the interior of said casing in advance of said casing piston, said plunger having passages therein through which fuel passes to the discharge end of said casing, said plunger being provided with a check valve to prevent back flow of fuel through said passages, said rod being operated by the movement of said power chamber piston to move the casing piston and plunger to force fuel out of the casing through the feed pipe and nozzle into said power chamber, the return movement of said rod being effected by the pressure of fuel entering said casing on the piston therein.

3. The invention defined in claim 1, in which said last means comprises a sleeve slidable in said chamber and operated by the piston to alternately open and close said exhaust passages.

4. The combination with a pressure generator including a combustion chamber, and a freely movable piston in said chamber; of devices operable to force charges of combustible fuel under pressure alternately into the opposite ends of said chamber, for the purpose of generating pressure charges, each device including a nozzle positioned to discharge fuel into the end of said chamber, means at the end of the chamber remote from the nozzle end thereof operated by the movement of the piston to operate the device, intake passages and exhaust passages respectively in communication with the opposite ends of said chamber, a sleeve slidable in said chamber and operated by the movement of the piston, said sleeve and piston having passages therein registrable with each other and with the intake passages to admit charges of air under pressure into said chamber through said intake passages alternately, and said sleeve also serving to alternately open and close said exhaust passages to control the discharge of the pressure charges from said chamber through said exhaust passages alternately.

JOSEPH B. McKEOWN.