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DEVICE FOR ALTERNATING ATOMIZER PRESSURES.

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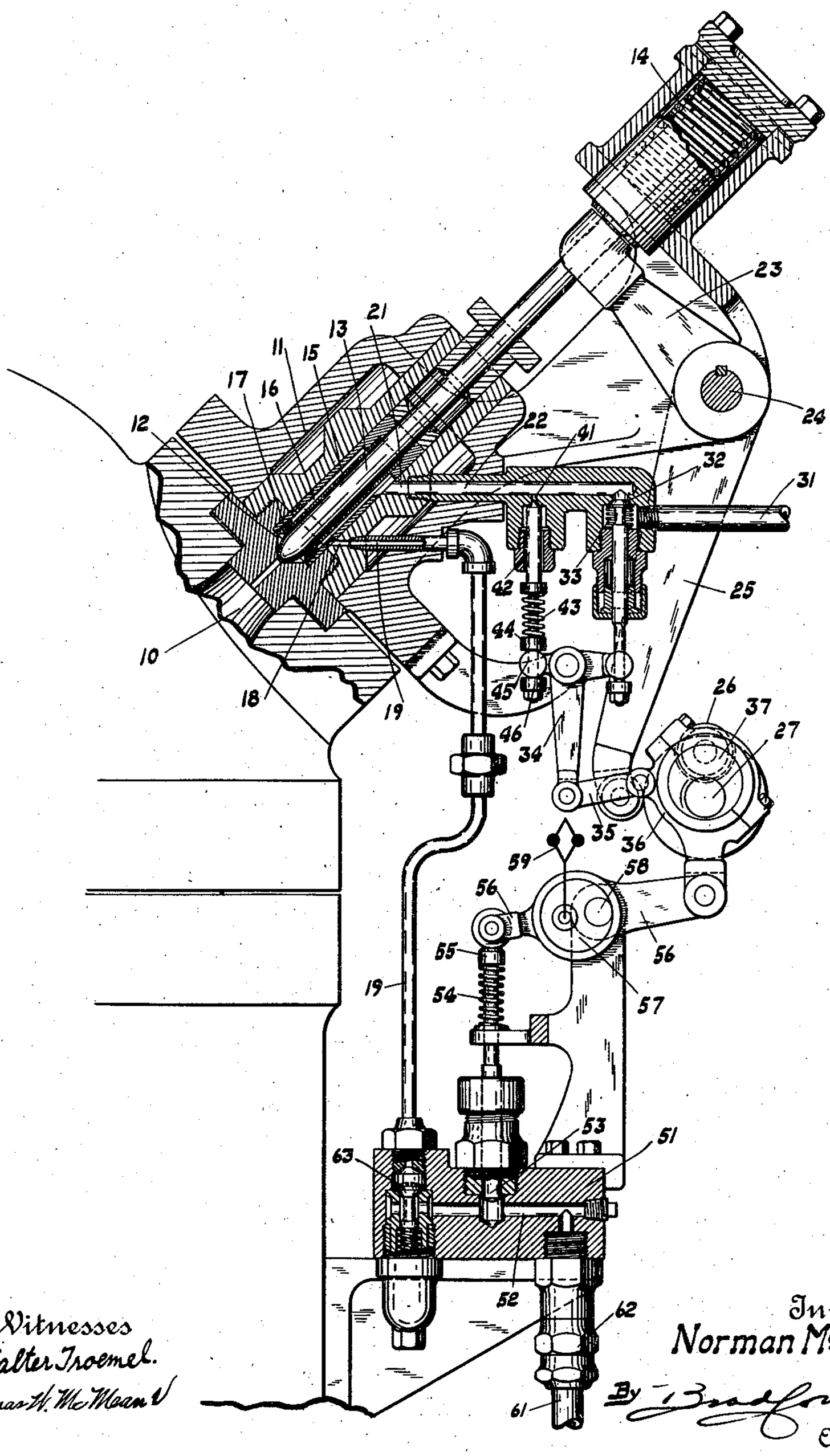
966,581. **Patented Aug. 9, 1910.**



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UNITED STATES PATENT OFFICE.

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DEVICE FOR ALTERNATING ATOMIZER-PRESSURES.

966,581. Specification of Letters Patent. Patented Aug. 9, 1910.

Application filed June 28, 1909. Serial No. 504,780.

To all whom it may concern:

Be it known that I, NORMAN McCARTY, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Devices for Alternating Atomizer-Pressures, of which the following is a specification.

In the operation of internal combustion engines, of the non-explosion type, liquid fuel is injected into the combustion chamber at a time when a considerable pressure (about 500 lbs.) has been developed in the combustion chamber, and it has heretofore been quite common to accomplish this injection of fuel by means of an atomizer supplied with air under about 1000 lbs. so that, when the atomizer valve is opened, the excessive air pressure delivered to the atomizer, is capable of forcing the liquid fuel into the combustion chamber. In such an apparatus, mechanism needs to be provided to force the liquid into the atomizer structure against the air pressure which is maintained therein and therefore in the pumping mechanisms heretofore commonly in use, it is difficult to provide means for automatically varying the quantity of liquid discharge to the atomizer in order to properly supply the motor with the amount of fuel necessary to carry the existing load on the motor. I have therefore conceived a new method of, and apparatus for, introducing liquid fuel into the combustion chamber of the motor by first bringing the liquid fuel to the point of injection under conditions which will not exert any great or material pressure upon the mechanism used to transport the fuel, subsequently exerting upon the charge of fuel a large pressure sufficient to produce injection thereof into the combustion chamber but under conditions which will not affect the fuel delivering mechanism, and then withdrawing or substantially reducing the pressure in the injecting means in order to facilitate the delivery to the injecting means of a new supply of fuel.

The accompanying drawing, which is partially in vertical section, illustrates an apparatus embodying my invention and capable of carrying out commercially my improved method.

In the drawings 10, indicates the combustion chamber of a motor and 11 indicates the atomizer structure of practically standard construction, said atomized structure having a valve-seat member 12 which communicates with the combustion chamber 10. Seated in seat 12 is a needle valve 13 which is normally held to its seat by a considerable pressure exerted by spring 14. The needle valve 13 lies within a tube 15 around which is formed an annular chamber 16 which delivers through small atomizing openings 17 to the valve seat 12. Leading into chamber 16, through a passage 18 near the lower end of the chamber, is a fuel pipe 19 and leading into the upper end of the chamber through a passage 21, is an air inlet 22. The needle valve 13 is intermittently moved from its seat by means of an arm 23 carried by a rock shaft 24 to which is connected a lever 25 engaging a cam 26 carried by a shaft 27 operated in any suitable manner by the motor.

Thus far the structure does not materially differ from structures now common in use. In the structures commonly in use, however, the air inlet 22 is directly connected with a supply pipe 31 so that a continuous pressure is maintained within the chamber 16. In the present form, I arrange, between pipe 31 and pipe 22, a valve 32 which is normally held closed by a spring 33 so as to normally prevent any passage of air from the supply pipe 31 to the pipe 22. Valve 32 may be intermittently moved from its seat by a lever 34 connected by a link 35 with an eccentric strap 36 mounted upon an eccentric 37 carried by shaft 27. In order that there may be times when there is no material pressure within chamber 16 I lead an exhaust passage 41 from pipe 22 and arrange an exhaust valve 42 to coöperate therewith. Valve 42 is normally held to its seat by means of a spring 43 one end of which engages the valve and the other end of which engages a collar 44 loosely mounted on the valve stem and continuously in engagement with an arm 45 connected with the lever 34. Arm 45 is also capable of engaging a collar 46 secured to the outer end of the stem of valve 42, the arrangement being such that arm 45 may have a limited play relative to the valve stem but at all times, except when it engages collar 46, serve to compress spring 43 and thus force the valve 42 to its seat to close passage 41.

Any suitable means may be provided for

delivering uniform, or variably measured, quantities of liquid to pipe 19. In the present drawings I have shown a pump body 51 into which is projected a displacing plunger 53 which is normally urged outwardly, relative to the chamber, by means of a spring 54 engaging a head 55 on the outer end of the plunger. The plunger is moved inwardly through its displacing movement by means of a lever 56 connected to the eccentric strap 36 and, in order that this lever may have a variable effect upon the plunger 53 and thus deliver variably measured quantities of liquid from the pump chamber, I pivot lever 56 upon an eccentric 57 carried by a rock shaft 58 and connect said rock shaft with a speed controlled governor 59 so that the governor will operate to shift the eccentric 57 and thus move the lever 56 toward and from the head 55 and thus vary the time during which the lever 56 will operate upon head 55 and thus vary the stroke of the plunger 53. Leading into chamber 52 is a supply pipe 61, in which is a suitable and usual inwardly opening check valve 62, and arranged between the pump chamber 52 and fuel pipe 19 is an outwardly opening check valve 63 of the usual form.

The operation is as follows: A suitable air pressure is maintained within pipe 31 and rotation of shaft 27 in the direction indicated by the arrow will swing lever 56 so as to permit spring 54 to retract plunger 53 and thus permit oil or other fuel to flow into pump chamber 52. At the same time valve 42 is held firmly to its seat so as to prevent any escape of air from passage 41 and valve 32 is withdrawn from its seat so as to permit the high pressure air to flow from pipe 31 through pipe 22 into chamber 16 and drive the liquid therein through passages 17 to valve seat 12. At the same time arm 23 serves to withdraw the needle valve 15 from its seat and permit the liquid to be driven into chamber 10. Immediately thereafter valve 32 is permitted to return to its seat and, immediately after it has returned to its seat, arm 45 engages collar 46 and withdraws valve 42 from its seat so as to open a communication through passage 41 from chamber 16 to atmosphere, thus relieving the pressure within chamber 16, and thereby relieves any undue loading on the governor due to atomizer pressure. Thereupon lever 56 engages head 55 so as to drive plunger 53 inwardly and force a measured quantity of liquid from pump chamber 52 past valve 63 into pipe 19, an equal quantity of oil flowing from said pipe into chamber 16 of the atomizer. This flow takes place at a time when there is only atmospheric pressure within chamber 16 and does not require any considerable pressure to be exerted upon plunger 53. Thereupon plunger 53 starts upon its return movement, valve 42 is returned to its seat, valve 32 is withdrawn from its seat, and the charge of liquid delivered to chamber 16 is driven into chamber 10 by the next charge of high pressure air received from pipe 31.

It will be noticed that the center of eccentric 57 is between the center of shaft 58 and that end of lever 56 which engages head 55 so that the comparatively small movement of the governor 59 will produce a larger movement of the lever relative to the head 55.

I claim as my invention:

1. The combination with an internal combustion engine, of a fuel chamber communicating with the combustion chamber of the engine, a valve arranged between said fuel chamber and combustion chamber, means for intermittently opening and closing said valve, a constant high pressure air supply connecting with the fuel chamber behind the valve, means for injecting successive quantities of fuel into the fuel chamber behind the valve, and means for intermittently connecting and disconnecting the fuel chamber with the air supply to cause an injection of the fuel from the fuel chamber into the combustion chamber when the valve is open.

2. The combination with an internal combustion engine, of a fuel chamber communicating with the combustion chamber of the engine, a valve arranged between said fuel chamber and combustion chamber, means for intermittently opening and closing said valve, a constant high pressure air supply connecting with the fuel chamber behind the valve, means for injecting successive variably measured quantities of fuel into the fuel chamber behind the valve, and means for intermittently connecting and disconnecting the fuel chamber with the air supply to cause an injection of the fuel from the fuel chamber into the combustion chamber when the valve is open.

3. The combination with an internal combustion engine, of a fuel chamber communicating with the combustion chamber of the engine, a valve arranged between said fuel chamber and combustion chamber, means for intermittently opening and closing said valve, a constant high pressure air supply connecting with the fuel chamber behind the valve, means for injecting successive quantities of fuel into the fuel chamber behind the valve, and means for intermittently connecting and disconnecting the fuel chamber with the air supply to cause an injection of the fuel from the fuel chamber into the combustion chamber when the valve is open, and for intermittently connecting the fuel chamber with atmosphere when the valve is closed.

4. The combination with an internal combustion engine, of a fuel chamber communicating with the combustion chamber of the

engine, a valve arranged between said fuel chamber and combustion chamber, means for intermittently opening and closing said valve, a constant high pressure air supply connecting with the fuel chamber behind the valve, means for injecting successive variably measured quantities of fuel into the fuel chamber behind the valve, and means for intermittently connecting and disconnecting the fuel chamber with the air supply to cause an injection of the fuel from the fuel chamber into the combustion chamber when the valve is open, and for intermittently connecting the fuel chamber with atmosphere when the valve is closed.

5. The combination with an internal combustion engine, of an atomizer structure delivering thereto, means for intermittently operating the valve of said atomizer, a fuel pipe leading into said atomizer, means for delivering successive quantities of liquid fuel to the atomizer through said pipe, an air pipe leading into the atomizer chamber, a valve arranged in said air pipe, an exhaust valve leading from said air pipe, and means for intermittently alternately actuating said valves, for the purpose set forth.

6. The combination with an internal combustion engine, of an atomizer structure delivering thereto, means for intermittently operating the valve of said atomizer, a fuel pipe leading into said atomizer, a pump delivering to said fuel pipe, speed controlled means automatically varying successive deliveries from said pump, an air pipe leading into the atomizer chamber, a valve arranged in said air pipe, an exhaust valve leading from said air pipe, and means for intermittently alternately actuating said valves, for the purpose set forth.

7. That improvement in the art of delivering liquid fuel to an internal combustion engine, which consists in delivering to an injection point, communicable with the combustion chamber but disconnected therefrom at the time of such delivery, successive quantities of liquid fuel; subsequently exerting upon said liquid fuel a fluid pressure in excess of the fluid pressure within the combustion chamber; opening communication between the injection point and the combustion chamber, whereby the liquid fuel is injected into the combustion chamber, and subsequently withdrawing the injection pressure from the injection point.

8. That improvement in the art of delivering liquid fuel to an internal combustion engine, which consists in delivering to an injection point, communicable with the combustion chamber but disconnected therefrom at the time of such delivery, variable measured successive quantities of liquid fuel; subsequently exerting upon said liquid fuel a fluid pressure in excess of the fluid pressure within the combustion chamber; opening communication between the injection point and the combustion chamber, whereby the liquid fuel is injected into the combustion chamber; and subsequently withdrawing the injection pressure from the injection point.

In witness whereof, I, have hereunto set my hand and seal at Indianapolis, Indiana, this twenty-second day of June, A. D. one thousand nine hundred and nine.

NORMAN McCARTY. [L. S.]

Witnesses:
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