N. McCARTY.

PUMP.

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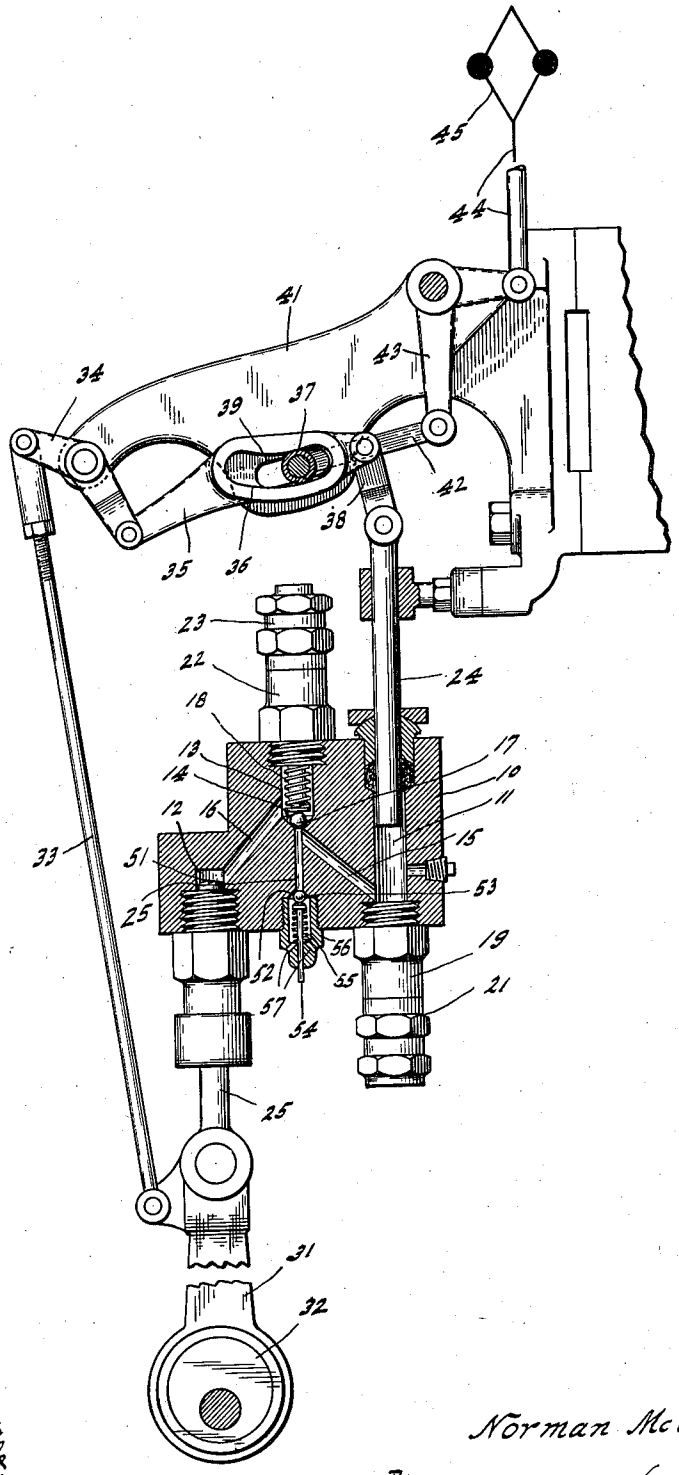
1,014,242.

Patented Jan. 9, 1912.



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UNITED STATES PATENT OFFICE.

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PUMP.

1,014,242. Specification of Letters Patent. Patented Jan. 9, 1912.

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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 a new and useful Pump, of which the following is a specification.

The object of my invention is to produce a two-stage pump of such character that imperfection of action of the valve between the two sections of the pump will be automatically compensated so as to prevent excessive delivery from the high stage side, and so as to permit automatic cleansing of the intermediate valve if the imperfection of the action thereof is due to sediment.

The accompanying drawing, which is a vertical section, illustrates my invention associated with automatic speed-controlled mechanism by means of which the discharge from the high pressure side may be automatically varied.

In the drawing, 10 indicates the main pump body having a low pressure chamber 11, a high pressure chamber 12, an intermediate valve chamber 13, intermediate valve seat 14, passage 15 connecting the low pressure chamber with the valve chamber and passage 16 connecting the intermediate valve chamber with the high pressure chamber. Arranged to seat upon seat 14, so as to normally prevent back flow from the high pressure chamber to the low pressure chamber, is a valve 17 which is normally held to its seat by means of a spring 18 which is of a strength but little greater than the suction value of plunger 25. The inlet 19 will be supplied with an inwardly opening check valve 21 of ordinary form. Leading from the valve chamber 13 is a delivery outlet 22, provided with an outwardly opening check valve 23 which delivers into a line in which a comparatively high pressure is maintained, the pump being primarily designed for use in delivering successive measured quantities of liquid fuel to an internal combustion engine of the slow combustion type where the liquid fuel is delivered through a nebulizer into a cylinder in which a preliminary high pressure, say five hundred or more pounds, has been attained. Projectable into and out of the low pressure chamber 11 is a low pressure plunger 24 and projectable into and out of the high pressure chamber 12 is a high pressure plunger 25.

Any suitable mechanism may be provided for properly moving the two plungers and the mechanism shown in the present drawing is merely illustrative of one form. In the form shown the high pressure plunger is given a uniform stroke by means of a pitman 31 and eccentric 32. A link 33 connects pitman 31 with a lever 34 which is connected to a lever 35 provided with an intermediate fulcrum slot 36 fulcrumed upon a sliding fulcrum 37. The opposite end of lever 35 is connected by a link 38 with the low pressure plunger 24. Fulcrum 37 is slidably mounted in a slot 39 formed in a suitable supporting bracket 41 and is connected by link 42 with the lever 43 which, in turn, is connected by a link 44 with a speed-controlled governor 45.

In the normal operation of the apparatus thus far described plunger 24 is withdrawn during the time when plunger 25 is being projected and upon withdrawal of plunger 24 fluid will be drawn into the low pressure chamber 11 past check valve 21. Upon the inner movement of plunger 24 the fluid within chamber 11 will be driven through passage 15 past valve 17 and through passage 16 into chamber 12, the check valve 23 preventing flow through the outlet passage 22 at this time because the chamber 12 is in condition to receive the charge. Upon the next outstroke of plunger 24 plunger 25 will make an instroke which will drive the fluid from chamber 12 out through outlet 22 past valve 23, valve 17 preventing return flow to the low pressure chamber, and the low pressure plunger will be drawn outwardly so as to draw an inward charge into the low pressure chamber 11. So long as valve 17 properly seats itself so as to permit only so much fluid to pass from chamber 11 to chamber 12 as will be driven thereto by the inward movement of plunger 24, the apparatus thus far described will work entirely satisfactorily, but when this apparatus is used as a pump for delivering successive governed quantities of liquid fuel to an internal combustion engine there is always possibility of sediment in the fuel and if this sediment lodges on the valve seat, or if for any other reason the valve fails to make a tight closure, the outstroke of the high pressure plunger 25 will produce a suction effect in chamber 11 which, if the instroke of the plunger 24 be less than the

outstroke of the plunger 25, will permit an undesired quantity of oil to be drawn over into the high pressure chamber and delivered from it to the engine, thus causing the engine to race. In order to avoid this difficulty therefore I provide a passage 51 which leads downwardly from the valve seat 14 and at the lower end of this passage I form a valve seat 52 onto which is pressed a valve 53 by means of a plunger 54. The plunger 54 is urged into position by a spring 55 which is of sufficient strength to hold the valve 53 seated against the action of the low pressure plunger 24, the spring 55 being thus considerably stronger than spring 18 but weaker than the check valve 23. Plunger 54 and spring 55 are carried in a casing 56 threaded into main body 10 and the casing is provided with suitable outlets 57. The operation of this relief device is as follows: If, for any reason, valve 17 does not properly seat upon an instroke of the high pressure plunger 25 then liquid from chamber 12 will be driven by plunger 25 through passage 16 and chamber 13 downwardly through the valve seat 14 and passage 51 past valve 52, instead of passing upwardly through the outlet 22. This downward flow of liquid across seat 14 will serve to clear the seat of sediment and permit the valve 17 to properly seat upon the next cycle of operation provided that imperfect seating of the valve was due to sediment and the operation of the device will therefore serve merely to miss one or two deliveries of fuel to the engine. If, however, there occurs any fault in the structure which prevents the proper seating of valve 17 for any material length of time the engineer will notice that fuel from the pump is being discharged through the outlets 57 at each stroke of the pump and he will thus know that the pump is in need of repair. Under any conditions however there can be no continued maximum delivery of fuel to the engine at a time when much less fuel is demanded by reason of the load and consequently there can be no possibility of racing the engine. It is not absolutely essential that the passage 51 lead downwardly from the valve seat 14 or that the valve seat 52 be upwardly presented but I deem this arrangement the best that can be made because then the direction of flow of liquid through passage 51 will be more likely to clear sediment from the valve seats.

In order that the function of the escape valve 53 may be thoroughly understood the action of the pump will be traced under such conditions as to cause a discharge of the oil through this valve. With the parts in the position shown in Fig. 1 a downward movement of plunger 25 will create a vacuum within the chamber 12 and passage 16 and if the valve 17 be properly seated there will be no flow of oil from the low pressure chamber 11 through passage 15 except as a result of the downward movement of plunger 24. The movement of this plunger is a variable one concurrent with the movement of plunger 25, the movement of plunger 25 causing a swinging of lever 34 and a combined swinging and oscillation of lever 35. Downward movement of plunger 24 will project a measured quantity of oil from chamber 11 through passage 15 past valve 17 into passage 16 and chamber 12, this amount varying from one or two drops to a full charge, depending upon the speed of the engine and its fuel requirements by reason of the action of the governor 45 upon fulcrum 37. On the up-stroke of plunger 25, which generally has a volume displacement greater than plunger 24, that amount of oil in chamber 12 and passage 16 which has been delivered by the previous action of plunger 24 will be ejected past the check valves 23 and delivered to the engine through its atomizing nozzle. If valve 17 be not properly seated however at the time of the in-stroke of plunger 25, the oil in chamber 12 and passage 16 will be driven backwardly past valve 17 into chamber 11. On the next down-stroke of plunger 25 and a concurrent downward or inward stroke of plunger 24, and with the valve 17 unseated, the plunger 25 will have an improper suction effect upon the inlet valves thus drawing into the pump structure an excessive amount of oil and enough to fill the entire interior of the pump. If it were possible for the next up-stroke of the plunger 25 to deliver this excessive amount of oil to the engine the engine speed would be enormously increased and the engine would "run away" and the governor would lose control of the pump. Instead of such an improper action however the next up-stroke of plunger 25 will discharge the excessive amount of fuel from passage 16 past valve 17 and, chamber 11 being full and unable to accommodate this excessive amount, because the upward movement of plunger 24 does not yield an equivalent volume to the volume displaced by the concurrent upward movement of plunger 25, the excessive oil will be driven out of the pump chambers past valve 53, because the resistance to the opening of the check valve 23 is much greater than the resistance of spring 55. If one or two such operations operate to wash the impediment from beneath valve 17, the delivery of fuel to the engine will be resumed in normal course; otherwise the pump will fail to deliver any fuel to the engine and the engine will come to a stop.

I claim as my invention:—

1. In a two-stage pump, the combination of a high pressure chamber, a low pressure chamber, a connection between said two

chambers, a valve arranged in said connection to normally prevent flow from the high pressure chamber to the low pressure chamber, means for intermittently delivering material from the low pressure chamber to the high pressure chamber, means for intermittently delivering the material from the high pressure chamber, and a valved delivery passage leading from the low pressure side of the valve between the two pressure chambers, the valve in said last mentioned passage opening outwardly and yielding only at a pressure in excess of the pressure normally developed in the low pressure chamber.

2. In a pump having a high pressure chamber, a low pressure chamber, a connection between said chambers, a valve seat formed in said connection, and a vent passage leading from the low pressure side of said valve seat, a valve seated in said valve seat and opening toward the high pressure chamber, a plunger arranged in the low pressure chamber, a plunger arranged in the high pressure chamber, an outwardly opening valve arranged in the vent passage, and means for normally holding said valve to its seat with a pressure exceeding the normal pressure developed in the low pressure chamber.

3. In a pump having a high pressure chamber, a low pressure chamber, a passage connecting said two chambers, an upwardly presented valve seat in said passage, a downwardly extending passage leading from said valve seat on the low pressure side, and an upwardly presented valve seat in said vent passage, a valve yieldingly seated upon the first mentioned valve seat and opening toward the high pressure chamber, a valve yieldingly seated upon the vent passage valve seat and opening downwardly, means for yieldingly urging said last mentioned valve to its seat by pressure exceeding the normal pressure developed in the low pressure chamber, a plunger in the low pressure chamber and a plunger in the high pressure chamber.

In witness whereof, I have hereunto set my hand and seal at Indianapolis, Indiana, this thirteenth day of April, A. D. one thousand nine hundred and eleven.

NORMAN McCARTY. [L. S.]

Witnesses:

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