F. H. BATES.

FUEL SUPPLY FOR GAS ENGINES.

APPLICATION FILED OCT. 12, 1908. RENEWED MAY 4, 1912.

1,051,364.

Patented Jan. 21, 1913.

2 SHEETS—SHEET 1.

Fig. 1

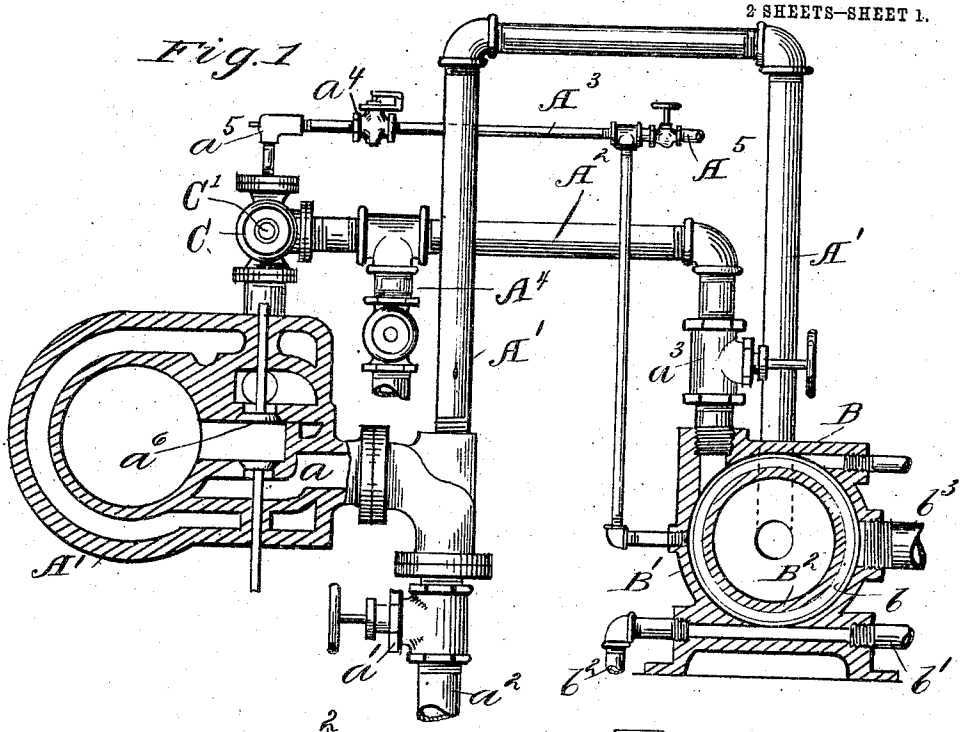
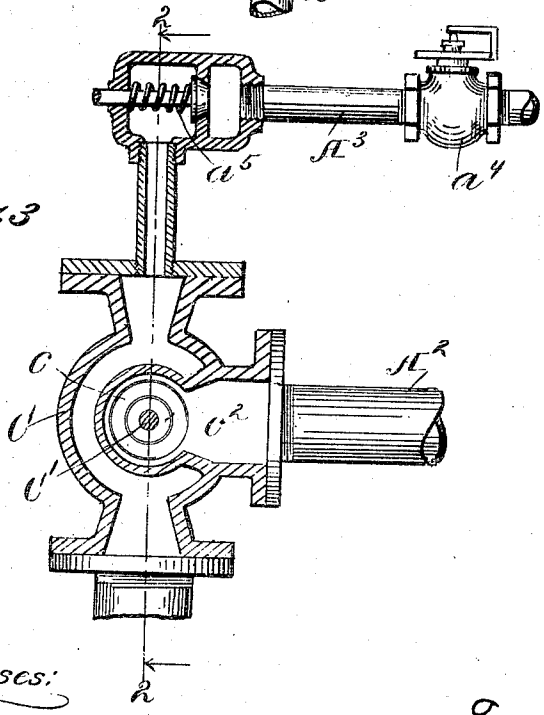


Fig. 3



Witnesses:

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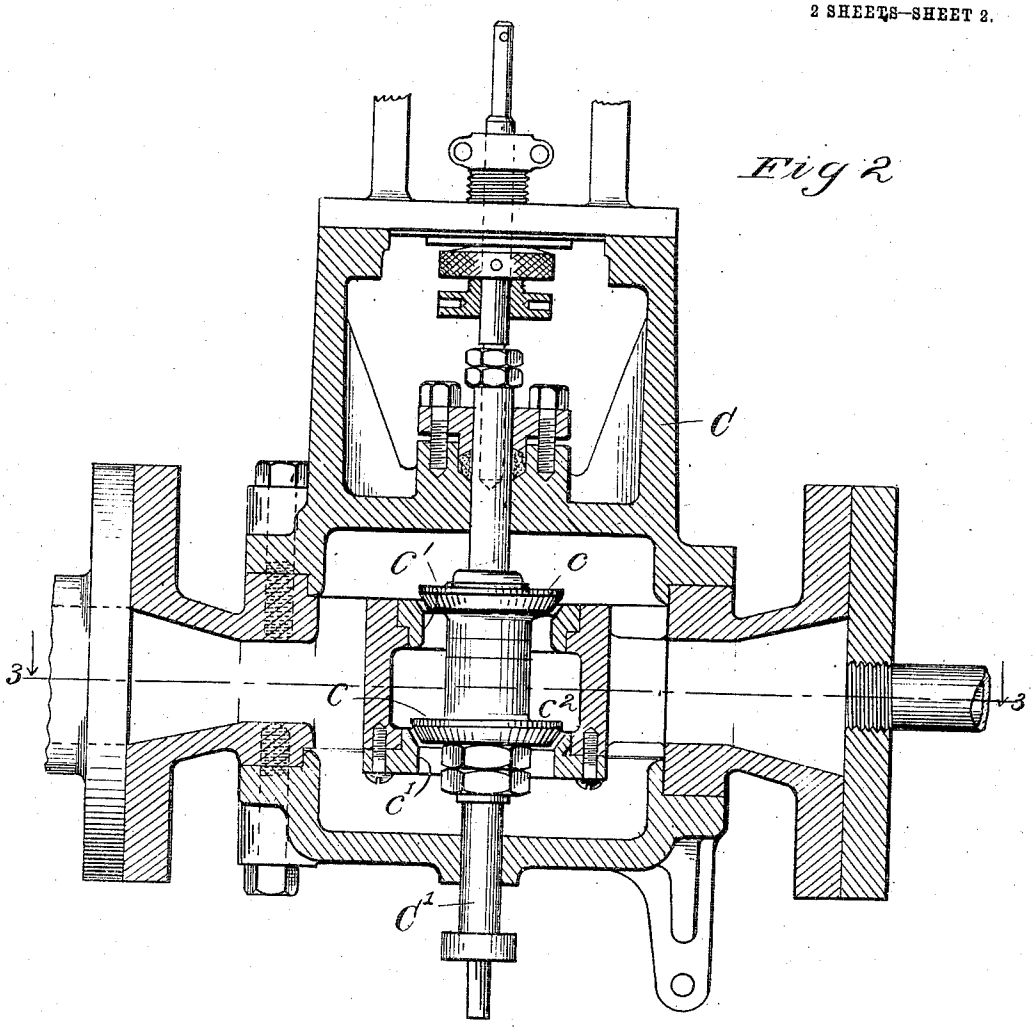
Fig 2



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UNITED STATES PATENT OFFICE.

FRANK H. BATES, OF ELYRIA, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO POWER PLANT ENGINEERING CO., A CORPORATION OF PENNSYLVANIA.

FUEL-SUPPLY FOR GAS-ENGINES.

1,051,364. Specification of Letters Patent. Patented Jan. 21, 1913.

Application filed October 12, 1906, Serial No. 457,218. Renewed May 4, 1912. Serial No. 695,316.

To all whom it may concern:

Be it known that I, FRANK H. BATES, a citizen of the United States, and a resident of Elyria, county of Lorain, and State of Ohio, have invented new and useful Improvements in Fuel-Supplies for Gas-Engines, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

The present invention has as its object the provision of improved means for supplying fuel, more particularly gaseous fuel, to explosive engines. The term fuel as employed herein, it should be prefaced, is intended to comprehend either gas derived from natural or artificial storage sources, or as in the case to be illustrated, from a generator for producing gas from oil or from a gas producer of any type using any fuel; it is therefore intended to connote either the gas by itself or admixed with a greater or less amount of air. In the case of the source being a generator of the character referred to, may be mixed with the gas the full quota of air necessary for its combustion, when introduced into the explosion chamber of the engine, although generally the hydro-carbon will predominate to such an extent as to necessitate a further addition of air from an outside source. The purpose in hand is the elimination of the difficulty frequently encountered in operating explosive engines of large capacity, when the supply of fuel is cut down by the governor under light running conditions, resulting in irregular firing, and consequent loss of efficiency.

To the accomplishment of the above and related ends, said invention, then, consists of the means hereinafter fully described, and particularly pointed out in the claims.

The annexed drawings and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings: Figure 1 represents, partly in plan and partly in section, the general layout of an engine and a fuel supply therefor, wherein are embodied my several improvements; Fig. 2, is a section on a larger scale of the governor valve and other connections interposed between the engine and the gas generator or producer; and Fig. 3 is a sectional view, on a plane at right angles to that of Fig. 2, through the same governing valve and other appurtenant parts.

Having reference first of all to the general disposition of the apparatus as shown in Fig. 1, A will be seen to designate the explosive engine or internal combustion motor to which the fuel is to be supplied. Such fuel is assumed in the present instance, to be gas derived from an oil gas producer B, details of the construction of which need not be particularly noted in the present connection, inasmuch as they form the subject matter of a separate application filed by me, May 29, 1908, Serial No. 435,628. It will suffice for the purpose in hand, to note that such generator comprises an outer stationary receptacle B′ that is of general cylindrical form, within which is rotatably mounted a cylindrical drum B^2, whereby an annular chamber b is in effect formed in the stationary drum or receptacle. This annular chamber b is designed to contain the oil being vaporized while the heating medium for thus vaporizing such oil body is passed through hollow shafts leading through the ends of the outer drum B′ to the interior of the revolving drum. By this means the surface of the latter is maintained at a proper temperature to volatilize the oil. Such oil is supplied to the annular chamber b through a pipe b' and may be drawn therefrom through another pipe b^2, control of the level of oil in such chamber being effected by any suitable apparatus (not shown). The heating medium thus utilized in connection with the generator for heating the inner rotatable drum, is designed in the present instance to consist of the exhaust gases from the engine A. These gases are conducted through an exhaust line A′ from the exhaust port a of the engine, and their amount is regulated by a control valve a' in a branch a^2 of such line A′ that opens direct into the air and constitutes the exhaust proper. The gases or vapors arising from the heated body of oil in the generator, either with or without a quantum of air admitted to chamber b through an air inlet pipe b^3 that may be suitably controlled in any usual fashion,

are conducted by a pipe A^2 that leads to the intake port of the engine and may be shut off when desired by means of a valve a^3. The final volume of air required to form a properly combustive mixture is admitted in the apparatus illustrated through a valve-controlled branch A^4 that preferably enters pipe A^2 near the governor valve, presently to be described, and indeed may be directly connected therewith, upon suitably modifying its construction to this end.

As usual in engines of the sort in hand, the supply of fuel, seen to consist in the present instance of oil vapor, is regulated by a valve C actuated by the engine governor. This valve illustrated in vertical section in Fig. 2, is of the lift valve type, and is made up of two members c c fitted to similarly directed valve seats wherewith the outwardly opening ports c' c' of the inner valve chamber e^2 are provided. Such inner valve chamber is connected (see Fig. 3) with the gas line A^2 leading from the generator, and the amount of gas supplied the engine will obviously be determined by movement of the valve, such movement being had through suitable connections (not shown) from the engine governor to the valve stem C′ as will be readily understood.

In addition to the main gas line heretofore constituting the only source of supply of gas to the engine, I connect with the outer or main valve casing C a separate line or duct A^3 that communicates directly with the outer chamber b of the producer, as shown in the Fig. 1. As in the cain line A^2, so here, provision for an additional admixture of air is made through a valve-controlled branch A^5, although it is contemplated that the fuel supplied through this pipe should be richer than normal. This line A^3 is of considerably smaller size than the main line, and preferably includes a dial cock a^4, whereby the flow of gas, or gaseous mixture, therethrough may be variously determined, and also a spring controlled valve a^5 adapted to open only upon the existence of a predetermined vacuum in the valve chamber C. The valve a^5, it will be understood, is not designed or required to sustain any of the back pressure from engine that being wholly cut off by the regular intake valve, a^6 nor will it always be necessary that such a valve be employed, the "leak" of fuel past cock a^4 being intended to be small at all events.

The operation of my improved gas supply should be obvious from the preceding description. Irrespective of the volume of fuel admitted through the regular throttle valve, controlled as it is, by the engine governor to vary such supply with the varying speed of the engine, there will at all times be admitted into the explosive chamber of the engine through the auxiliary fuel supply, a small pre-determined volume of fuel, which volume may be varied by the dial cock to suit the occasion. Adjustment of this valve, however, will ordinarily be necessary only at the time of installation, or when the character of the oil in the producer is changed, so that the same result could be secured by a proper calibration of the duct, and the valve entirely omitted. Where no control valve a^5 is employed a small amount of fuel will always be provided, irrespective of whether the governor valve closes down so as to shut off the regular supply of fuel entirely or not (such entire shutting off being apt to occur whenever the valve "chatters") and I always have the assurance of a sufficiency of fuel to prevent mis-firing. The result is much more even and smooth operation on the part of the engine, as has been fully demonstrated in actual practice. Where a valve, as a^5 is utilized, such auxiliary supply of course become available only when the governor valve so nearly closes as to cause a perceptible lowering of pressure in the valve chamber on the suction stroke of the engine piston. It should be remarked that this auxiliary fuel supply serves equally well to overcome any excess of air in the regular fuel supply, such air having been observed to predominate under certain circumstances when the throttle is nearly closed.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. The combination with an explosive engine and fuel supply therefor, of two separate connections between said engine and supply, one of said connections being externally controlled and the other automatically supplying fuel upon an increase in the suction effect of the engine.

2. The combination with an explosive engine and fuel supply therefor, of two separate connections between said engine and supply, and an externally operable valve adapted to control one of said connections, the other of said connections being directly responsive to the varying suction effect of the engine in supplying fuel thereto.

3. The combination with an explosive engine of separate means for supplying fuel thereto, means for controlling one of the said fuel supply means, and automatic means for permitting the other fuel supply means to supply fuel to the said engine upon an increase of suction effect of said engine irrespective of the condition of the supply means with which said controlling means is associated.

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4. The combination with an explosive engine and fuel supply therefor of two separate connections between said engine and supply, means for controlling the passage of fuel through one of said connections, and means acting automatically to supply fuel through the other of said connections upon an increase in suction effect of the engine.

5. The combination with an explosive engine and fuel supply therefor of two separate connections between said engine and supply, externally operable means for controlling the passage of fuel through one of said connections, and automatically acting means associated with the other of said connections to permit the passage of fuel through said other connection upon an increase in the suction effect of the engine.

6. The combination with an explosive engine and a source of fuel supply therefor of two separate connections between said engine and said source of supply, a valve adapted to control one of said connections, means for controlling the rate of flow through the other of said connections, and additional means acting automatically upon an increase of suction effect in said engine to permit the passage of fuel through said other connection.

7. The combination of an explosive engine, a source of fuel supply therefor, a main supply connection between said source and said engine, a valve for controlling the said connection, a supplemental fuel supply connection between the said source and the said engine, and means interiorly of the said supplemental connection which is responsive to variations of pressure in the said engine for permitting a supply of fuel therethrough irrespective of the condition of the first-named connection.

8. The combination of an explosive engine, a source of fuel supply therefor, a main fuel supply connection between said source and said engine, a valve for controlling the said connection, a supplemental fuel supply connection between the said source and the said engine, means for regulating the rate of flow of said fuel through said supplemental connection, and means interiorly of said supplemental connection responsive to variations of pressure in the said engine for permitting a supply of fuel therethrough irrespective of the condition of the first-named connection.

9. The combination with an explosive engine and a fuel supply therefor, of two separate connections between said engine and supply, a valve adapted to control one of said connections, and a spring-controlled valve in the other of said connections, said last-named valve opening to supply fuel to the engine under the increasing suction effect of said engine as said first valve approaches a closed position.

10. The combination with an explosive engine and a fuel supply therefor, of two separate connections between said engine and supply, a valve adapted to control one of said connections, a spring-controlled valve in the other of said connections, said last-named valve opening to supply fuel to the engine under the increasing suction effect of said engine as said first valve approaches a closed position, and a dial cock for limiting the amount of fuel thus supplied through said spring-controlled valve.

Signed by me this 8th day of October, 1908.

FRANK H. BATES.

Attested by—
MARY GLADWELL,
JNO. F. OBERLIN.