B. M. ASLAKSON.

GAS ENGINE.

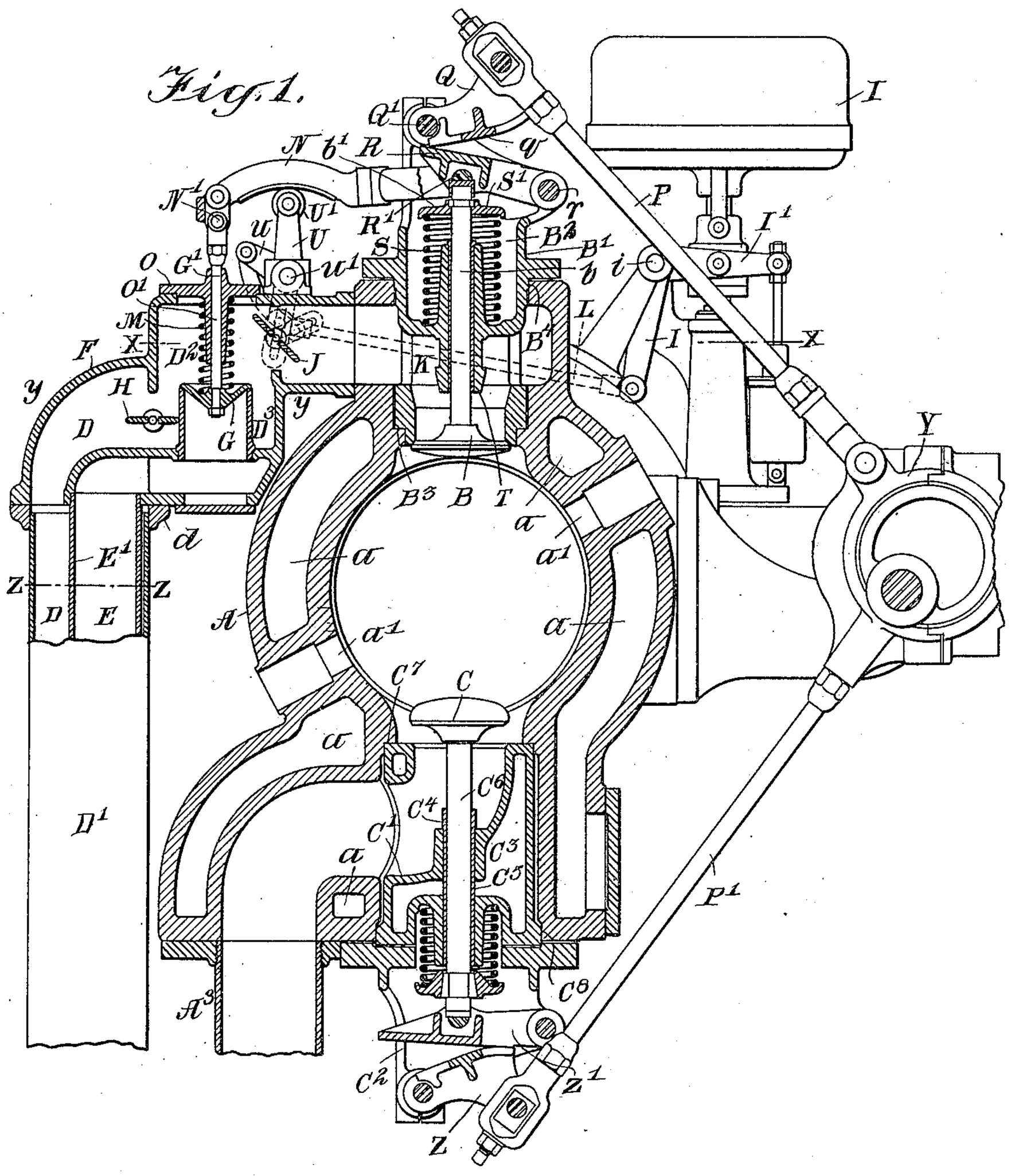
APPLICATION FILED OCT. 19, 1907.

999,426.

Patented Aug. 1, 1911.

4 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

Wm. Paxton

Virginia Geis.

INVENTOR

Baxter M. Aslakson

BY

Frank H. Ashley

ATTORNEY

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

B. M. ASLAKSON.

GAS ENGINE.

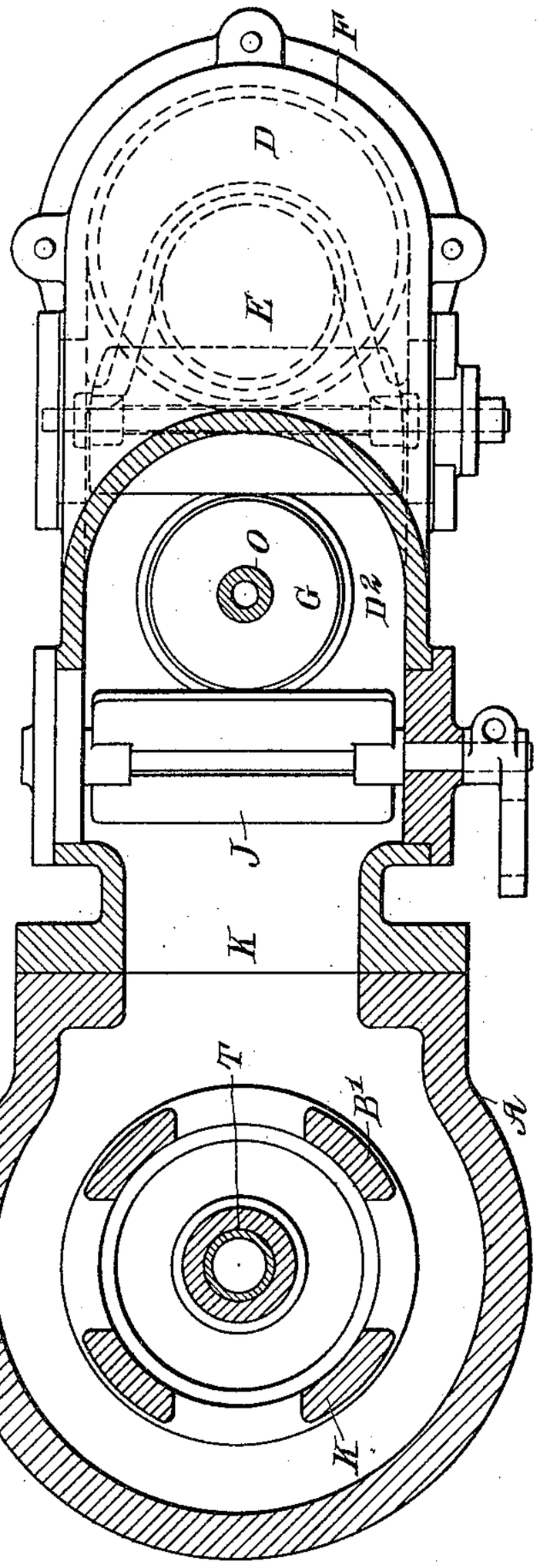
APPLICATION FILED OCT. 19, 1907.

999,426.

Patented Aug. 1, 1911.

4 SHEETS—SHEET 2.

Fig. 2.



WITNESSES:

Wm Paylen

Virginia Geis

INVENTOR

Baxter M. Aslakson

BY

Frank P. Stanley

ATTORNEY

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

B. M. ASLAKSON.

GAS ENGINE.

APPLICATION FILED OCT. 19, 1907.

999,426.

Patented Aug. 1, 1911.

4 SHEETS—SHEET 3.

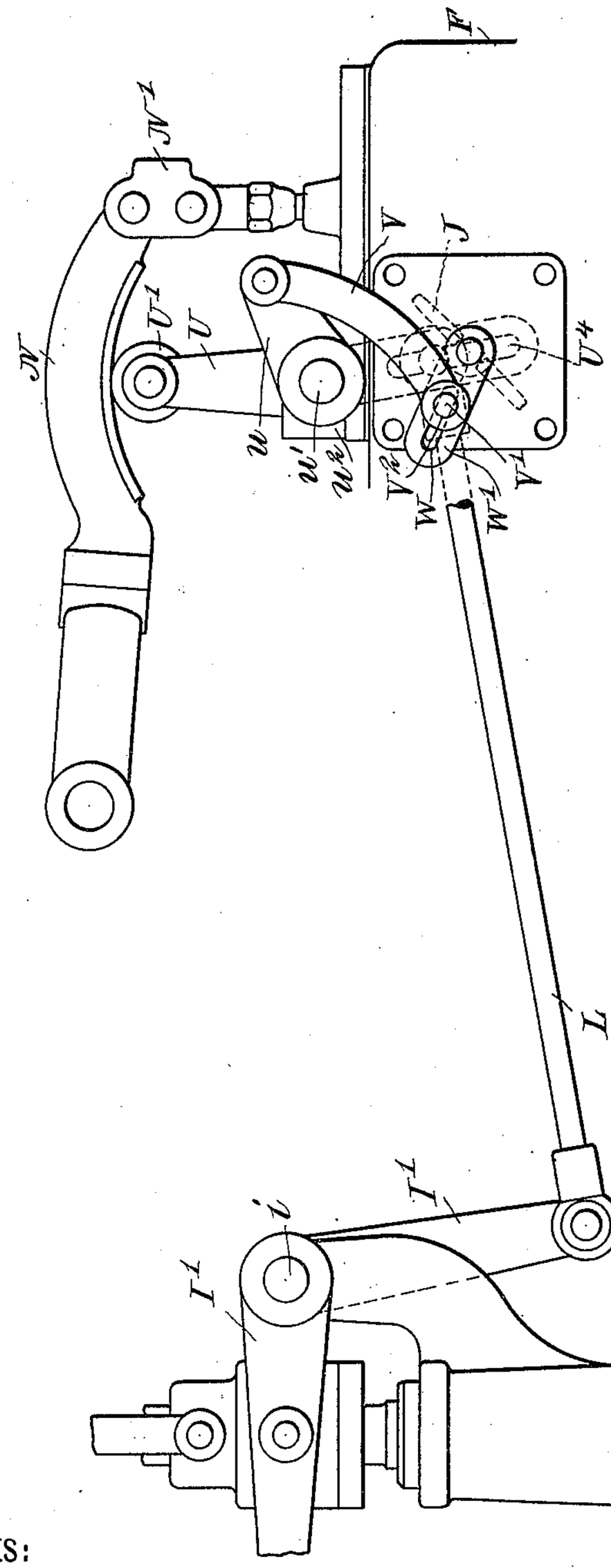


Fig. 3.

WITNESSES:

Wm. Payton

Virginia Geis

INVENTOR

Baxter M. Aslakson

BY

Frank H. Ashley

ATTORNEY

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

B. M. ASLAKSON.

GAS ENGINE.

APPLICATION FILED OCT. 19, 1907.

999,426.

Patented Aug. 1, 1911.

4 SHEETS—SHEET 4.

Fig. 4

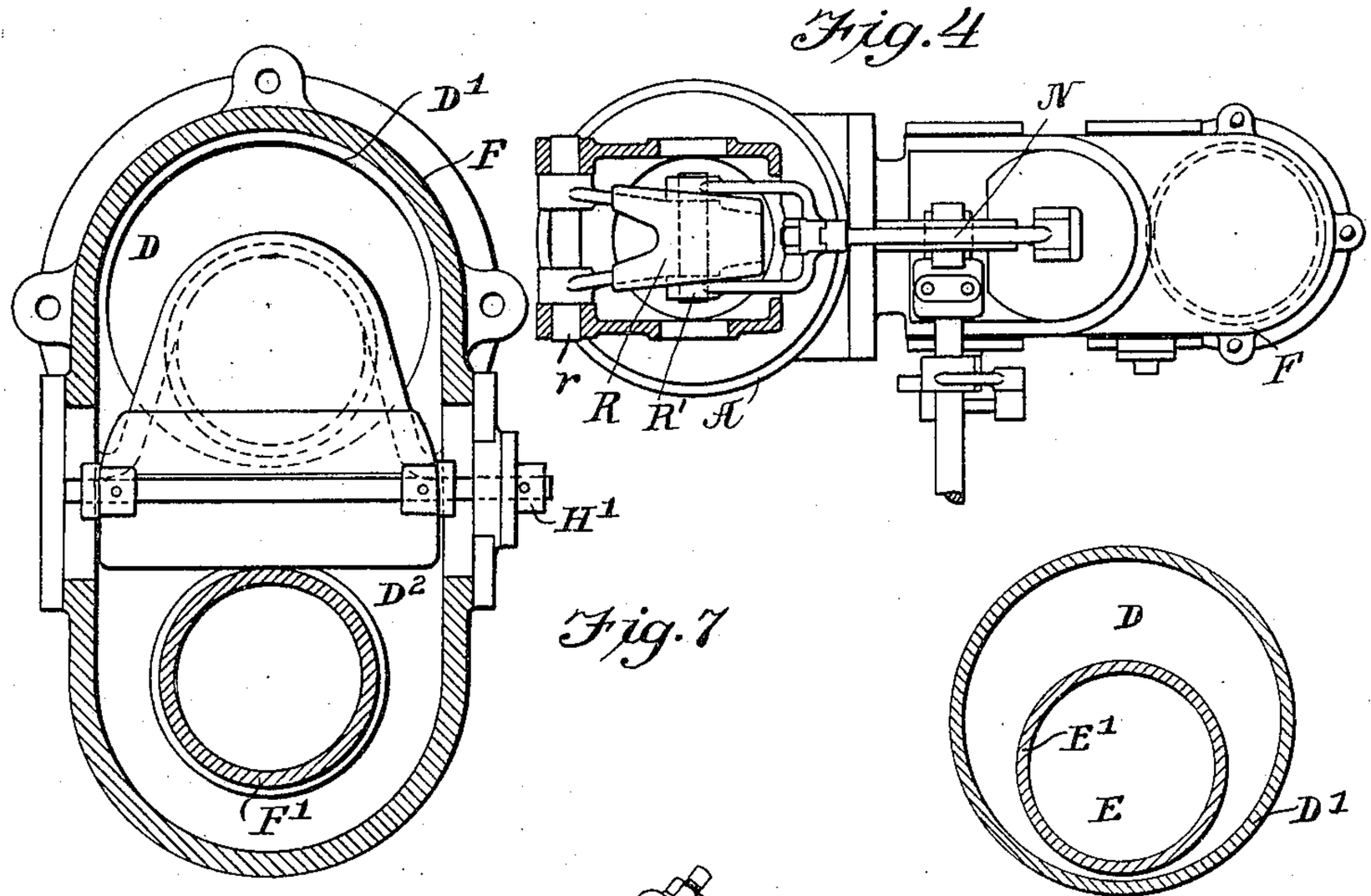


Fig. 7

Fig. 6

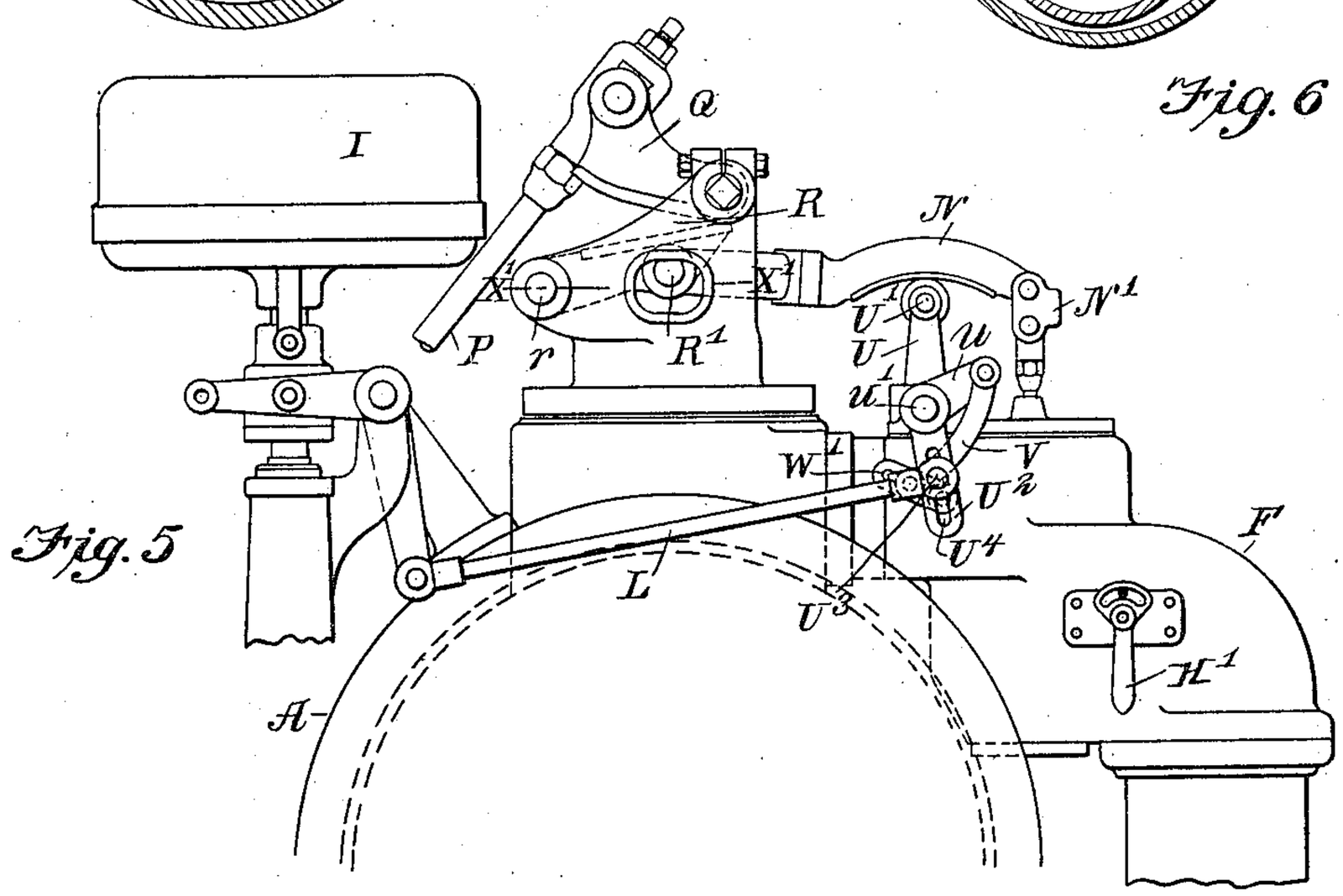


Fig. 5

WITNESSES:

Wm Paxton

Virginia Geis.

INVENTOR

Baxter M. Aslakson

BY

Frank H. Ashley

ATTORNEY

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

BAXTER M. ASLAKSON, OF SALEM, OHIO.

GAS-ENGINE.

999,426. Specification of Letters Patent. **Patented Aug. 1, 1911.**

Application filed October 19, 1907. Serial No. 398,156.

To all whom it may concern:

Be it known that I, BAXTER M. ASLAKSON, a citizen of the United States, and resident of Salem, in the county of Columbiana and State of Ohio, have invented certain new and useful Improvements in Gas-Engines, of which the following is a specification.

My invention relates to gas engines and the objects of my invention are to provide an improved construction whereby the air and gas can be effectively controlled and mixed before entering the cylinder of the engine, and to govern the volume of fuel admitted to the cylinder, and also to present a more compact construction for a given size of engine.

The novel features are clearly set forth in the subsequent detailed description and clearly pointed out in the claims.

In the accompanying drawings forming part of this specification,—Figure 1, is a vertical cross sectional view through the cylinder, inlet and exhaust valves and air and gas conduits of a gas engine, the air and gas controlling valves and means employed for operating the valves, being also disclosed. Fig. 2, is an enlarged sectional plan view of Fig. 1, on the broken line *x*—*x*, thereof, disclosing the control valve for the fuel charge, which is automatically operated by the governor. Fig. 3, is an enlarged detail view of the means employed for operating the control valve, said means being viewed from a position opposite to that in which they are indicated in Fig. 1. Fig. 4, is a reduced plan view, partly in section on the plane indicated by the line *x'*—*x'*, Fig. 5. Fig. 5, is an exterior view of the valve casings with the valve operating means as these parts appear from the side opposite to that shown in Fig. 1. Fig. 6, is an enlarged cross sectional detail plan view of the air and gas conduits, the plane of section being that indicated by the broken line *z*—*z*, Fig. 1. Fig. 7, is an enlarged cross sectional detail plan view on the line *y*—*y*, Fig. 1, disclosing the manually operated air-control valve.

One end is shown of a working cylinder A, of a gas engine, having the usual water cooling chambers *a*—*a*, etc., and openings *a'*—*a'*, for sparking devices. The inlet valve B, is seated in a removable valve casing B', and the exhaust valve C, is seated in a removable valve casing C', each of said valve casings being located in openings cored in the cylinder casing and each being provided with conduits or passageways through which the gases flow.

D, indicates the main conduit for air and E, the main conduit for gas.

D' is a pipe held by a flange *d* to the casing F, and E' is a pipe located within pipe D', and connected to casing F so that conduit E will extend to the gas control valve G. It will be noted that the casing F serves as a housing for all of the valves except the cylinder inlet and exhaust valves. The valve H controls the admission of air to the mixing chamber D^2, and is manually set in a proper position to admit the required volume. The valve G controls the admission of gas to the mixing chamber D^2 and is automatically controlled by the governor I. The valve J controls the admission of the mixed gases comprising the fuel charge to the chamber K, presented by the valve casing B', and said valve J, is automatically operated by the governor I and by means of the same rod L through which motion is transmitted to control valve G. This latter valve G, is of the mushroom type and closes on the top of a cylindrical seat F', the cone shape of said valve on its under side permitting the supply of gas to be graduated, dependent upon the distance the valve is from its seat. The valve C, is held to its seat by a spring M, which also acts to hold the lever N in its lowest position by reason of the connection of same with the valve rod G'. The valve G, may be removed through the opening covered by a cap O, which has a central bore O' serving as a guide for the valve rod G'. A link N' provides for the necessary relative lateral movement between the rod G' and lever N.

The eccentric rods P and P', operate the inlet valve B, and exhaust valve C, respectively, through the instrumentality of an eccentric mounted on a lay shaft and driven from the main shaft of the engine in the usual manner. The eccentric rod P, is directly connected to a rock lever Q which is pivoted at Q' to the top of the valve casing B', and the face *q*, of said lever, is adapted to rock on the top of a lever R pivoted at *r* to the casing B'.

Pivoted to the lever R on a shaft R' is the bifurcated lever N, the end of which at the shaft R', is carried downward with the movement of the lever R, the under side of

the shaft R′ being flattened at its middle to allow the flat portion to rest on the capped end *b′* of the valve rod *b*.

Located in an annular chamber B^2, in the casing B′, is a spring S, the bottom of which rests against the casing and the top end of which abuts a flange which is connected to the valve rod *b*, and serves to hold same, together with valve B in its upper position.

T, indicates a guideway lining which is firmly attached to the casing B′ by frictional engagement therewith, and its inner surface has a close sliding fit with the valve rod *b*.

U, indicates a bell-crank lever having a roller U′ at one end, to reduce friction when moving in contact with the under side of the lever N, which lever N is curved to form an arc of a circle on its under side. The vertical member of the bell-crank lever serves as a movable fulcrum for the lever N, by means of which the degree of the opening movement of the valve G is governed. Connected to the arm *u* of the bell-crank lever U, is one end of a curved cast member V, which has at its opposite end, a boss V^2, provided with a laterally extending pin V′ extending into the slot W of a link W′, one end of which is connected to a journal of the valve J. The bell-crank lever is composed of three members, U, *u* and *u′* respectively, *u′* being a shaft which extends longitudinally of the engine and is held in a box bearing U^2, at one end.

The bell-crank lever I′, to which the rod L, is connected, is pivoted at *i*, and operated by the governor I in the usual manner well known in the art.

The exhaust valve C, is operated by mechanism arranged practically the same as that described for the operation of valve B, and is clearly shown by the drawings. The casing C′, and the housing C^2, are however, made in two parts, instead of integral as the casing B′, and the part C′, is cast hollow thus forming a chamber C^3 which may be used as a water jacket. A lining C^4 spans the opening C^5, and serves as a guide for the valve rod C^6, and also prevents water from leaking past said rod. Both casings B′ and C′ are seated firmly in the cylinder casting at B^3 and C^7 respectively, and their opposite ends are fitted in sliding engagement with the borings at B^4 and C^8 respectively, thus preventing leakage at these points. It will be noted that the cylinder casing is extended at the exhaust portion and water jacketed so that the hot gases may be cooled to some extent before entering the exhaust pipe A^3.

In Figs. 3 and 5, I show by dotted and full lines respectively, a lever consisting of an extended slotted link U^2 connected to the shaft U′ at one end and rod L at the other, by means of which the levers U and *u* are operated. The slot U^4 in the lever U^2 permits the degree of throw of the lever to be increased or diminished relative to the movement of rod L, and the slot W in lever W′ permits the same function to be performed in this lever relative to lever V, so that each is independently adjustable.

Since the principal factor conducive to a high thermal economy is a high compression, it follows that the ideal method of regulation would be to maintain a constant degree of compression at all loads. With such arrangement, a gas engine would have more nearly a uniform thermal economy under all loads. Such a method of regulation could be carried out by regulating the quality of the mixture to suit any load variation but the practicability of this system fails at the low loads since the mixtures become too attenuated to ignite properly. I therefore have devised a system which combines the quality and quantity system of regulation.

Assuming the engine to be fully loaded, and then the load falling off gradually to merely a friction load, if the load falls from 100% to 25% the quality of the mixture alone is varied, the compression being nearly constant, below 25% of normal load throttling begins and compression begins to drop.

In operation, air is conducted through the conduit D to flow past the valve H, which latter is set in a predetermined position and may be adjusted manually while the engine is running by means of lever H′ attached to said valve. The air then flows into the annular channel D^3 and to the chamber D^2. In passing from said channel to said chamber, the air mixes with the gas which is released by the valve G, from the conduit E, and the mixture is then controlled by valve J, which is automatically operated by the governor I. The fuel charge is admitted to the interior of the cylinder A, by inlet valve B, which is operated by the eccentric Y and coöperative instrumentalities P, Q, R and S, as previously described. The speed of the engine is maintained under variable loads by the governor and coöperating parts, which operate the gas valve G and charge valve J, as follows: Assuming the engine to be operating under a normal load and the position of the bell-crank member U being vertical as shown in Fig. 5, the downward stroke of the lever R would lift the valve G a certain distance from its seat and admit gas to the chamber D^2 in proportion to the lift, the wheel U′ being the fulcrum on which the member N rocks. Now suppose the load on the engine is increased, the governor will force the rod L farther to the right, thus forcing wheel U′ to the left, thereby shortening the distance from the

fulcrum to the shaft R′, and therefore the downward stroke of lever R will raise the valve G higher from its seat and more gas will flow to the chamber D^2. An increase in the speed of the engine will operate to throw the lever U to the right and thus decrease the amount of gas admitted to the chamber D^2. The movement of this governor also controls the valve J by reason of the connection with the same through the link W′, and a very nice adjustment of the relative gases admitted to the cylinder is maintained. When the mixture of gas and air is reduced to a minimum of gas and the ignition is reaching a point where it would fail to quickly fire the charge, the valve J begins to restrict the volume of fuel flowing to the cylinder, and compression is then slowly reduced to govern the speed of the engine. The spring M serves to assist gravity in seating valve G and to hold lever N in contact with wheel U′.

The exhaust valve C is operated by an eccentric through the rod P′ and the rock levers Z and Z′ in a manner readily understood by those skilled in this art.

The construction above described is simple, effective and durable and is economical in its use of fuel for a given power generated.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is—

1. A gas engine containing a fuel chamber and comprising a valve between the chamber and a working cylinder, controlling the fuel admission to the latter, an inlet valve controlling the charge supply, to the fuel chamber, an inlet valve controlling the gas supply for the fuel and arranged to open independent of the charge supply valve, valve rods, pivoted levers adapted to depress one valve rod and elevate the other to unseat the first and last named valves, and means actuated from the engine for operating said lever.

2. A gas engine containing a fuel chamber and comprising a valve between the fuel chamber and a working cylinder, controlling the fuel admission to the latter, a valve controlling the charge supply, to the fuel chamber, pivoted levers adapted to unseat said first and last named valves, means actuated from the engine for operating the lever, and a variable fulcrum for said levers, controlled from the engine governor.

3. A gas engine containing a fuel chamber and comprising a spring-seated valve between the fuel chamber and a working cylinder, controlling the fuel admission to the latter, a spring-seated inlet valve controlling the gas supply for the fuel, a pivoted lever adapted to simultaneously unseat said valves, a valve operated by the governor and controlling the flow of fuel to the fuel chamber, means actuated from the engine for operating the lever, and a variable fulcrum for said lever, controlled from the engine governor.

4. A gas engine containing a fuel chamber and comprising a valve between the chamber and a working cylinder, controlling the fuel admission to the latter, an inlet valve controlling the gas supply for the fuel, a pivoted lever adapted to unseat said valves, a separately operated charge valve controlling communication with the fuel chamber, means actuated from the engine for operating the lever, and means operable from the governor for controlling the charge valve.

5. A gas engine containing a fuel chamber and comprising a valve between the chamber and a working cylinder, controlling the fuel admission to the latter, an inlet valve controlling the gas supply for the fuel, a pivoted lever adapted to unseat said valves, a separately operated charge valve controlling communication with the fuel chamber, means actuated from the engine for operating the lever, a variable fulcrum for said lever, said fulcrum and charge valve being controlled from the engine governor.

6. A gas engine containing a fuel chamber and comprising a spring-seated valve between the chamber and a working cylinder, controlling the fuel admission to the latter, a spring-seated inlet valve controlling the gas supply for the fuel, a pivoted lever adapted to simultaneously unseat said valves, a separately operated charge valve controlling communication with the fuel chamber, means actuated from the engine for operating the lever, a variable fulcrum for said lever, said fulcrum and charge valve being controlled from the engine governor.

7. A gas engine containing a fuel chamber and comprising a valve between the fuel chamber and a working cylinder, controlling the fuel admission to the latter, an externally extending valve rod, an inlet valve controlling the gas supply for the fuel, a pivoted lever having a shaft with a flattened under side for contact with the valve rod, a second lever hung on said shaft, having an intermediate fulcrum and in operative relation with the inlet valve, and means for actuating the first lever and through it, the second lever, to unseat the valves.

8. A gas engine containing a fuel chamber and comprising a spring seated valve between the fuel chamber and a working cylinder, controlling the fuel admission to the latter, an externally extending valve rod, a spring seated inlet valve controlling the gas supply for the fuel, a pivoted lever with a shaft having a portion for contact with the valve rod, a second lever with a bifurcated part hung on said shaft, said second lever having an intermediate fulcrum and in op-

erative relation with the inlet valve, and means for actuating the first lever and through it, the second lever, to unseat the valves, said means comprising a lay shaft, an eccentric mounted thereon, and a rod connecting said eccentric and said first lever.

9. A gas engine comprising a cylinder, a mixing chamber communicating directly therewith, a valve between same, pipes for supplying air and gas to said chamber, the gas pipe being within the air pipe, and valves for separately controlling the air and gas admission to said chamber.

10. A gas engine comprising mixing and charge receiving chambers, pipes for supplying air and gas to the mixing chamber, the gas pipe being within the air pipe, valves for independently controlling the air and gas admission, and a valve controlling the admission to the charge receiving chamber.

11. A gas engine comprising mixing and charge receiving chambers, pipes for supplying air and gas to the mixing chamber, the gas pipe being within the air pipe, valves for independently controlling the air and gas admission, and a valve automatically controlling the admission to the charge receiving chamber.

12. A gas engine having a cylinder, a mixing chamber in direct communication therewith, a valve between same, and an annular air conduit in normal open communication with said mixing chamber, a gas conduit having an inlet within said air conduit, and a valve automatically controlling said inlet and inclined at its under side to graduate and spray the supply of gas into the air in said mixing chamber.

13. A gas engine containing a mixing chamber and an annular air conduit in normal open communication therewith, a valve controlling said conduit, a gas conduit having an inlet within said air conduit, a valve controlling said inlet and inclined at its under side to graduate and spray the supply of gas to the mixing chamber, means operated from the engine for unseating said valve, and separate means operable from the governor for controlling the extent of said unseating movement.

14. The combination with a valve-seat and a valve therefor, of a bell-crank lever; a lever fulcrumed on one member of the bell-crank lever and connected to the valve; means for vibrating the last mentioned lever on its fulcrum; means connected with the bell-crank lever for controlling the fulcrum member of the same; and an eccentric and rod for operating said levers with the exception of said bell-crank lever, said rod being connected directly to said eccentric at one end and to one of said levers at its opposite end.

15. The combination with a valve seat and a valve therefor, of a bell-crank lever, a slotted link pivotally movable with said bell-crank, a second lever fulcrumed on one member of the bell-crank lever and connected to the valve, means for vibrating said second lever, a curved member connected with the other member of the bell-crank lever and with a rod operable from a governor, and an engagement with the link whereby as the rod is moved said engagement moves near to the bell-crank pivot and increases the ratio of movement of the fulcrum member.

16. A gas engine containing mixing and charge receiving chambers and air and gas inlets communicating with the mixing chamber, a manually operated valve for limiting the flow of air through said air inlet, a valve controlling the gas inlet and a charge valve for the receiving chamber, a bell-crank lever, a second lever fulcrumed on one member of the bell-crank lever and connected to the gas inlet valve, means for vibrating the second lever, and means connected with the other member of the bell-crank lever and with the charge valve for operating both said lever and valve, and an eccentric and rods for actuating said levers.

17. A gas engine containing mixing and charge receiving chambers and air and gas inlets communicating with the mixing chamber, a valve for limiting the flow of air through said air inlet, a valve controlling the gas inlet and a charge valve for the receiving chamber, a bell-crank lever, a second lever fulcrumed on one member of the bell-crank lever and connected to the gas inlet valve, means for vibrating the second lever, and means connected with the other member of the bell-crank lever and with the charge valve and adapted to automatically operate both said lever and valve.

18. A gas engine containing mixing and charge receiving chambers and air and gas inlets communicating with the mixing chamber, a valve for limiting the flow of air through said air inlet, a valve controlling the gas inlet and a charge valve for the receiving chamber, a bell-crank lever, a second lever fulcrumed on one member of the bell-crank lever and connected to the gas inlet valve, means for vibrating the second lever, and means operable from the governor and connected to the bell-crank lever and to the charge valve for operating both of the same.

19. The combination with a valve-seat and a valve therefor, of a pivoted member having a roller, a lever connected to the valve and having a curved surface bearing on said roller to provide a fulcrum, means for operating said lever, and means for controlling the position of the pivoted member.

20. A gas engine containing mixing and charge receiving chambers and air and gas inlets communicating with the mixing cham-

ber, a working cylinder communicating with the receiving chamber, a valve controlling the cylinder admission, means for operating said valve, a valve for the gas inlet, a valve for the air inlet and a charge valve for the receiving chamber, a pivoted member, a lever fulcrumed on said member and connected both with the gas inlet valve and the admission valve-operating means, and means operable from the governor for controlling the fulcrum member and the charge valve.

21. A gas engine containing mixing and charge receiving chambers and air and gas inlets communicating with the mixing chamber, a working cylinder communicating with the receiving chamber, a valve controlling the cylinder admission, means for operating said valve, a valve for the gas inlet and a charge valve for the receiving chamber, a bell-crank lever, a second lever fulcrumed on one member of the bell-crank lever and connected both with the gas inlet valve, and the means for operating the cylinder admission valve, and means operable from the engine governor and connected to the other member of the bell-crank lever and with the charge valve.

22. A gas engine containing mixing and charge receiving chambers and air and gas inlets communicating with the mixing chamber, a working cylinder communicating with the receiving chamber, a valve controlling the cylinder admission, means for operating said valve, a valve for the gas inlet and a charge valve for the receiving chamber, a bell-crank lever, a second lever fulcrumed on one member of the bell-crank lever and connected both with the gas inlet valve and the means for operating the cylinder admission valve, a slotted link pivotally movable with the bell-crank lever, a curved member connected with said bell-crank lever and with a rod operable from the engine governor, and having a sliding connection with the slotted link and connected with the charge valve.

Signed at Salem in the county of Columbiana and State of Ohio this eighth day of October A. D. 1907.

BAXTER M. ASLAKSON.

Witnesses:
FRANK M. ASHLEY,
W. G. HARD.