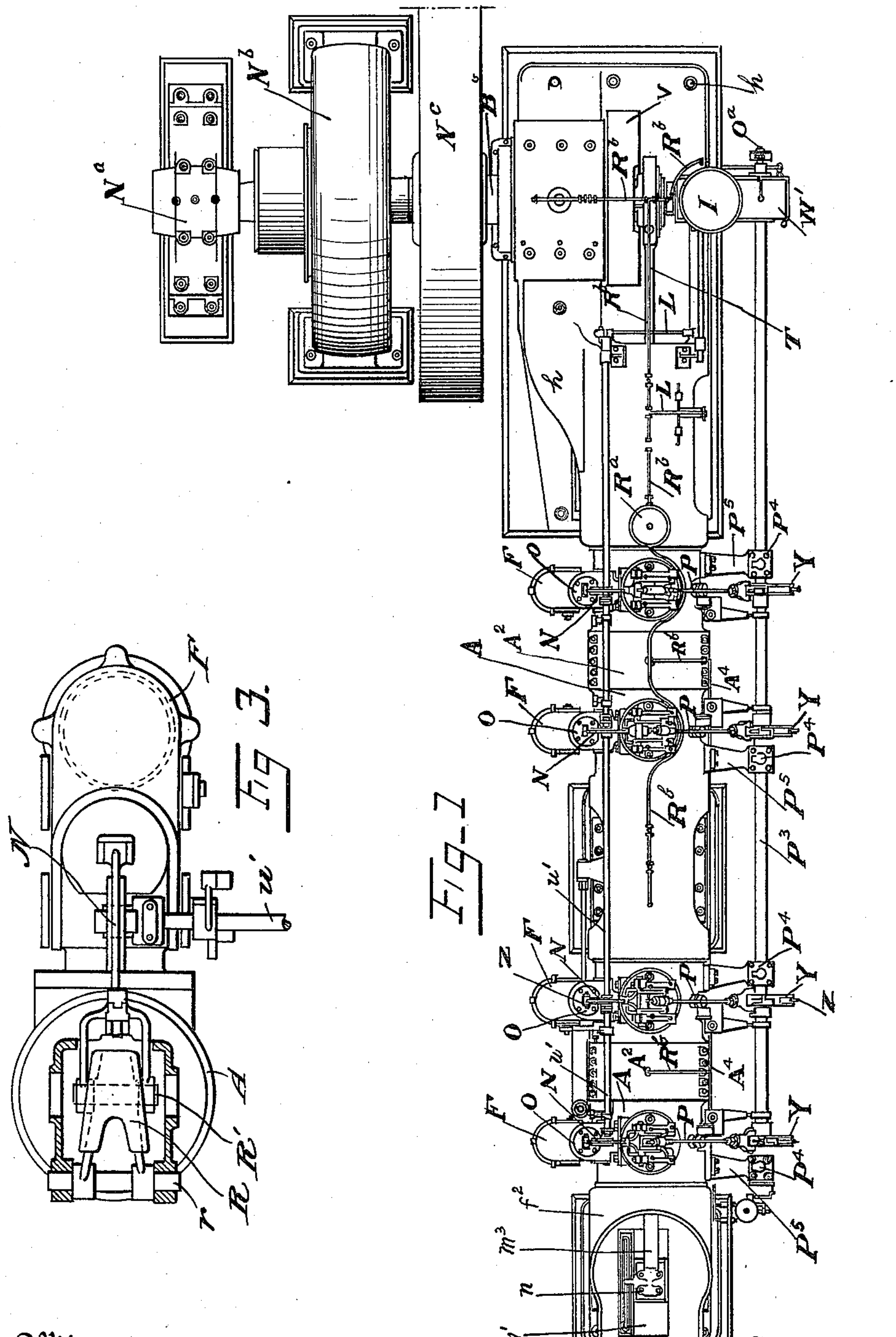
B. M. ASLAKSON.
GAS ENGINE.
APPLICATION FILED JAN. 12, 1910.

1,034,673. Patented Aug. 6, 1912.

3 SHEETS—SHEET 1.



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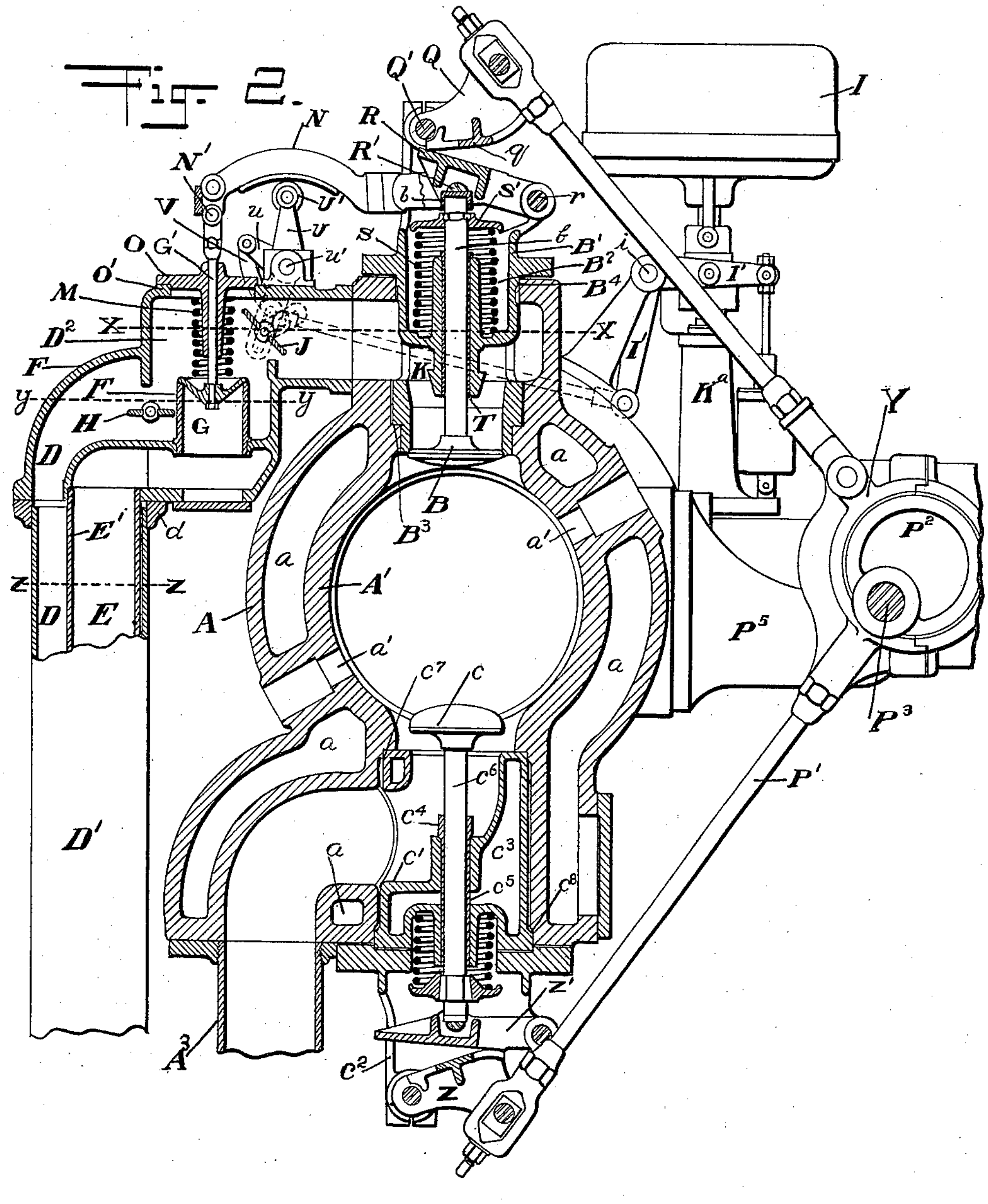
3 SHEETS—SHEET 2.

Fig. 2.



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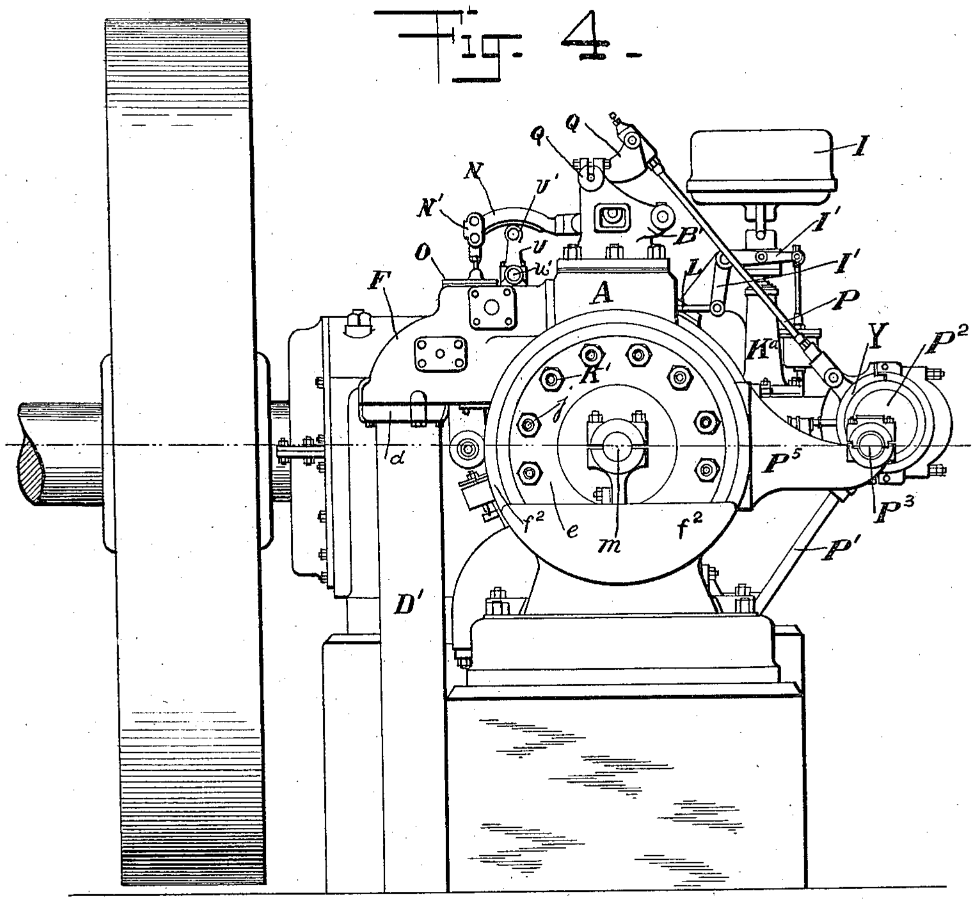
3 SHEETS—SHEET 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

BAXTER M. ASLAKSON, OF SALEM, OHIO.

GAS-ENGINE.

1,034,673. Specification of Letters Patent. Patented Aug. 6, 1912.

Application filed January 12, 1910. Serial No. 537,616.

To all whom it may concern:

Be it known that I, BAXTER M. ASLAKSON, citizen of the United States, and a 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 object of my invention is to provide a tandem engine construction of improved design and utility, the specific features of which will be described in the following specification and pointed out particularly in the claims presented herewith.

Referring to the drawings which form a part of this specification Figure 1 is a general plan view of the engine. Fig. 2 is a vertical cross sectional view through one of the cylinders, inlet and exhaust valves and air and gas conduits, the air and gas controlling valve and means employed for operating the valves being also disclosed. Fig. 3 is a cross sectional view through a portion of the engine frame, main crank, and auxiliary crank through which the lay shaft and governor is driven. Fig. 4 is an end elevational view of the engine from the rear end.

In describing the engine, I will first take up the construction of the valves and their operation.

Referring to Fig. 2, A indicates a casing having a working cylinder A′, both shown in cross section and taken on line Z—Z of Fig. 1, and having a water chamber *a* for cooling purposes 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 the 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 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 on the distance the valve is from its seat. The valve G 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 the 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 G, respectively, through the instrumentality of an eccentric P^2, which is mounted on a lay shaft P^3, which extends longitudinally of the engine and is driven through the instrumentality of an auxiliary crank hereinafter referred to. 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 a bifurated 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 which in turn is driven by a short shaft as hereinafter described.

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 rod C^6, and also prevents water from leaking past said rod. Both castings 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 Fig. 3, I show in dotted lines, 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.

Since one of the principal factors conducive to a high thermal economy is a high compression of the gases, 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 more nearly retain 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 mixture becomes 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, and 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 the 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, 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 left and thus decrease the amount of gas admitted to the chamber D^2. The movement of the 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 by reason of the attenuation of the charge, the valve J being 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 P^2 through the rod P′ and the rock levers Z and Z′. It will be noted that the eccentric strap Y operates both rods P and P′ through the instrumentality of the eccentric P^2, and that the degree of movement of these two rods is constant and driven in timed relation with the crank. By referring to Fig. 1, it will be seen that there are four sets of these valves which are located at the respective ends of the two cylinders adjacent to the cylinder heads *e*, *e*, etc., which heads are respectively provided with flanges *e′*, by means of which they are bolted in position in the cylinders. The cylinder heads are cast with a chamber formed therein indicated by e^2, through which water is circulated to keep them cool.

t, indicates the connecting rod which drives the main crank V.

Referring to Fig. 3, *v* indicates the main crank of the engine which is provided with a crank-pin *v′*. *w*, indicates a casting provided with a cover *w′*, which is mounted on the engine frame, and mounted therein in suitable boxes A^a and A^b is a shaft B^a, which is mounted in alinement with main shaft B^b, and mounted thereon at one end is a crank C^a, which is driven by means of crank pin D^a, connected to crank-pin *v′* as follows: The crank *v* and pin *v′* are provided with a bore v^2, which is enlarged in diameter at v^3, thereby forming a shoulder at v^4, against which the inner head of the bolt E^a abuts. The bolt E^a extends through the main crank and within the crank-pin *v′* a short distance, thus strengthening the pin at the point where it joins the crank *v*, and is provided with a tapped end E^b, into which one end of the crank pin D^a is screwed, as shown. The crank-pin D^a is provided with a shoulder D^b, which abuts against a cap F^a, which serves to hold the connecting rod (not shown in this figure) on the crank-pin *v′*, and also serves as an abutment whereby bolt E^a may be drawn in position and retained therein, as will be readily understood. The shank D^c of the crank pin D^a is of less diameter than the bore v^2, thereby forming a chamber v^5, having a passage v^6, leading to the surface of the crank pin *v′*. Formed in the crank C^a is an annular chamber C^b, which is in open communication with the atmosphere at its left side by an annular groove C^c, which extends in a circle concentric with the chamber C^b, through which oil is introduced through a pipe which leads thereto (not shown) to within the chamber C^h, whence it is thrown by centrifugal action through passage C^d, pipe C^e and passage F^b to chamber v^5, and thence through passage v^6 to the surface of the crank pin *v′*. The bearing surface of the crank-pin D^a is round in form and rests in a box bearing G^a, which is held together in the crank C^a by bolts which pass through the holes G^b, and a nut H^a screws on the end of the crank-pin D^a, as shown. The box G^a is free to move longitudinally a limited distance relative to the crank casting, which is provided with an opening of greater length than that of said box. This arrangement provides a ball joint between the crank pin D^a and crank C^a, so that any wear tending to throw the main shaft out of alinement with the auxiliary shaft B^a, will not cause undue heating or strain of crank pin C^a. Mounted on shaft B^a are two gears, I^a and I^b respectively, the gear I^b being in mesh with gear J^a, which is mounted on the governor drive shaft J^b, which extends through the pedestal K^a, which is mounted on the casing cover *w′*, as shown, and secured thereto by stud bolts and nuts J^c. The gear I^a is in mesh with and drives the gear L^a, which is indicated in dotted lines and which is mounted on the lay shaft P^3, one end of which is supported in the box M^a, which is mounted in the casting *w*. The gear L^a is double the diameter of the gear I^a, and is, therefore, driven at one half of the speed of the latter. The casting *w* is secured to the frame by stud bolts in the usual manner. The lay shaft P^3 is supported in boxes P^4, which are supported by brackets P^5. An outboard bearing is indicated at N^a in Fig. 1, and the engine fly wheel is indicated by N^c and N^b indicates a dynamo. A timer O^a is mounted on the end of the lay shaft P^3, and is driven thereby, and the period of ignition is controlled by the governor I through the instrumentality of a rod P^a, in a manner known to the art. There is a timer contact arranged in coöperative relation for each spark plug, unless there is more than one plug arranged in each end of a cylinder, in which case they may be connected in series. The arrangement of the wiring to operate the spark plugs is understood in the art and needs no further description. R^a indicates an oil reservoir and R^b the piping through which the oil is distributed to the bearing surfaces.

It will be understood that by using four sets of valves as illustrated with two working cylinders, every stroke of the engine will be a power stroke, the valves being adjusted to effect this result.

By the construction above described, I have secured a very compact and durable construction, all the parts of which are easily accessible for inspection or repairs.

Having thus described my invention, I claim as new:

1. A gas engine comprising a plurality of cylinders arranged in tandem relation; inlet and exhaust valves for said cylinders; a frame provided with a bearing for a main shaft; a main shaft supported therein; a crank carried by said shaft and provided

with a crank-pin; a lay shaft; an auxiliary shaft geared thereto and provided with a crank; means for connecting said last named crank to said crank-pin; valve rods for actuating said valves; and means mounted on said lay shaft and connected with said rods to actuate the same.

2. A gas engine comprising a cylinder; inlet and exhaust valves for said cylinder; a frame provided with a bearing for a main shaft; a main shaft supported therein; a crank carried by said shaft and provided with a crank-pin; a lay shaft; an auxiliary shaft geared thereto and provided with a crank; means for connecting said last named crank to said crank-pin; valve rods for actuating said valves; and means mounted on said lay shaft and connected with said rods to actuate the same.

3. A gas engine comprising a casting having a cylinder; inlet and exhaust valves for said cylinder; a frame provided with a bearing for a main shaft; a main shaft supported therein; a crank carried by said shaft; an auxiliary shaft driven thereby; a lay shaft driven by said auxiliary shaft; eccentrics mounted thereon; and rods connected thereto, one of which actuates one of said inlet valves and one of which actuates one of said exhaust valves.

4. A gas engine comprising a plurality of cylinders arranged in tandem relation, each cylinder having housings formed integral therewith, two of which are located at each end thereof and on opposite sides thereof; valves supported in said housings; a frame provided with a bearing for a main shaft; a main shaft supported therein; a crank carried by said shaft and provided with a crank pin; a lay shaft; an auxiliary shaft geared thereto and provided with a crank; means for connecting said last named crank to said crank pin; eccentrics mounted on said lay shaft; and two rods extending from each eccentric, one of which operates one of said valves on one side of said cylinder and the other of which operates the valve on the opposite side thereof.

Signed at Salem in the county of Columbiana and State of Ohio this twenty third day of November.

BAXTER M. ASLAKSON.

Witnesses:
C. H. Weeks,
George S. Cooper.