B. M. ASLAKSON.

AIR AND GAS ENGINE.

APPLICATION FILED JUNE 18, 1908.

949,139.

Patented Feb. 15, 1910.

6 SHEETS—SHEET 1.

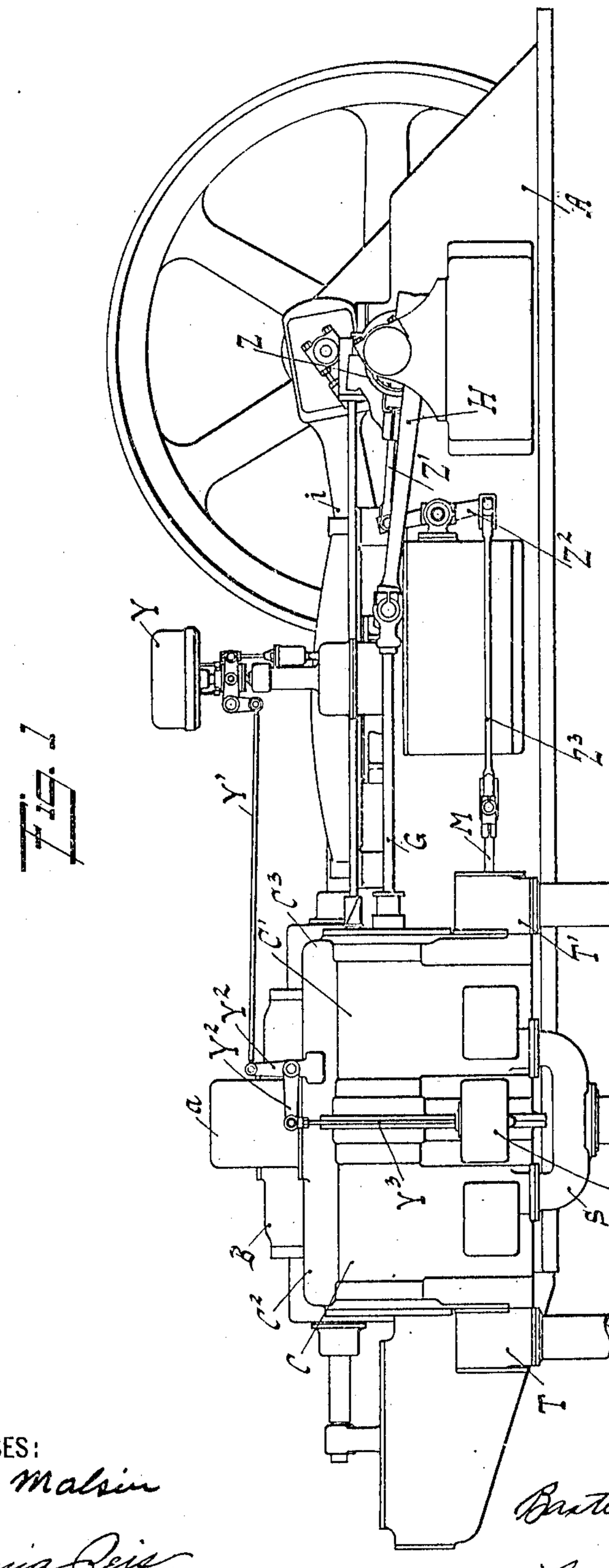

FIG. 1.

WITNESSES:

Albert Malsin

Virginia Geis.

INVENTOR

Baxter M. Aslakson

BY

Frank P. Stanley

ATTORNEY

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6 SHEETS—SHEET 2.

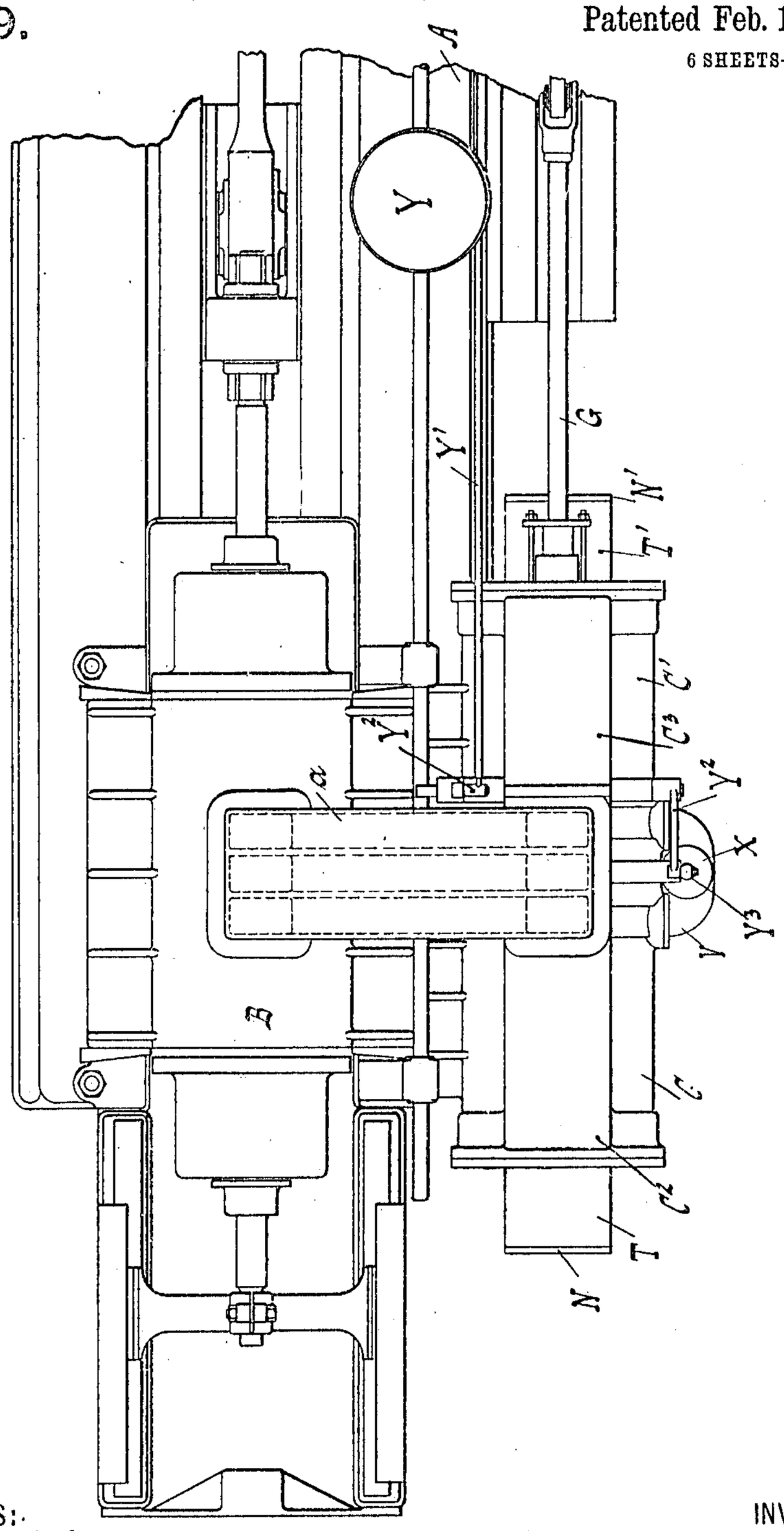

Fig. 2.

WITNESSES:

Albert A. Malsin

Virginia Geis.

INVENTOR

Baxter M. Aslakson

BY

Frank H. Hartley.

ATTORNEY

B. M. ASLAKSON.

AIR AND GAS ENGINE.

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6 SHEETS—SHEET 3.

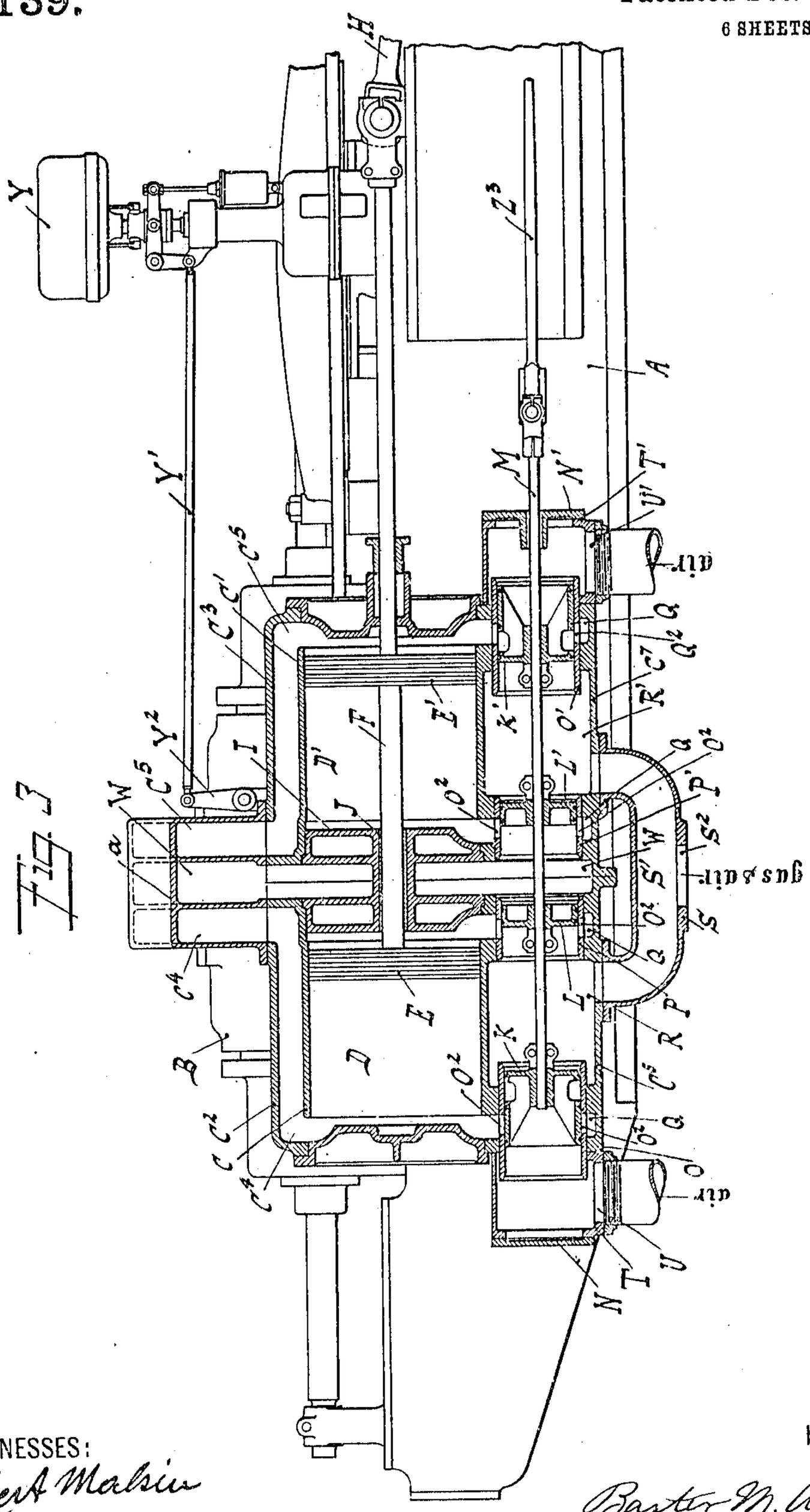

FIG. 3

WITNESSES:

Albert A Malsin

Virginia Geis.

INVENTOR

Baxter M. Aslakson

BY

Frank D Ashley

ATTORNEY

B. M. ASLAKSON.

AIR AND GAS ENGINE.

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6 SHEETS—SHEET 4.

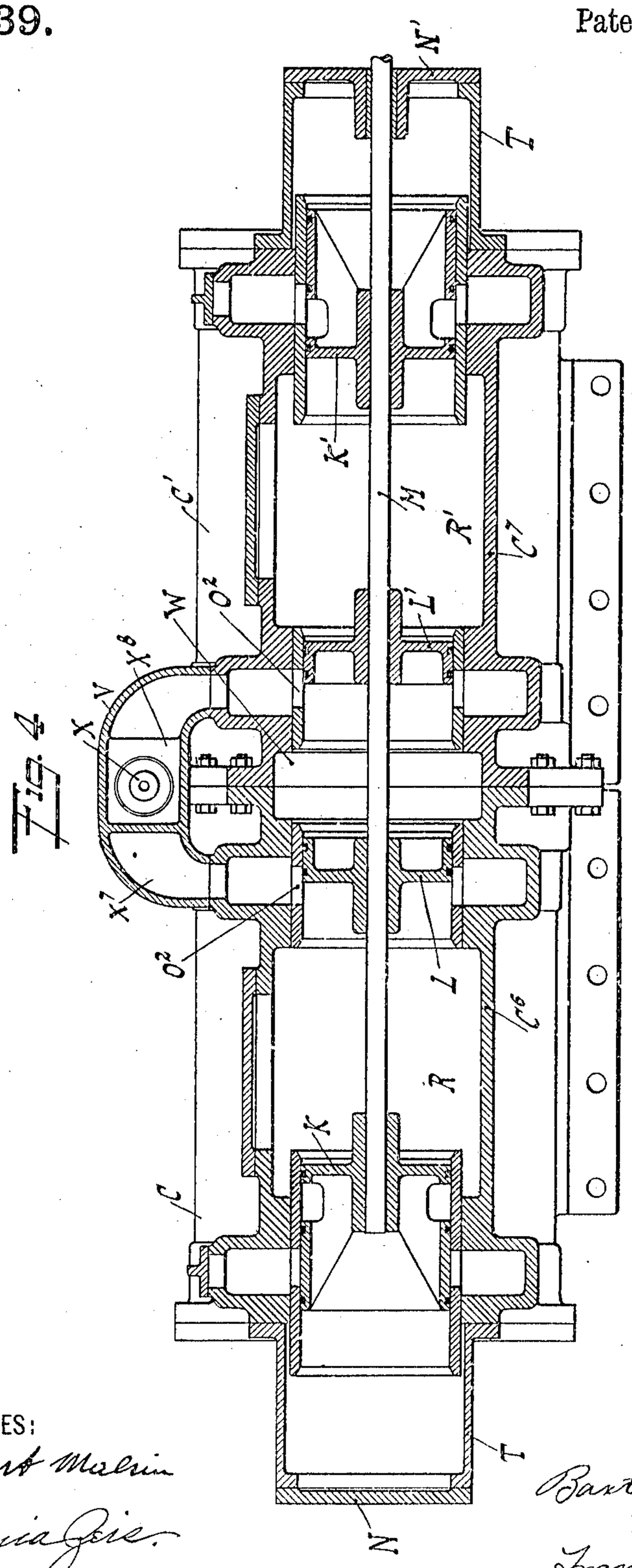

Fig. 4

WITNESSES:

Albert Mahrin

Virginia Fox.

INVENTOR

Baxter M. Aslakson

BY

Frank D. Merrill

ATTORNEY

B. M. ASLAKSON.

AIR AND GAS ENGINE.

APPLICATION FILED JUNE 18, 1908.

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6 SHEETS—SHEET 5.

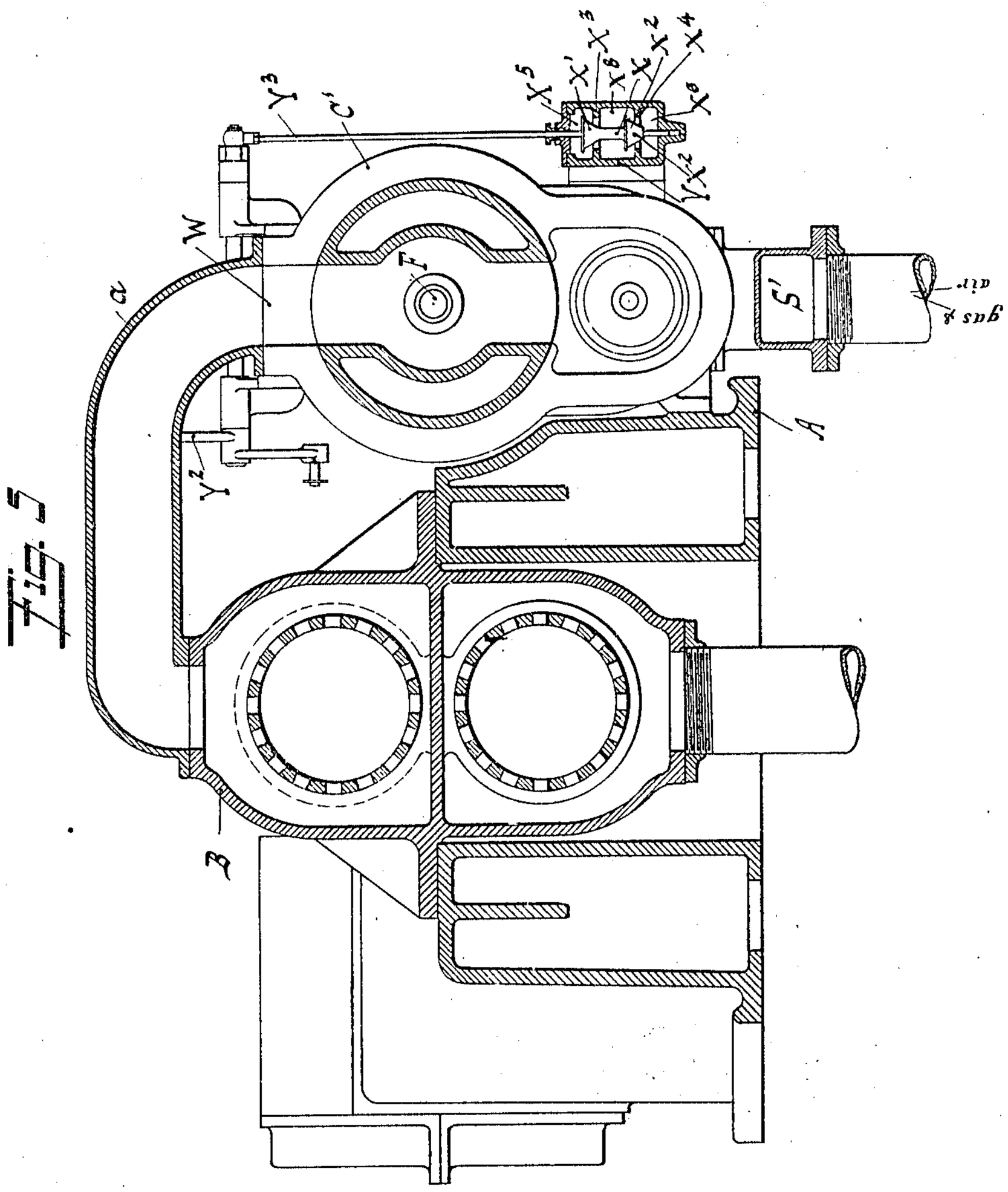


Fig. 5

WITNESSES:

Albert Malsin

Virginia Geis.

INVENTOR

Baxter M. Aslakson

BY

Frank D. Stanley

ATTORNEY

B. M. ASLAKSON.

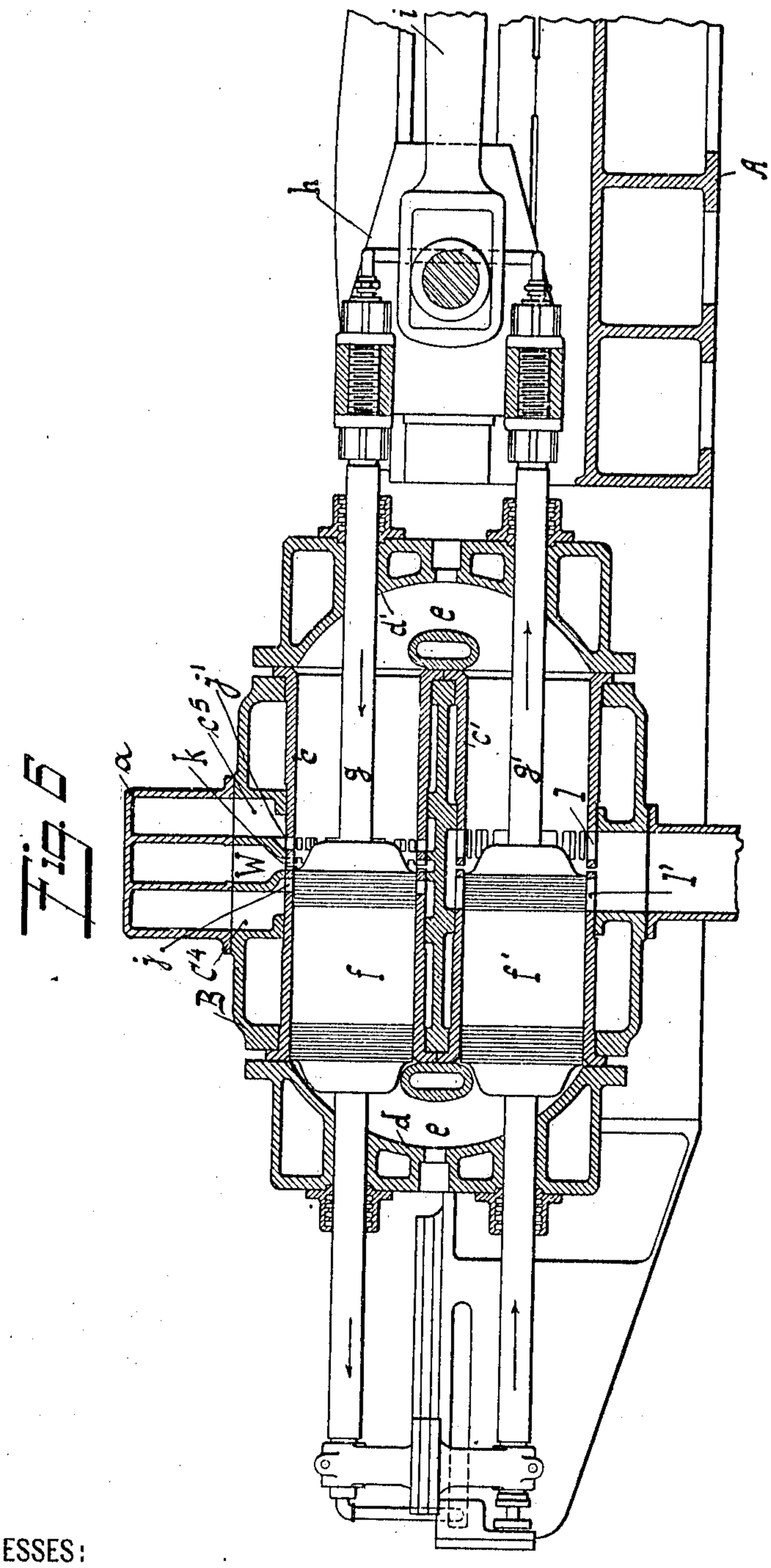
AIR AND GAS ENGINE.

APPLICATION FILED JUNE 18, 1908.

949,139.

Patented Feb. 15, 1910.

6 SHEETS—SHEET 6.



WITNESSES:

Albert Malsin

Virginia Peirce

INVENTOR

Baxter M. Aslakson

BY

Frank D. Stanley

ATTORNEY

UNITED STATES PATENT OFFICE.

BAXTER M. ASLAKSON, OF SALEM, OHIO.

AIR AND GAS ENGINE.

949,139. Specification of Letters Patent. Patented Feb. 15, 1910.

Application filed June 18, 1908. Serial No. 439,133.

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 Air and Gas Engines, of which the following is a specification.

My invention relates to pumping mechanism for use with two cycle gas engines and the object of same is to provide a combined air and gas pump which will be double acting, may be driven directly by the engine and built to form a part thereof.

A further object is to design the pumping and valve mechanism in such a manner that the parts thereof may be interchangeable as far as possible and compactness, simplicity and durability secured.

Referring to the drawings which form a part of this specification,—Figure 1, is a side elevation of a double acting two cycle gas engine with the pumping mechanism forming the subject of the present application, disclosed on the near side thereof. Fig. 2, is a plan view of the rear portion of the engine and pumping mechanism on a scale somewhat larger than that of Fig. 1. Fig. 3, is a longitudinal sectional view through the pump cylinders and the valves controlling the inlet of gases thereto. Fig. 4, is an inverted sectional plan view through the pump casing and valves, the pump being on a larger scale than it is shown in Fig. 3. Fig. 5, is a cross sectional view through the pump, valve and engine casings, and disclosing a by-pass valve located at the right side of the valve casing. Fig. 6, is a vertical longitudinal sectional view through the cylinders of the engine, disclosing the working pistons therein and the conduits which communicate with the gas pumps located thereon.

A, refers to the cast bed frame of the engine, on which are mounted the usual engine parts such as the cylinders and casings B, the cross head and the main shaft being in their customary positions.

C, and C′, indicate the pump casings in which are formed the pump cylinders D and D′, containing the pistons E and E′ respectively, connected together by the rod F and driven by rod G which in turn is actuated by a pitman H, having a crank-connection with the main shaft of the engine or with an auxiliary shaft receiving motion therefrom.

Located between cylinders D and D′, and forming the inner casing or heads for the same, is a casting I, containing a liner J, through which the rod F, passes in close sliding relation.

Formed integral with the casings C and C′, are sections C^2 and C^3 respectively, coacting to form conduits C^4 and C^5, which communicate with the pump chambers and interiors of the engine cylinders as hereinafter more fully described, and also formed integral with said casings C and C′, are casings C^6 and C^7, in which are located the valves K and L, and K′ and L′, respectively, said valves mounted on a rod M and all being of the same diameter, so that by removing a cap N, they may be easily removed together from the casing, said common connection and uniform diameters permitting the valves to balance each other when operating in coöperation with the pump pistons E and E′. It will be observed that the casings C and C′ are duplicates of each other, as are also the pistons E and E′, the valves K and K′, valves L and L′, and the valve cylinders O and O′ and P and P′, respectively. The valve cylinders O and O′ and P and P′ are fitted tightly in the casings C^6 and C^7, and are provided with a plurality of ports O^2 which communicate with annular passages Q formed in the casings and communicating with the pump cylinders as shown. Chambers R and R′ are formed in the casings C^6 and C^7 respectively, between the valves located therein and the casing walls, and are in open communication with each other through a conduit S′ formed in a casting S. Connected to one end of each of the casings C^6 and C^7, are cylindrical castings T and T′ having inlets U and U′ respectively, in which pipes are fitted to conduct air thereto.

V, indicates a cast iron pipe by which the two contiguous ends of the casings C^6 and C^7, are connected to a gas chamber W, by way of the adjacent ports O^2, and a by-pass valve X is located in the pipe V, and controlled by the engine governor Y acting through rod Y′, bell crank lever Y^2 and rod Y^3, which latter is directly connected to said by-pass valve X.

The valve rod M is driven by an eccentric Z which is mounted on the main shaft of

the engine, and transmits its motion to said rod through a rod Z′, lever Z^2 and rod Z^3, joined together by box straps in the usual manner as shown. The valve X is balanced and comprises two valves X′ and X^2 having seats X^3 and X^4 respectively, formed in the pipe V, the passages X^5 and X^6 being in communication with a passage X^7 and forming part of the same, and the passage X^8 leading between the valves X′ and X^2, it is obvious that a suction occurring in either passage would act in such a manner as to balance the valve, thus permitting the latter to be operated by a comparatively easy pull exerted by the governor Y.

Connecting with the conduits C^4 and C^5 of the engine casing B, and the gas conduit W of the pump, is a casting *a*, having three conduits therein which register with the conduits just mentioned of the pump and engine and constitute continuations of the same.

As before stated the pumping mechanism is driven in timed relation with the engine and therefore to properly understand the operation of the pumps, the operation of the engine should be understood and I therefore illustrate the cylinders of my preferred form of two cycle engine, though any other double acting two cycle engine may be used with the pumping mechanism here shown.

c and *c′*, indicate two cylinders connected at each end by a cylinder head *d* and *d′*, respectively, each of which presents a conduit *e* also serving as a combustion chamber. Located in the cylinders are pistons *f* and *f′*, provided with piston rods *g* and *g′* respectively, each of which is connected with a cross head *h* secured to a connecting rod *i*, attached to the main crank of the engine in the usual manner. The piston *f* is of sufficient length to cover the air inlet port *j* when at the end of its stroke in one direction as shown, and to cover the port *j′* when at the end of its stroke in the opposite direction, but in either case when at the end of its stroke, one air port and the gas port are in open communication with one end of the cylinder, and the pistons serve as valves for the ports, the piston *f* acting as the inlet valve and the piston *f′* as the exhaust valve, controlling the ports *l* and *l′*. Therefore assuming the conduits C^4 and C^5 to contain air under pressure supplied from the pump, the conduit W to be under pressure of gas fuel also supplied from the pump, and the engine pistons *f* and *f′* to be in the position in the cylinders *c* and *c′* as indicated, the pistons in moving to their present position would first uncover the exhaust port *l*, allowing the burned gases to exhaust, and immediately thereafter the air port *j′* would be uncovered, allowing the fuel to enter and immediately thereafter the return movement of the pistons would close the ports and trap the proper amount of air and gas in the cylinders to compress the same and form a combustible charge for generating power, and while the pistons were at the end of their stroke in one direction, the same action would occur on the opposite ends, the air entering the cylinder through ports *j* and gas through ports *k*, and exhausting through ports *l′*, as will be readily understood.

In operation, the turning of the main shaft of the engine actuates the air and gas pumps and the valves therefor, and the power of the engine is regulated by supplying more or less gas to the engine to provide a rich or lean mixture, this result being effected by the governor acting on the valve X, to by-pass the gas fuel from one of the gas pumps to the other when less than the full amount of gas is required by the engine to drive the load at normal speed. Now assuming the pistons in the engine cylinders to be at the end of their stroke in one direction as indicated, the pistons in the pump cylinders D and D′, would be at the end of their stroke as indicated, and the pump valves would be in the relative positions shown. Now suppose the pistons in the engine to make their return stroke, thus driving the main shaft which in turn drives the pump pistons and valves from their present position to effect the following cycle of operations:—Air is admitted by way of inlets U and U′ to the valves K and K′, and a gas and air mixture is admitted to conduit S′ and thence to valves L and L′, to ports O^2 which communicate with the annular passages Q leading to the ends of the pump cylinders D and D′. Now as the pistons E and E′ move toward the left hand ends of the chambers, air will be drawn in through the passage U′ and through the open valve ports Q^2 to the right hand face of the piston E′, while at the same time the gas fuel will be drawn through conduit S′ and valve L behind the right hand end of piston E, coincident with which, a charge of air previously drawn into the left of cylinder D and gas previously drawn into the left of cylinder D′ by the previous stroke of the pistons E and E′, will be forced through the conduits C^4, and W, respectively, to the engine cylinders to supply fuel for one power stroke thereof. When the pistons E and E′ have reached the end of the stroke to the left, the pump valves will have moved over and closed the inlet ports of the valves L and K′, and will have opened ports O^2 of valves K and L′, thereby allowing air to be drawn into cylinder D and putting the opposite end of the chamber in communication with the passage W due to the valve L having traveled over its port O^2

and valve L′ having passed over its port O², thus placing cylinder D′ in communication with the gas inlet port O², with the valve L′ standing to the left of said port. The return stroke of the engine and pump will cause the pump to deliver air to conduit C⁵ and gas to conduit W, as will be readily understood. Now should the engine increase its speed slightly above normal, due to less load, the governor would act to raise the valve X from its seat in proportion to the increased speed, and the pump instead of forcing all of the gas in the cylinder thereof to the cylinder of the engine, would by-pass a portion to the opposite pump cylinder, thereby decreasing the pressure of gas in the conduit W and affecting the flow of gas to the engine cylinder accordingly.

The parts are simple, durable and compact, and in practical operation have proven of decided utility.

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

1. In an internal combustion motor, the combination of a fuel feed and supply pump provided with cylinders disposed in tandem relation with each other; and pistons for the cylinders; a gland separating the cylinders; a connecting rod passing through the gland and uniting the pistons; and a gas chamber enveloping the gland formed between the adjacent heads of the said cylinders.

2. In an internal combustion motor, the combination of a fuel feed and supply pump provided with cylinders disposed in tandem relation with each other; and pistons for the cylinders; a gland separating the cylinders; a connecting rod passing through the gland and uniting the pistons; and a gas chamber enveloping the gland formed between the adjacent heads of the two said cylinders, together with admission and outlet ports for the said cylinders; and valves adapted to control the inlet of gas to the said cylinders and the outlet thereof to said gas chamber.

3. In an internal combustion motor, the combination of a fuel feed and supply pump provided with cylinders disposed in tandem relation with each other; and pistons for the cylinders; a gland separating the cylinders; a connecting rod passing through the gland and uniting the pistons; and a gas chamber enveloping the gland formed between the adjacent heads of the two said cylinders, together with ports at the opposite ends of each of the respective cylinders; and a supplemental valve chamber communicating with said ports; and controlling valves disposed therein adapted to cut off communication with said ports and said supplemental valve chamber.

4. In an internal combustion motor, the combination of a fuel feed and supply pump provided with cylinders disposed in tandem relation with each other; and pistons for the cylinders; a gland separating the cylinders; a connecting rod passing through the gland and uniting the pistons; and a gas chamber enveloping the gland formed between the adjacent heads of the said cylinders; a supplemental gas chamber comprising a valve chest having ports formed between said cylinders and said supplemental chamber and establishing communication therebetween; and a plurality of valves slidingly mounted in said valve chest and disposed in tandem relation adapted to open and close said ports.

5. In a pump of the character described and in combination with the cylinders and pistons thereof, a valve chest containing a plurality of piston valves in tandem relation, and having communicating ports formed in the walls and communicating with said cylinders; a casing connecting the adjoining ends of each of said pump cylinders and having a passage therein establishing communication therebetween, together with means for controlling said passage, thereby forming a by-pass communication.

6. In a pump of the character described and in combination with the cylinders and pistons thereof, a valve chest containing a plurality of piston valves in tandem relation, and having communicating ports formed in the walls and communicating with the said cylinders; a casing connecting the adjacent ends of each of said pump cylinders and having a passage therein establishing communication therebetween, and a valve coöperating with said passage and adapted to control the same, together with means for operating the valve.

7. In a pump of the character described and in combination with the cylinders and pistons thereof, a casing connecting two adjacent cylinders having a conduit establishing communication therebetween and a valve controlling said communication, thus forming a by-pass communication for the purpose set forth.

8. In a pump of the character described, the combination of two cylinders arranged in tandem relation and a piston in each of said cylinders, thereby forming four chambers; a casing having a conduit connecting the two adjacent ends of the cylinders and the adjacent chambers thereof; a valve controlling said communication; and a supplemental casing having a conduit establishing communication between the adjacent ends of said cylinders; and a valve therein controlling said communications.

9. In a pump of the character described, the combination of two cylinders arranged in tandem relation and a piston in each of said cylinders, thereby forming four cham-

bers; a casing having a conduit connecting the two adjacent ends of the cylinders and the adjacent chambers thereof; a valve controlling said communication; and a valve chest casing having ports establishing communication between the ends of said cylinders and said chest; and a plurality of valves therein each of which controls one of said ports.

10. In a pump of the character described, the combination of two cylinders arranged in tandem relation and a piston in each of said cylinders, thereby forming four chambers; a casing having a conduit connecting the two adjacent ends of the cylinders and the adjacent chambers thereof; a valve controlling said communication; and a valve chest casing having ports establishing communication between the ends of said cylinders and said chest; and a plurality of valves therein arranged in tandem relation and operated together.

11. In a gas and air pump of the character described, the combination of two pump cylinders having cylinder heads and arranged in tandem relation; a piston in each cylinder both connected to a piston rod; a chamber formed between the two adjacent cylinder heads and having an outlet; a valve casing having valves therein which control pump inlets to said cylinders and two of which serve to admit gas from the source of supply to said pump cylinders and from said cylinders to said chamber.

12. In a gas and air pump of the character described, the combination of two pump cylinders arranged in tandem relation; and a cylinder head for each cylinder comprising a casting having a cylinder head connected to each of the opposite ends of a gland, thus forming a space or chamber between the heads; a valve casing having ports communicating with the valve chambers and pump chambers; and valves in said casing adapted to admit gas from the valve casing to said cylinders and from said cylinders to said chamber formed between the cylinder heads.

13. In a pump of the character described, the combination of two pump cylinders arranged in tandem relation; a piston in each cylinder connected to a rod; a chamber formed between the adjacent ends of the said cylinders and having an outlet; a valve casing having four chambers therein; four valves in said casing arranged in tandem relation and serving to form said valve chambers, two of said chambers having inlets for gas thereto and the other said chambers having inlets for air thereto and said pump cylinders having inlets and outlets for air and gas respectively; and means for operating said valves in timed relation with the pump pistons whereby air will flow into two of said valve chambers and through the ports therein to the cylinders of the pumps and be discharged from the pump cylinders through the outlets thereof, and whereby gas will flow through the other two inlets to the other two chambers and through the ports to the pump cylinders and from the pump cylinders to the said gas chamber formed between the ends of the two pump cylinders, substantially as set forth.

14. In a pump of the character described, the combination of two pump cylinders arranged in tandem relation; a piston in each cylinder connected to a rod; a chamber formed between the adjacent ends of the said cylinders and having an outlet; a valve casing having four chambers therein; four valves in said casing arranged in tandem relation and serving to form said valve chambers; two of said chambers having inlets for gas thereto and the other said chambers having inlets for air thereto, and said pump cylinders having inlets communicating with said valve chambers and having outlets for air and gas respectively; means for operating said valves in timed relation with the pump pistons whereby air will flow into two of said valve chambers and through the ports therein to the cylinders of the pumps and be discharged from the pump cylinders through the outlets thereof, and whereby gas will flow through the other two inlets to the other two chambers and through the ports to the pump cylinders and from the pump cylinders to the said gas chamber formed between the ends of the two pump cylinders as set forth; and a supplemental casing connected to the adjacent ends of the two pump cylinders and having a conduit establishing communication between the chambers thereof and having a valve adapted to control said conduit.

15. In a pump of the character described, the combination of two pump cylinders; a piston in each of same; valves for controlling ingress of gas thereto; and a casing having a conduit establishing communication between the pump cylinders and having a valve controlling said conduit whereby the degree of pressure of gas in said pump cylinders may be varied by permitting the piston in one of said cylinders to draw gas from the other of said cylinders subject to the control of said valve, and thereby vary the pressure of the gas delivered from the pump for the purpose set forth.

Signed at New York in the county of New York and State of New York this tenth day of January A. D. 1908.

BAXTER M. ASLAKSON.

Witnesses:

FRANK M. ASHLEY,

A. T. SCHARPS.