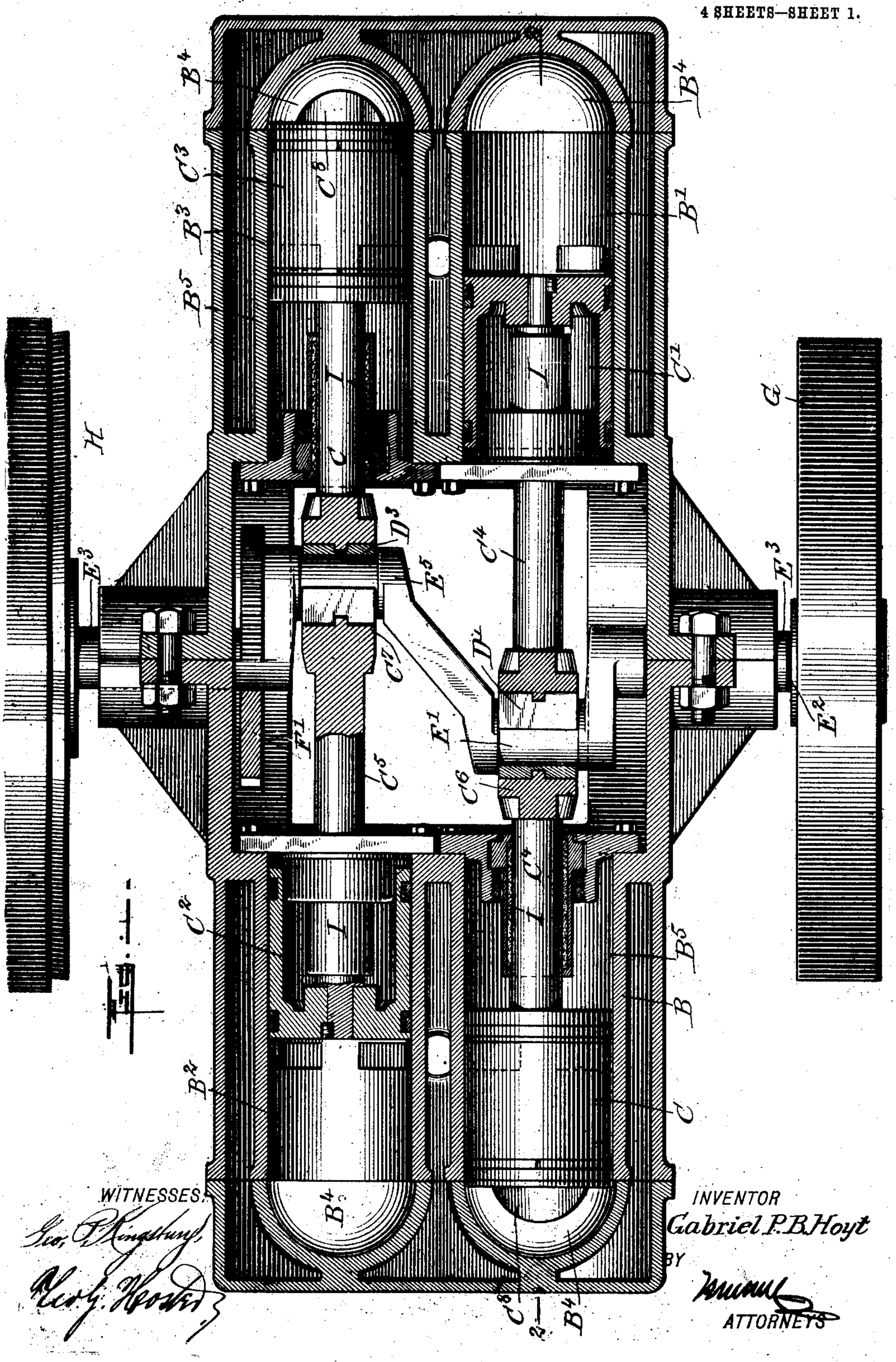
No. 874,200. PATENTED DEC. 17, 1907.

G. P. B. HOYT.

MOTOR.

APPLICATION FILED NOV. 16, 1905.

4 SHEETS—SHEET 1.



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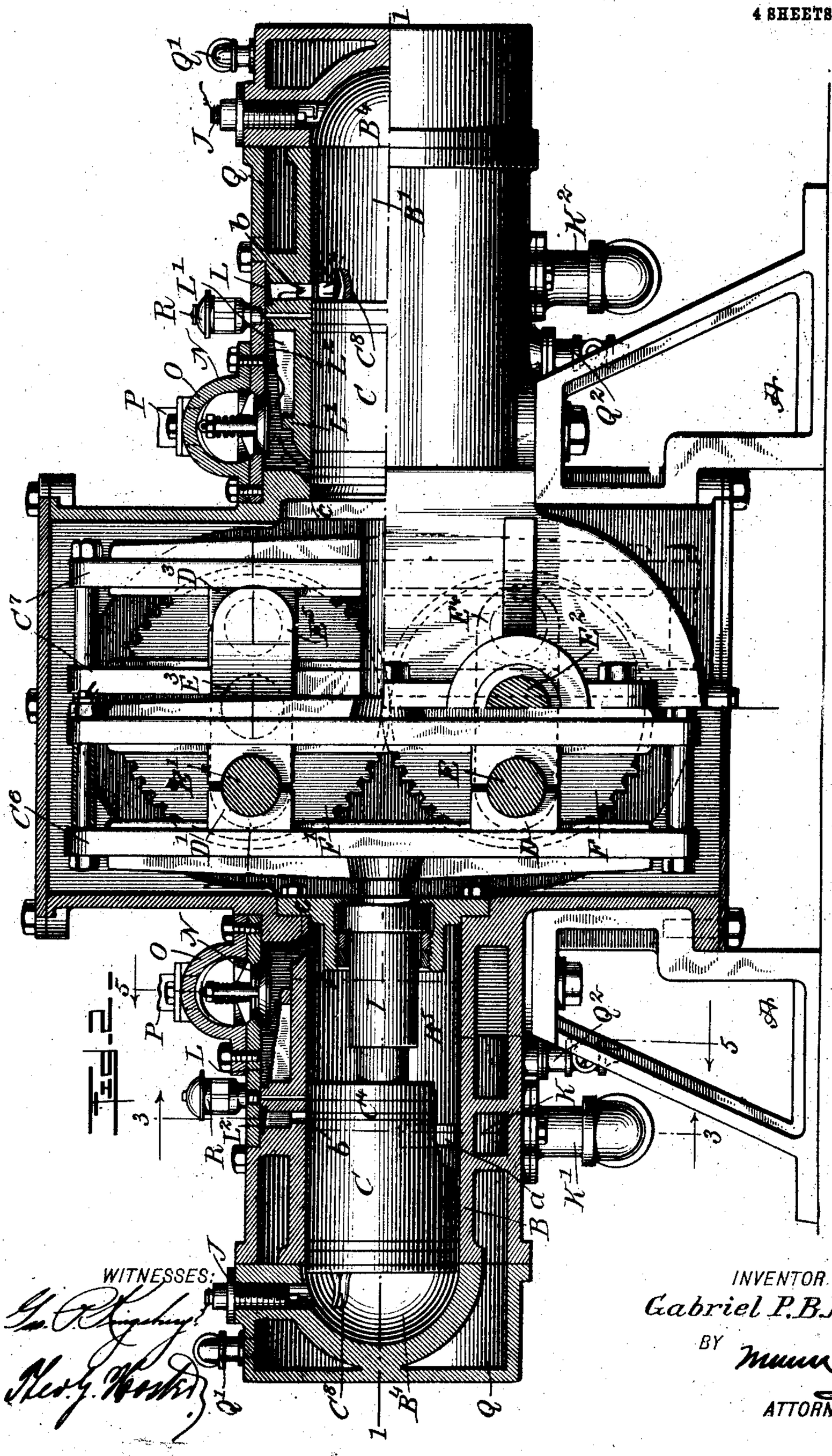

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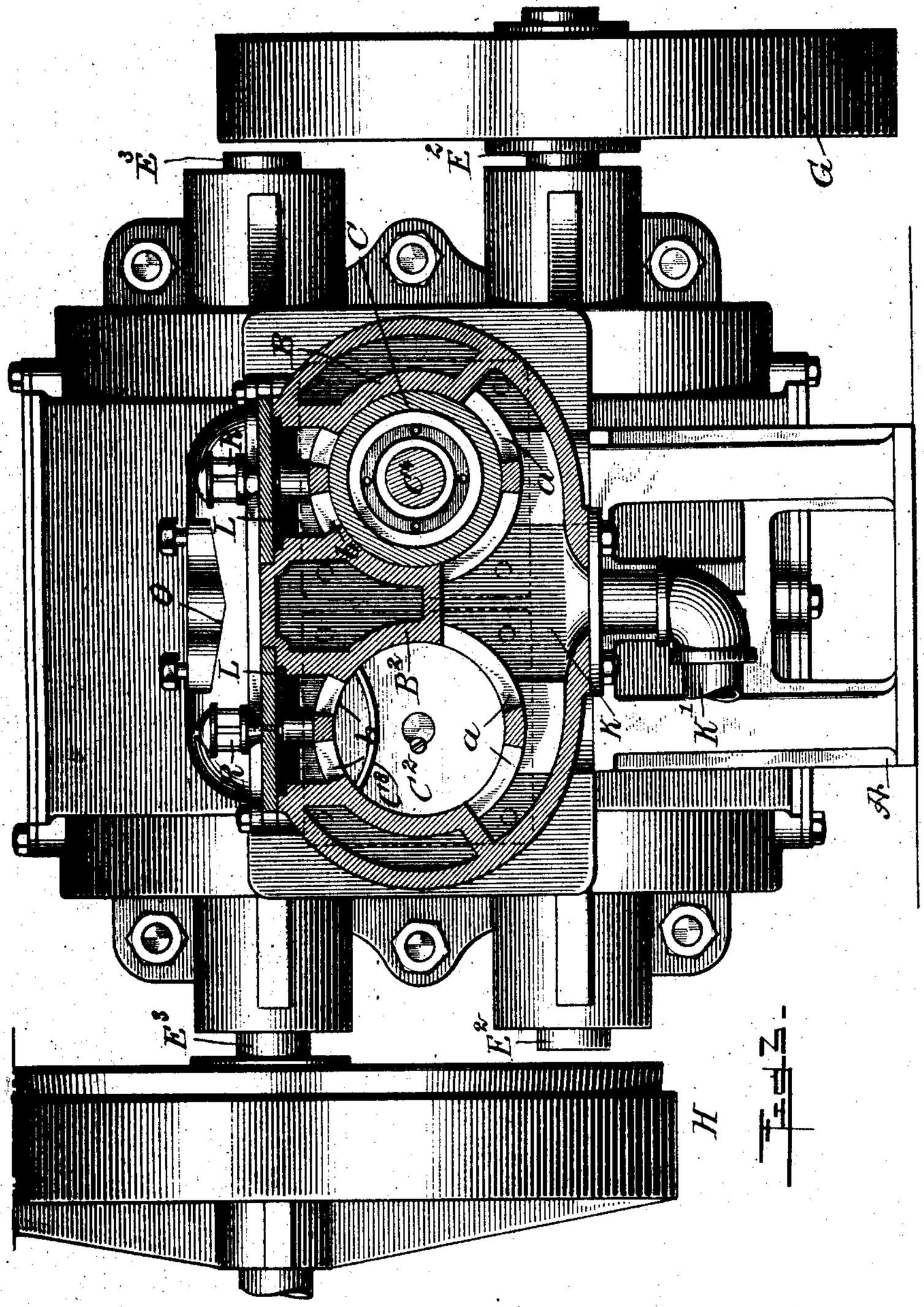

Fig. 1.

WITNESSES:

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Rud. F. Hoerich

INVENTOR

Gabriel P. B. Hoyt

BY

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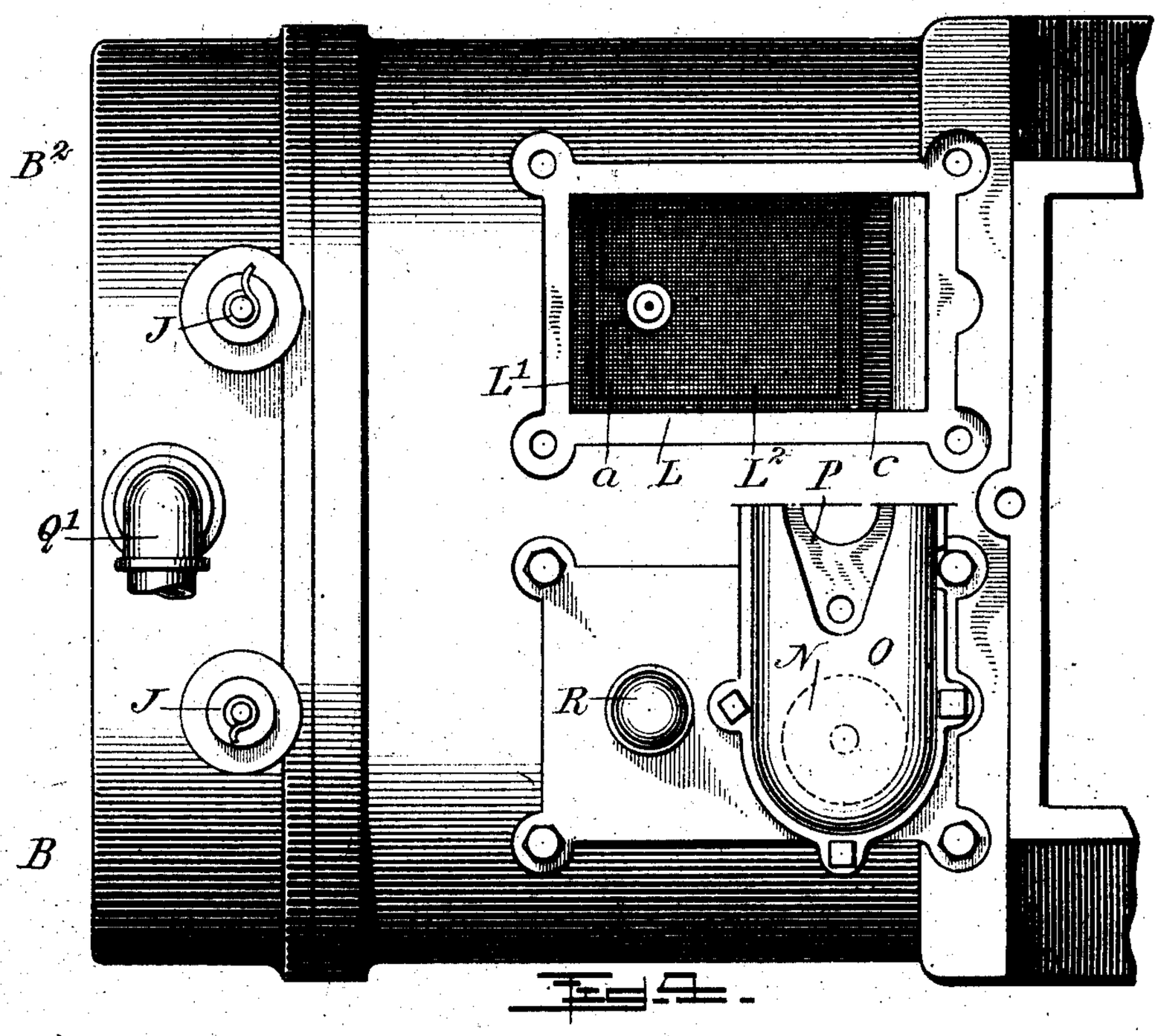

FIG. 4.

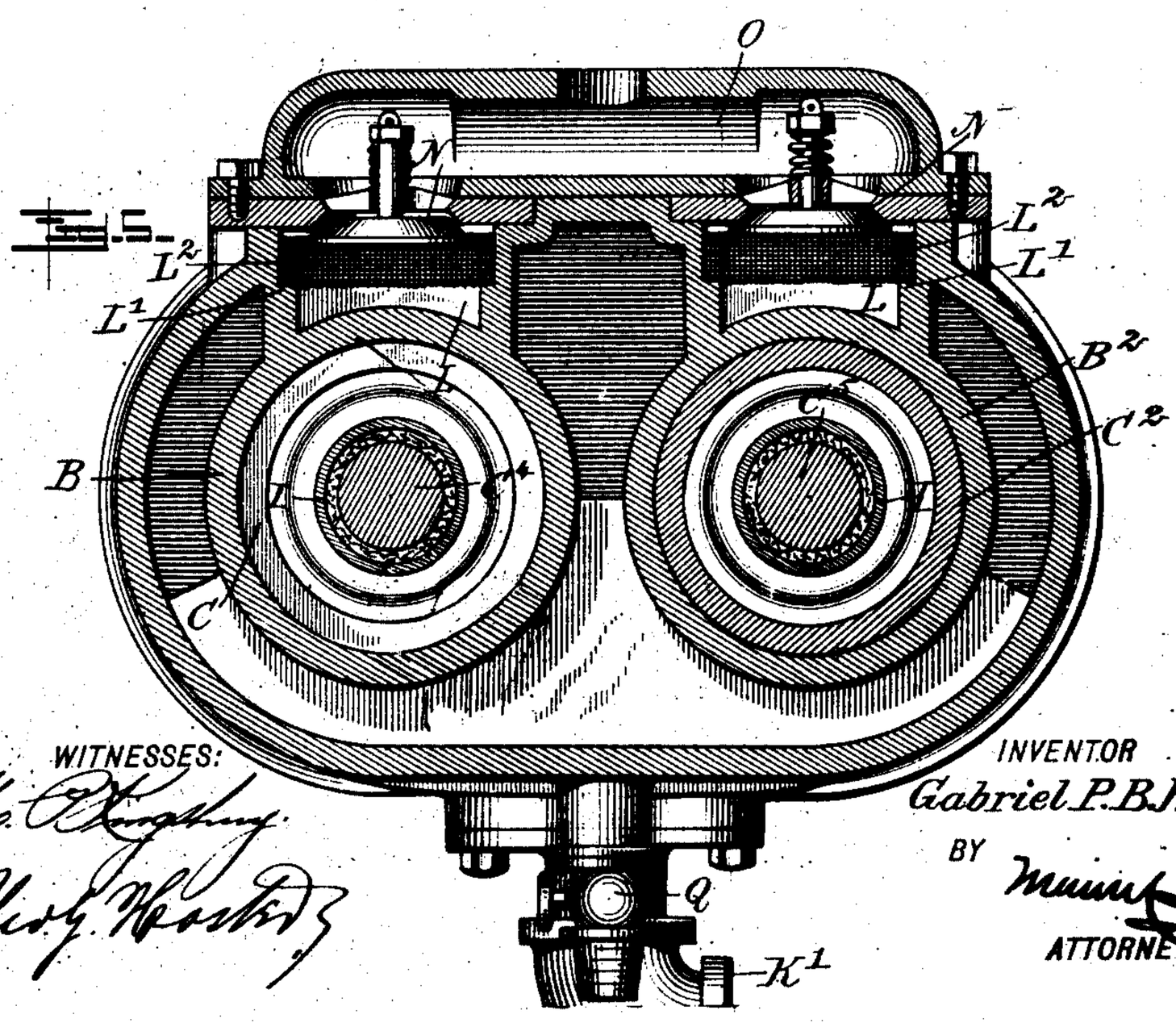

FIG. 5.

WITNESSES:

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UNITED STATES PATENT OFFICE.

GABRIEL P. B. HOYT, OF NEW YORK, N. Y.

MOTOR.

No. 874,200. Specification of Letters Patent. Patented Dec. 17, 1907.

Application filed November 16, 1905. Serial No. 287,621.

To all whom it may concern:

Be it known that I, GABRIEL P. B. HOYT, a citizen of the United States, and a resident of the city of New York, Jamaica, borough of Queens, in the county of Queens and State of New York, have invented a new and Improved Motor, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved motor or explosion or internal combustion engine of the two-cycle type, arranged to produce a high auxiliary compression without danger of leakage, to insure a complete removal of the burned gases of the previous explosion by the incoming new charge, without any loss of the latter; and to overcome all vibration by balancing the engine perfectly, and thus insuring easy running of the motor.

The invention consists of novel features and parts, and combinations of the same which will be more fully described hereinafter and then pointed out in the claims.

A practical embodiment of the invention is represented in the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a sectional plan view of the improvement, on the line 1—1 of Fig. 2; Fig. 2 is a longitudinal sectional side elevation of the same, on the line 2—2 of Fig. 1, parts thereof being shown in elevation; Fig. 3 is a cross section of the same, on the line 3—3 of Fig. 2; Fig. 4 is an enlarged plan view of part of the improvement; and Fig. 5 is an enlarged transverse section of the improvement, on the line 5—5 of Fig. 2.

On a suitably constructed base or stand A are secured sets or pairs of cylinders B, B′ and B^2, B^3, in which reciprocate pistons C, C′ and C^2, C^3, of which the pistons C, C′ are rigidly connected with each other by a piston rod C^4 common to both pistons C and C′, and a similar piston rod C^5 connects the pistons C^2 and C^3 rigidly with each other. As shown in Fig. 1, the cylinders B and B′ are in axial alinement with each other and are arranged alongside the cylinders B^2 and B^3, likewise in axial alinement with each other. The piston rods C^4, C^5, between the cylinders B, B′, and B^2, B^3, are provided with vertically-disposed guideways, C^6, C^7, in which are mounted to slide boxes or cross heads D, D′, and D^2, D^3, respectively, of which the boxes D and D′ are engaged by the crank pins E and E′ of the crank shafts E^2 and E^3 extending transversely and journaled in suitable bearings carried by a casing connecting the cylinders B, B^2 and B′, B^3 with each other. The boxes D^2 and D^3 in the guideway C^7 are engaged by crank pins E^4, E^5 forming part of the crank shafts E^2, E^3, but standing diametrically opposite the crank arms E and E′. The crank shafts E^2 and E^3 are connected with each other by gear wheels F and F′ secured on the shafts and in mesh with each other, so that the shafts E^2 and E^3 rotate in unison, and in opposite directions. One of the shafts, preferably the shaft E^2, is provided at one outer end with a fly wheel G, and the other shaft E^3 carried a clutch-pulley H of any approved construction, for transmitting the power of the engine to the other machinery.

Each of the cylinders B, B′ and B^2, B^3 is closed at both the outer and inner ends by suitable heads, and the inner heads are provided with a stuffing box I for the corresponding piston rods C^4 and C^5. Each of the cylinders B, B′ and B^2, B^3 is provided, at its outer end, with a compression and explosion chamber B^4, into which extends a spark plug J or other igniting device for igniting the explosive mixture at the proper time; and the inner end of each cylinder B, B′ and B^2, B^3 is provided with a suction mixing and compression chamber B^5, into which the explosive mixture is drawn, mixed and compressed, as hereinafter more fully explained. At the inner end of each compression and ignition chamber B^4 is arranged an exhaust port *a* opening into an exhaust chamber K, from which leads an exhaust pipe K′ for carrying off the burned gases; and the inner end of each chamber B^4 is connected with an admission port *b* leading to a by-pass L connected by a port *c* with the inner end of the suction mixing and compression chamber B^5 of the corresponding cylinder B, B′, B^2 or B^3. The ports *a* and *b* are so arranged relative one to the other that when a piston C, C′, C^2 or C^3 is on its inward stroke, it first partly uncovers the exhaust port *a* and then the admission port *b* at the time the piston nearly reaches the end of its innermost stroke. Each of the pistons C, C′, C^2 and C^3 is provided at the outer face with a baffle or deflecting plate C^8

standing opposite the admission port *b* at the time a piston moves into an innermost portion to cause an outward deflection of the incurving charge in the upper portion of the corresponding cylinder.

Into each by-pass L opens a suction or check valve N connected with a supply chamber O having a supply pipe P for the explosive charge to pass into the chamber O by way of the valve N into the by-pass L at the time the corresponding piston C, C′, C² or C³ is on its outward stroke. When a piston C, C′, C² or C³ is on the inward stroke, the valve N closes, so that the charge drawn into the chamber B⁵ from the by-pass L by way of the port *c* is highly compressed; and when the piston C, C′, C² or C³ nears the end of its inward stroke and uncovers the admission port *b*, then the compressed charge is forced from the chamber B⁵ by way of the port *c*, by-pass L and port *a* into the compression and ignition chamber B⁴, against a baffle-plate C⁸ and is deflected to the top of the cylinder behind the exploded charge, driving out the remaining burned gases and filling the said chamber B⁴ with a new and fresh charge, to be subsequently compressed on the outward stroke of the corresponding piston C, C′, C² or C³.

The by-pass L is provided with an offset L′, over which is stretched a screen L², through which passes the charge on its passage from the chamber B⁵ to the chamber B⁴, to insure an intimate mixture of the component parts of the charges, and also to prevent back-firing from the chamber B⁴ by way of the port *b*.

The cylinders B, B² and B′, B³ are provided with water jackets Q, or other cooling devices, having the usual pipe connection Q′ and a drain cock Q². Each of the cylinders B, B′, B² and B³ is properly lubricated from an oil cup R, as will be readily understood by reference to Fig. 2. Lubrication of many parts can be accomplished by splash in crank case.

The operation is as follows: When the engine is in operation and the several parts are in the position shown in Figs. 1 and 2, then explosions take place simultaneously in the chambers B⁴ of the cylinders B and B³, so that the pistons C and C³ are caused to travel inwardly by the force of the explosion. As the pistons C, C′ and C², C³ are rigidly connected with each other it is evident that the pistons C′, C² move outward at the time the pistons C, C³ move inward, and the said pistons C′, C² now compress the charge passed into the chambers B⁴ of the cylinders B′ and B² from previous compression in the chambers B⁵ of the said cylinders. The pistons C and C³, during their inward stroke, compress the explosive mixture in the chambers B⁵ of the cylinders B and B³, and when the pistons C and C³ near the inner ends of their strokes and successively uncover the ports *a* and *b*, then the burned gases pass out of the chambers B⁴ by way of the port *a* and a new charge passes into the chambers B⁴ by way of the admission port *b*, and against the baffle plate C⁸, to completely drive out the burned gases, at the same time filling the chambers B⁴ with a fresh charge. At the time this takes place, explosions occur in the chambers B⁴ of the cylinders B′ and B², to move the pistons C′ and C² inwardly, and consequently the pistons C and C³ outwardly. The above-described operation is then repeated; that is to say, two explosions simultaneously take place in diagonally-disposed cylinders B, B³ or B′, B², and the force of the explosion is transmitted by the corresponding pistons C, C³ or C′, C² and their piston rods C⁴, C⁵ and guideways C⁶, C⁷ to the crank pins E, E′ and E⁴, E⁵ of the crank-shafts E², E³ rotating in unison, and in opposition by the connection of the gear wheels F and F′. By the arrangement described, the charge drawn into the chamber B⁵ is strongly compressed, sufficiently to readily force the entire charge by the by-pass L, to the top of the chamber B⁴, in which the charge is recompressed and ignited at the proper time.

It will be noted that the charge in chamber B⁵ can be compressed to any desired pressure and forced with sufficient pressure into the chamber B⁴ to drive out the remaining burned gases without danger of any loss of the fresh charge, by proportioning the parts accordingly.

By arranging the cylinders in pairs, as described, and transmitting the power by the mechanism described to the two shafts E² and E³ geared with each other, it is evident that all undue strains in a sidewise direction are prevented and a complete transmission of the power takes place. It will be seen that the initial inertia is overcome by the compression in the opposite cylinder acting as an air cushion, thus relieving the wrist pins of the crank arms of undue strain and preventing the wrist pins from wearing flat, as is so frequently the case in engines as heretofore constructed. It will also be seen that the mechanical counterbalance of the engine is perfect, as no part of the engine works in a direction which has not a corresponding part working in the opposite direction; and the engine is explosively balanced, as the ignition takes place at opposite ends of the engine at the same time, so that the vibration caused by the explosion at one end is counterbalanced by an opposing equal force caused by the explosion at the other end. It will also be noted that the engine is gyroscopically balanced, as the fly wheel G and the clutch wheel H revolve in opposite directions, thus destroying all tendency of the engine to revolve on its base A.

Having thus described my invention, I

claim as new and desire to secure by Letters Patent:—

1. A two-cycle explosion engine, comprising pairs of oppositely arranged alined cylinders, the pistons of each pair being rigidly connected with each other, and all of said cylinders being in the same horizontal plane, means for constraining all of the pistons to move in unison, said cylinders being provided with a compression and explosion chamber at one end, having an exhaust port, and with a compression and mixing chamber at the other end provided with an inlet port, each of said cylinders having a by-pass connecting the chambers, said by-pass opening into the compression and explosion chamber at a point such that the contents of the compression and mixing chamber will be partly compressed before the piston uncovers said opening, to permit the passage of said contents to the compression and explosion chamber, the piston of the member of one pair being arranged to move synchronously with the piston of the diagonally opposite member of the other pair whereby to balance the engine.

2. An explosion engine comprising multiple sets of cylinders arranged one alongside the other and each set having two alined cylinders spaced apart, each cylinder being closed at its ends and having a compression and explosion chamber and a suction, mixing and compression chamber, and each cylinder having an exhaust port in the compression and explosion chamber and a by-pass connecting the said chambers of the cylinder with each other, the entrance end of the by-pass into the said compression and explosion chamber being opposite and partly in the rear of said exhaust port, pistons reciprocating in the said cylinders, a piston rod for the pistons of a pair of alined cylinders to connect the said pistons with each other, a guideway on each piston rod and at a right angle thereto, crank shafts transverse to the said cylinders and piston rods and having diametrically-disposed crank arms engaging the said guideways, and gear wheels secured on the said shafts and in mesh with each other.

3. An explosion engine comprising multiple sets of cylinders arranged one alongside the other and each set having two alined cylinders spaced apart, each cylinder being closed at its ends and having a compression and explosion chamber and a suction, mixing and compression chamber, and each cylinder having an exhaust port in the compression and explosion chamber and a by-pass connecting the said chambers of the cylinder with each other, the entrance end of the by-pass into the said compression and explosion chamber being opposite and partly in the rear of the said exhaust port, pistons reciprocating in the said cylinders, a piston rod for the pistons of a pair of alined cylinders to connect the said pistons with each other, a guideway on each piston rod and at a right angle thereto, crank shafts transverse to the said cylinders and piston rods and having diametrically-disposed crank arms engaging the said guideways, gear wheels secured on the said shafts and in mesh with each other, and a suction check valve for each cylinder.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GABRIEL P. B. HOYT.

Witnesses:
THEO. G. HOSTER,
E. C. NIELSON.