No. 724,333. PATENTED MAR. 31, 1903.

F. W. ROGLER.

ENGINE OR MOTOR.

APPLICATION FILED DEC. 6, 1901.

NO MODEL. 2 SHEETS—SHEET 1.

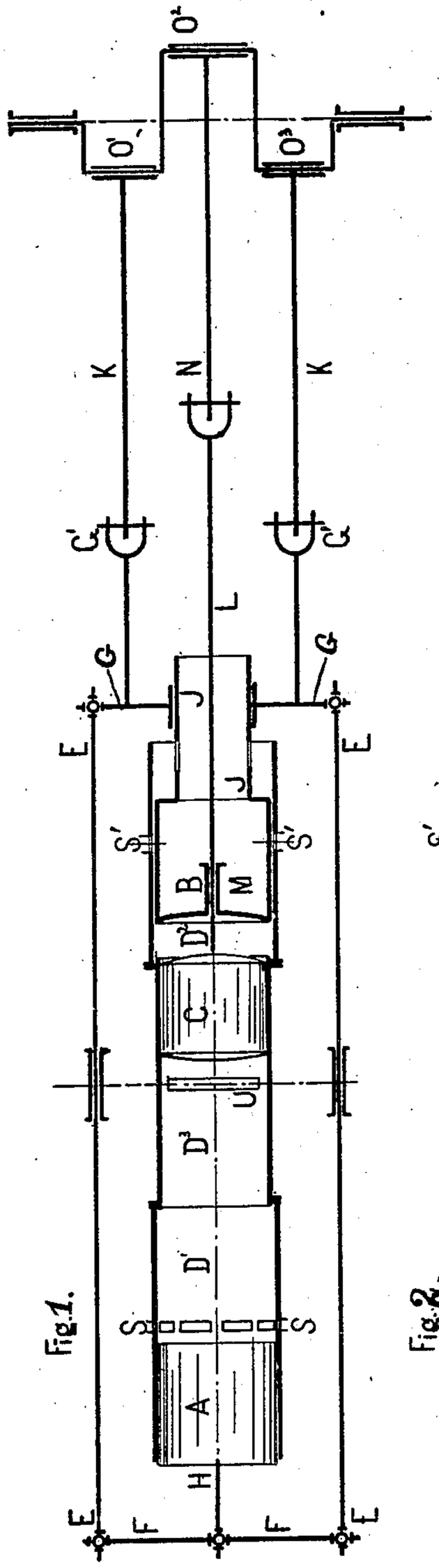

Fig. 1.

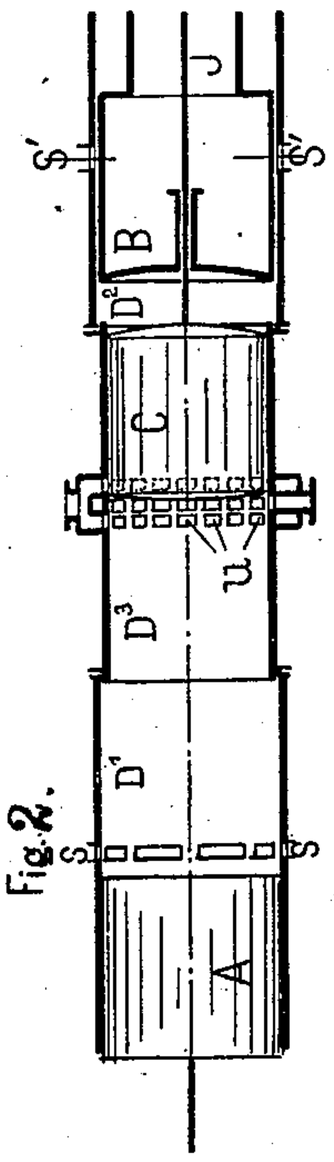

Fig. 2.

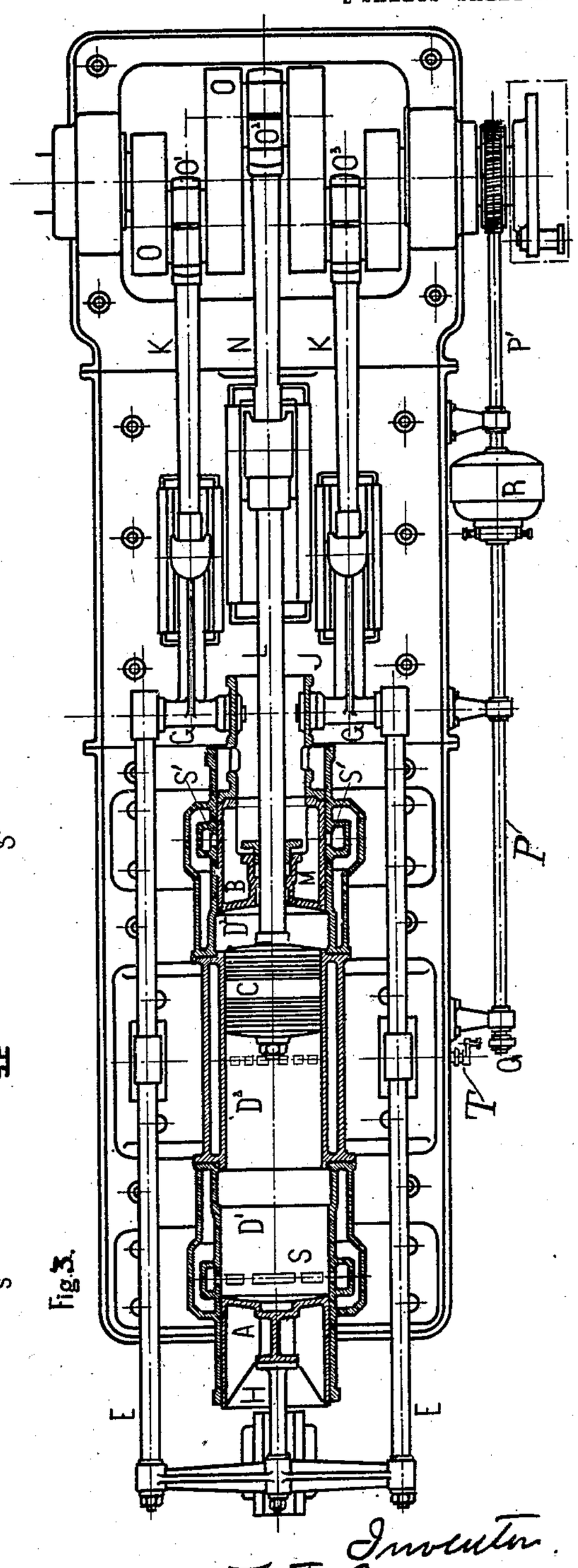

Fig. 3.

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NO MODEL. 2 SHEETS—SHEET 2

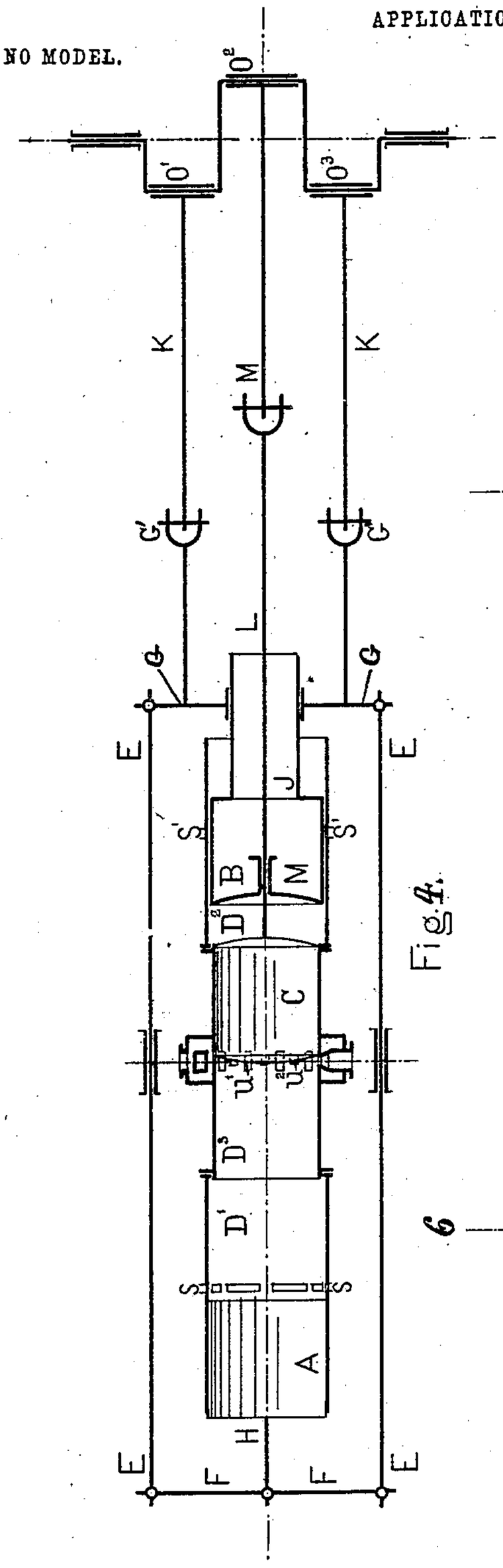

Fig. 4.

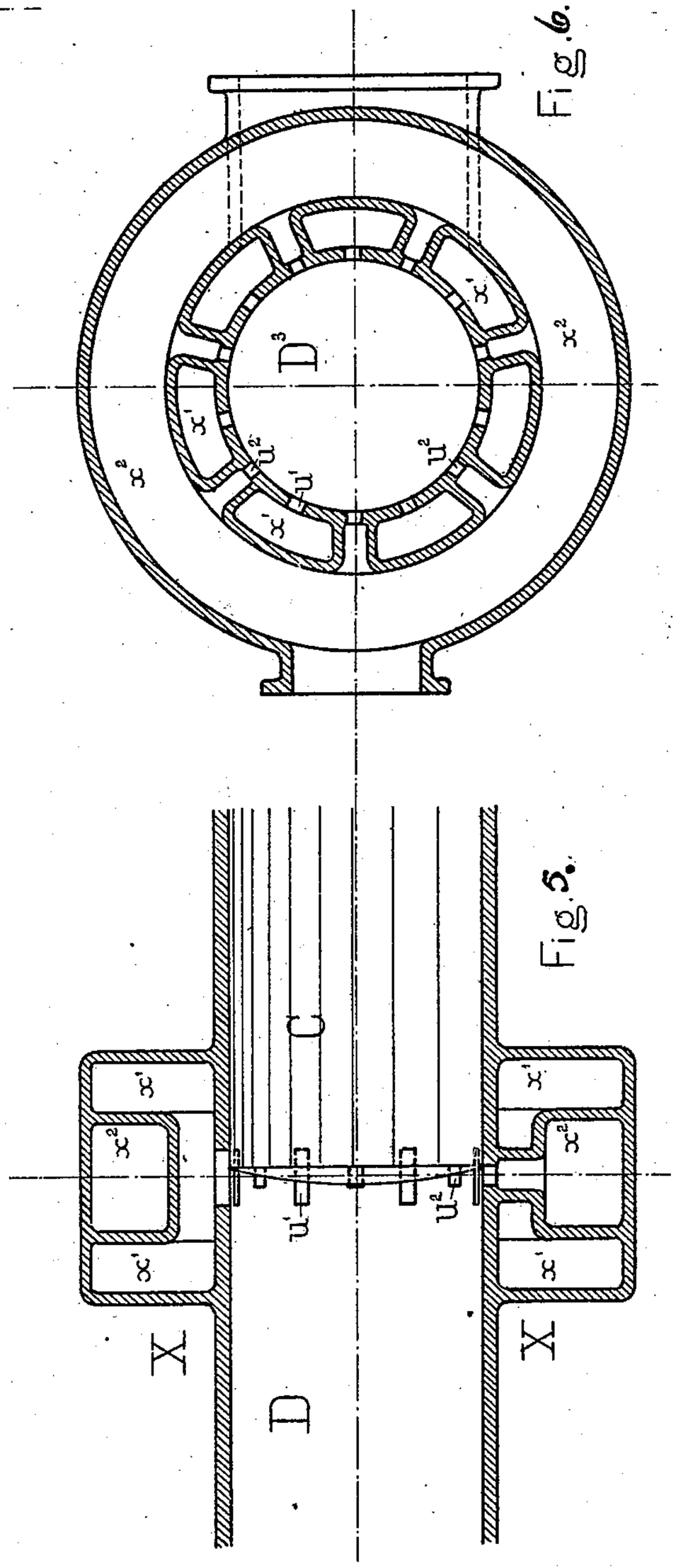

Fig. 6.

Fig. 5.

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UNITED STATES PATENT OFFICE.

FREDRICK WILLIAM ROGLER, OF BUDAPEST, AUSTRIA-HUNGARY, ASSIGNOR OF ONE-HALF TO HANS HOERBIGER, OF BUDAPEST, AUSTRIA-HUNGARY.

ENGINE OR MOTOR.

SPECIFICATION forming part of Letters Patent No. 724,333, dated March 31, 1903.

Application filed December 6, 1901. Serial No. 84,974. (No model.)

To all whom it may concern:

Be it known that I, FREDRICK WILLIAM ROGLER, a citizen of the United States of America, residing at Budapest, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in or Relating to Engines or Motors, (for which application for Letters Patent has been made in Great Britain under No. 16,206, dated August 12, 1901,) of which the following is a specification.

My present invention relates to an engine or motor having a cylinder in which operate three pistons coöperating together and performing the function of cylinder heads or abutments for the explosive charge in addition to their functional property of pistons strictly speaking, and thus form with the cylinder two combustion-chambers, the central piston being common to both chambers and being adapted to be moved in a direction opposite to the two outer pistons, which are rigidly connected, and therefore always move together. These pistons may also be advantageously utilized for directly controlling the admission and exhaust ports. The development of power in the combustion-chambers alternates in such a manner that the crank-shaft receives for each rotation one impulse from each working chamber. The engine forming the subject-matter of the present invention compared with other known motors gives with a relatively small diameter of the cylinder and a smaller total weight a greater efficiency, considerably more uniformity in working, relatively high speed of the piston, and therefore a high working efficiency. An opening or a series of openings is arranged in the wall of the cylinder centrally therein, which opening is or openings are in connection with the gas-conduit, as well as with the air-conduit, and one or the other, or both, can be closed by means of a single operating mechanism. A further advantage is obtained in that in building the machine as a double-acting motor only a single inlet mechanism is necessary, and the latter never comes in contact with combustion products of high tension, which for the purpose of insuring tightness and promoting coolness of the parts is of the greatest importance, or the inlet mechanism may be constituted by the center piston itself, which can cover the inlet entirely, and with reference to the above-mentioned opening or series of openings is always in such a position that one of the combustion-chambers is closed against the supply of air and gas.

As already mentioned, each combustion-chamber is limited by two pistons, one of which is common to both chambers. Combustion of the charge contained in each of said chambers takes place alternately, whereby the two pistons are forced apart. At the end of each movement the exhaust of the products of combustion, introduction of compressed air for removing the same, and the supply of fresh charge takes place, which latter is compressed during the following stroke when the pistons are approaching each other, and the charge is then ignited.

The characteristic feature of the mode of operation of the motor is that during the time combustion takes place in one chamber the charge introduced at the end of the stroke just finished is compressed in the other chamber and then ignited after the exhaust and the inlet of blast-air, as well as a fresh charge, has taken place in the first-named combustion-chamber.

To more clearly understand my invention, reference is had to the accompanying drawings, in which like letters indicate like parts in the several views, and in which—

Figure 1 is a diagrammatic view illustrating my invention. Fig. 2 is a substantially similar view showing a modified arrangement of the inlet-ports; Fig. 3, a diagrammatic plan view, partly in section; Fig. 4, a substantially similar view to Fig. 1, showing a still further-modified arrangement of inlet-ports; Fig. 5, a sectional detail view of the inlet means shown in Fig. 4, and Fig. 6 a vertical section on line 6 6 of Fig. 5.

The three pistons A, B, and C are arranged in a suitable cylinder open at both ends and coöperating with said pistons to form two alined combustion-chambers, the wall of the cylinder and the central piston C being com-

mon to both combustion-chambers, while the outer pistons A B act as cylinder-heads for the respective chambers and close the outer ends of said cylinder. The cylinder is preferably formed of three sections tightly connected together and forming the outer compartments D′ D² of the same diameter and the intermediate compartment D³ of a lesser diameter, the pistons A and B having equal diameters and operating in the outer enlarged compartments, while the piston C is somewhat smaller in diameter and operates in the intermediate reduced compartment D³.

The outer pistons A and B are rigidly connected together by means of the piston-rods H and J, cross-bars F and G, and longitudinal bars E E, arranged and guided on the outside of the cylinder, and the piston-rods are operated by means of connecting-rods K K, at one end pivoted directly to the cross-bars G (or, as shown, to the extensions G′ on said cross-bars G) and at their other ends to two similar cranks O′ O³ on the driven shaft, while the central piston C operates a third crank O² on the same driven shaft, disposed at an angle of one hundred and eighty degrees to the first-mentioned cranks, by means of a piston-rod L and connecting-rod N, the piston-rod L passing through a suitable stuffing-box in the forward piston B, as clearly shown in the drawings.

It will be observed that the two outer pistons A and B have a shorter stroke than the central piston, and therefore the cranks O′ and O³ have shorter crank-arms than the arm of the middle crank O².

According to the oppositely-disposed arrangement of the cranks O′ O³ relative to the crank O² and the connection between the same and the corresponding pistons the outer pistons A and B on the one hand and the central piston C on the other always move in opposite directions, so that while the volume of one combustion-chamber is diminishing the other is increasing to the same extent.

After the two pistons A C have been driven apart by an explosion between them and the shaft has been turned to an extent of about one hundred and eighty degrees the exhaust-gases are caused to escape at S, and at U the entrance of a blast of air and also of gas or explosive mixture takes place, while during the return stroke the explosive mixture, which had been admitted previously into the other combustion-chamber (between C and B) in the same manner and compressed, is ignited, and the pistons B and C are in their turn driven apart, and the shaft is thus given a further half-rotation, and the charge admitted between A and C is compressed, and so on. A double-acting engine is thus obtained, receiving at each rotation of each crank two working impulses, exactly as in a double-acting steam or air-compressor engine.

A powerful gas-engine, working with great uniformity and requiring only small room and small fly-wheels and which is of very simple construction, is thus obtained.

The division of the cylinder into the two outer enlarged and the intermediate reduced compartments before described, allowing of the employment of pistons of different diameters, is of special importance in many cases. For instance, by increasing the diameter of the two outer pistons A B to the same extent their stroke relatively to that of the middle piston C is decreased, and, further, considering the difference of the speed of the pistons and the length of the connecting-rods actuating the two cranks O′ O³ and the middle crank O² of the crank-shaft, a more perfect compensation of the forces acting on the crank-shaft can be effected.

Several advantages are obtained by the aforementioned arrangement. In the first instance, as can be seen, the whole length of the engine is considerably decreased. The two outer working pistons, which are coupled, work with a lower piston speed than the middle piston, and it is possible to regulate the speed of any driven means when said means are directly coupled with the rear working piston A. In case the piston of a single-acting pump is directly coupled with the rear working piston A the rear piston of the two outer working pistons, which are coupled and of equal diameter, can be increased for the purpose of compensating the loss of power during the pressure stroke of the piston.

In the above-described construction a single opening or a row of openings or a plurality of rows of openings may be arranged in the center of the cylinder for the admission of the air and gas. In Fig. 2, however, I have shown three rows of slots or openings arranged in the center of the cylinder, the two side rows preferably supplying blast-air, while the central row is provided for admitting the gas or explosive mixture for supplying both working chambers.

Although I have previously stated that the admission ports or openings are controlled directly by the central piston during its stroke for admitting the explosive charge alternately to the combustion-chambers at either end of the cylinder, it is obvious that suitable mechanism may be arranged for controlling the openings of these parts irrespective of said piston, and, indeed, when the engine is running at a high speed or under other circumstance it may be preferable to arrange two alternately-acting inlet mechanisms. As previously stated, any suitable well-known mechanism may be employed for this purpose, and in Fig. 3 I have shown, in diagram, an arrangement wherein P represents a longitudinal shaft connected at one end to the governor R and at its other end provided with a suitable cam Q, adapted to engage at the proper time the connection T, which controls suitable valve mechanism (not shown) for the inlet-ports. P′ is a similarly-

disposed shaft connected at one end to the governor R and at the other end suitably geared to the driven shaft of the engine or motor.

If the movement of the central piston is carefully followed and it is borne in mind that each admission of gas is preceded by a cleansing charge of compressed air, it will be seen that it is advisable for this order of succession of operations to take place automatically. In connection with this it also becomes possible to effect the mixing of air and gas in the proportions necessary for the explosive mixture in the explosive-chamber itself—viz., during the inlet of both mediums. An example of this arrangement which appears perfect in every respect is shown in Figs. 4 to 6.

As may be seen from the drawings, only one row of openings is arranged for the working piston C, the openings u' being longer than the openings u^2. The former serve for the admission of air, the latter for the admission of gas. The cylinder is surrounded by a chamber X, the compartments or divisions x' of which communicate with the gas-inlet openings u^2. It will be seen that the center piston C during its movement in either direction uncovers the longer air-openings u' before the shorter gas-openings u^2, so that the cylinder is first cleansed by pure air. Immediately afterward the gas-inlets become free, and the air and gas entering radially become mixed in an intimate manner. By this means the usual gas-and-air-mixing devices can be dispensed with. It is obvious, however, that any suitable well-known means may be employed for controlling the admission of the compressed air and explosive mixture without departing from the essential features of my invention, although I prefer the arrangement described above.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In an explosive-engine, the combination with a cylinder, of a pair of connected pistons operating in either end thereof, an intermediate piston, a crank-shaft having oppositely-disposed cranks, rods connecting said pistons and cranks, exhaust-passages in the outer ends of said cylinder controlled by said outer pistons, gas-inlet ports disposed centrally of said cylinder, air-inlet ports adjacent said gas-ports and disposed on each side thereof longitudinally of said cylinder, and ignition means.

2. In an explosive-engine, the combination with a cylinder, of a pair of connected pistons operating in either end thereof, an intermediate piston, a crank-shaft having oppositely-disposed cranks, rods connecting said pistons and cranks, exhaust-passages in the outer ends of said cylinder controlled by said outer pistons, gas-inlet ports disposed centrally of said cylinder, elongated air-inlet ports alternating with said gas-ports and extending on each side thereof longitudinally of said cylinder, and ignition means.

3. In an explosive-engine, the combination with a cylinder, comprising the enlarged outer and intermediate reduced chambers, a pair of connected pistons operating in said enlarged chambers, a smaller piston operating in said intermediate chamber, a crank-shaft having oppositely-disposed cranks, rods connecting said pistons and cranks, gas and air inlet ports, exhaust-passages, and ignition means.

4. In an explosive-engine, the combination with a cylinder comprising the enlarged outer and intermediate reduced chambers, a pair of connected pistons operating in said enlarged chambers, a smaller piston operating in said intermediate chamber, a crank-shaft having oppositely-disposed cranks, rods connecting said pistons and cranks, exhaust-passages in the outer ends of said enlarged chambers, controlled by said outer pistons, gas-inlet ports disposed centrally of said cylinder, air-inlet ports adjacent said gas-ports and disposed on each side thereof longitudinally of said cylinder, and ignition means.

5. In an explosive-engine, the combination with a cylinder comprising the enlarged outer and intermediate reduced chambers, a pair of connected pistons operating in said enlarged chambers, a smaller piston operating in said intermediate chamber, a crank-shaft having oppositely-disposed cranks, rods connecting said pistons and cranks, exhaust-passages in the outer ends of said enlarged chambers, controlled by said outer pistons, gas-inlet ports disposed centrally of said cylinder, elongated air-inlet ports alternating with said gas-ports and extending on each side thereof longitudinally of said cylinder, and ignition means.

6. In an explosive-engine, the combination with a cylinder having a plurality of exhaust-passages in its outer ends, a plurality of centrally-located gas-inlet ports, a plurality of elongated air-inlet ports, alternating with said gas-inlet ports and extending on each side thereof longitudinally of said cylinder, an annular casing surrounding said cylinder having a hollow chamber communicating with said elongated air-inlet ports, a second chamber within said casing communicating with said gas-inlet ports, pistons operating in said cylinder controlling said inlet and exhaust-passages, and ignition means.

7. In an explosive-engine, the combination with a sectional cylinder composed of the enlarged outer and reduced intermediate chambers, a plurality of exhaust-ports located in said outer chambers, a plurality of gas-inlet ports disposed centrally of said intermediate chamber, a plurality of elongated air-inlet ports alternating with said gas-inlet ports and extending on each side thereof longitudinally of said cylinder, an annular

casing surrounding said cylinder having a hollow chamber communicating with said elongated air-inlet ports, a second chamber within said casing communicating with said gas-inlet ports, pistons operating in said chambers controlling said inlet and exhaust-passages, and ignition means.

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

FREDRICK WILLIAM ROGLER.

Witnesses:

PAUL J. TOMANOZY, Jr.,

RAYMOND WILLEY.