(No Model.)

5 Sheets—Sheet 1.

C. SINTZ.

GAS ENGINE.

No. 539,710. Patented May 21, 1895.

Fig 1

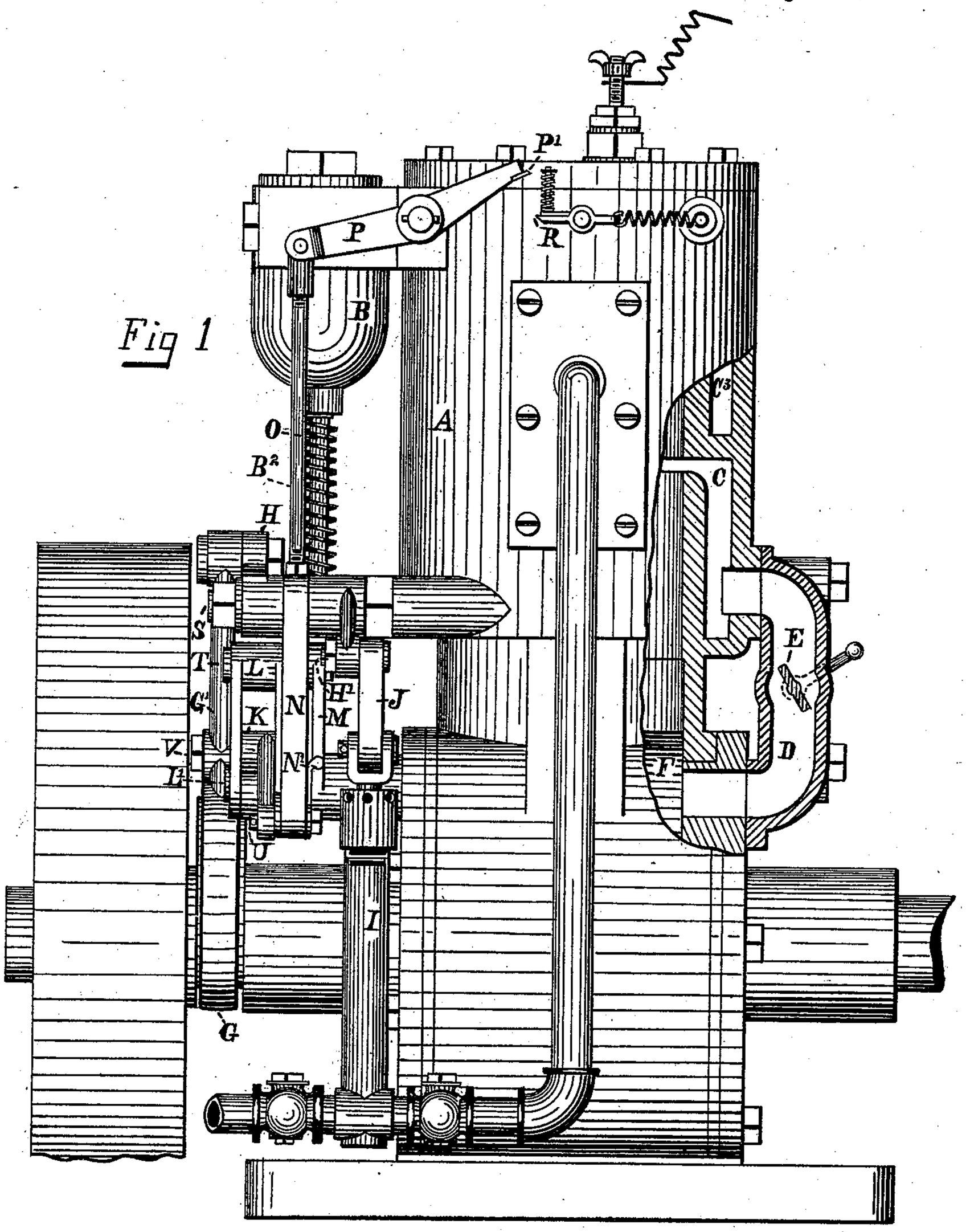

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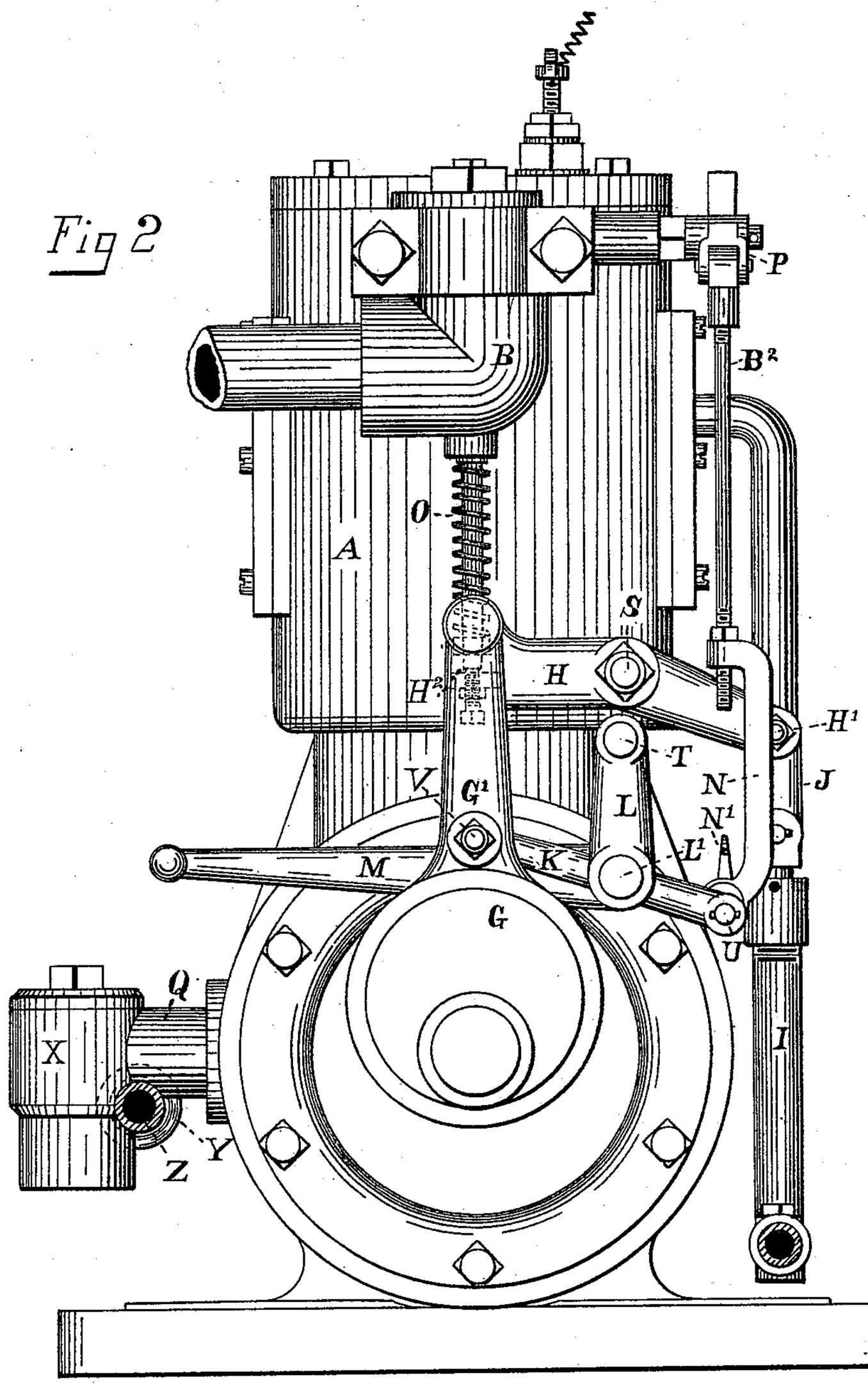
Fig 2



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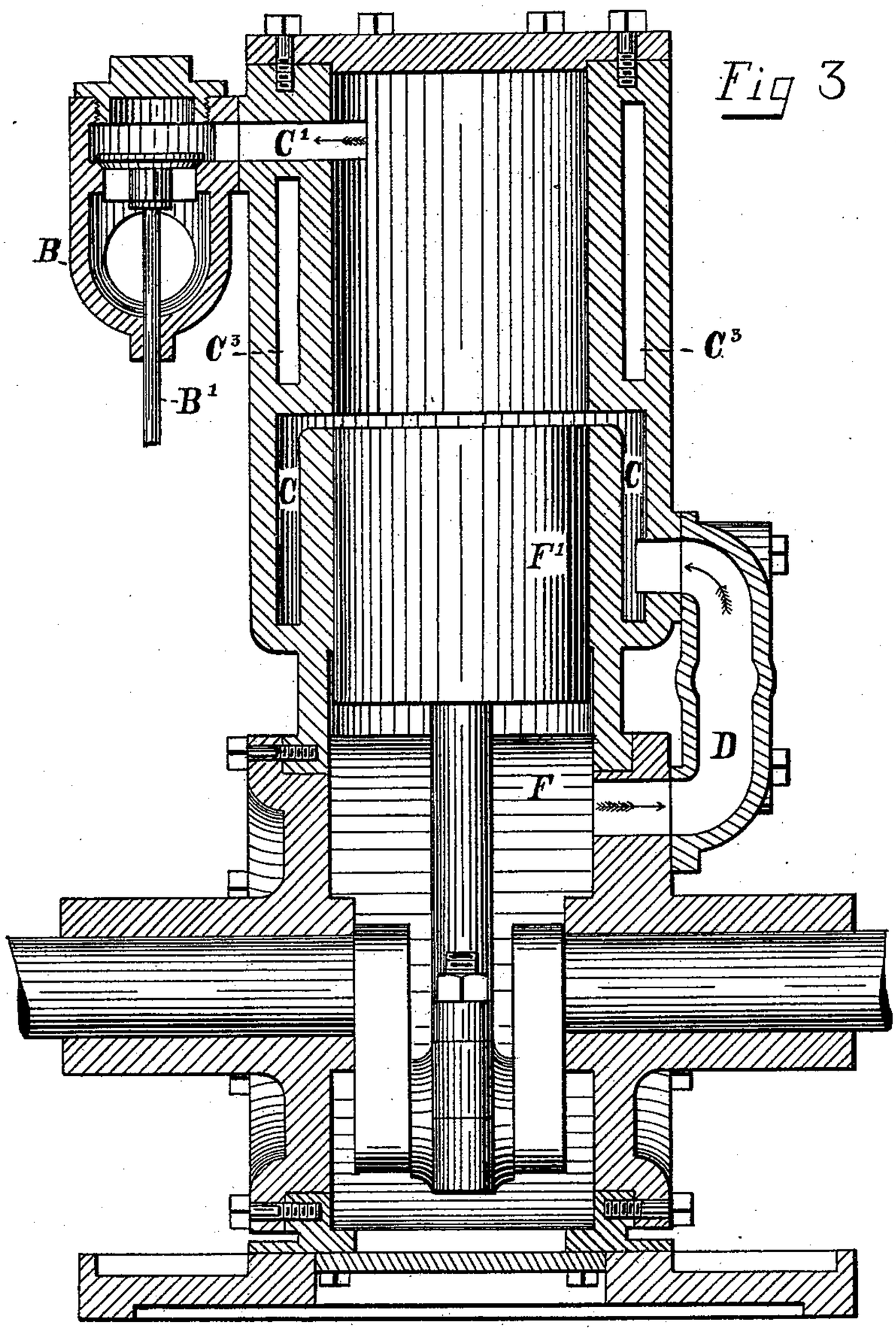

Fig 3

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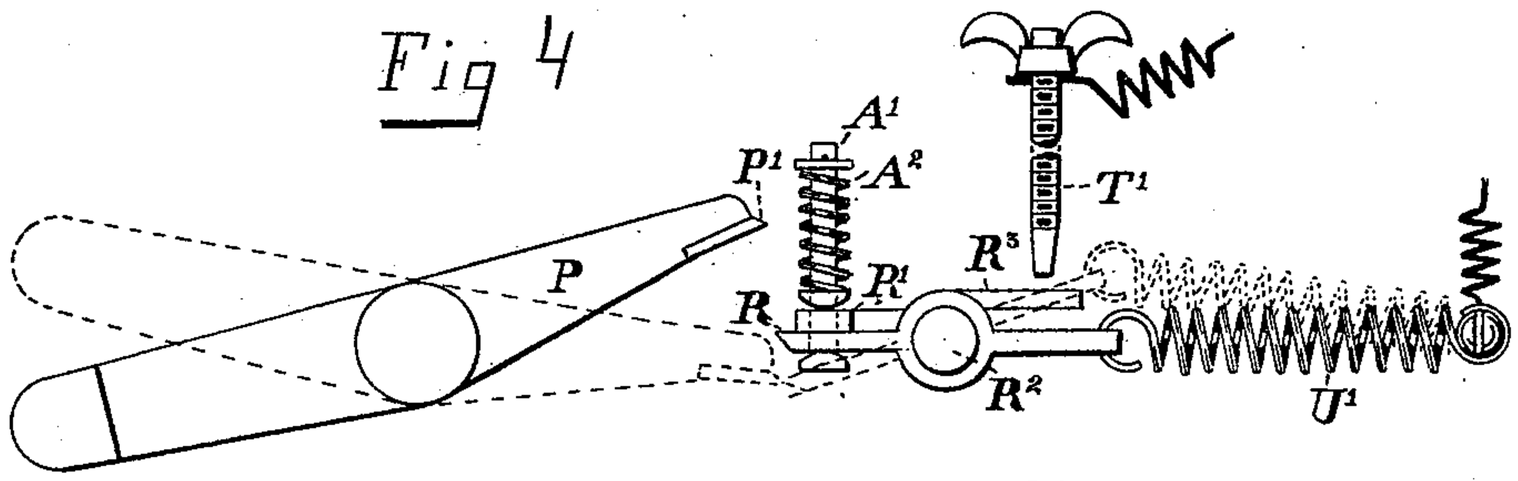
Fig 4



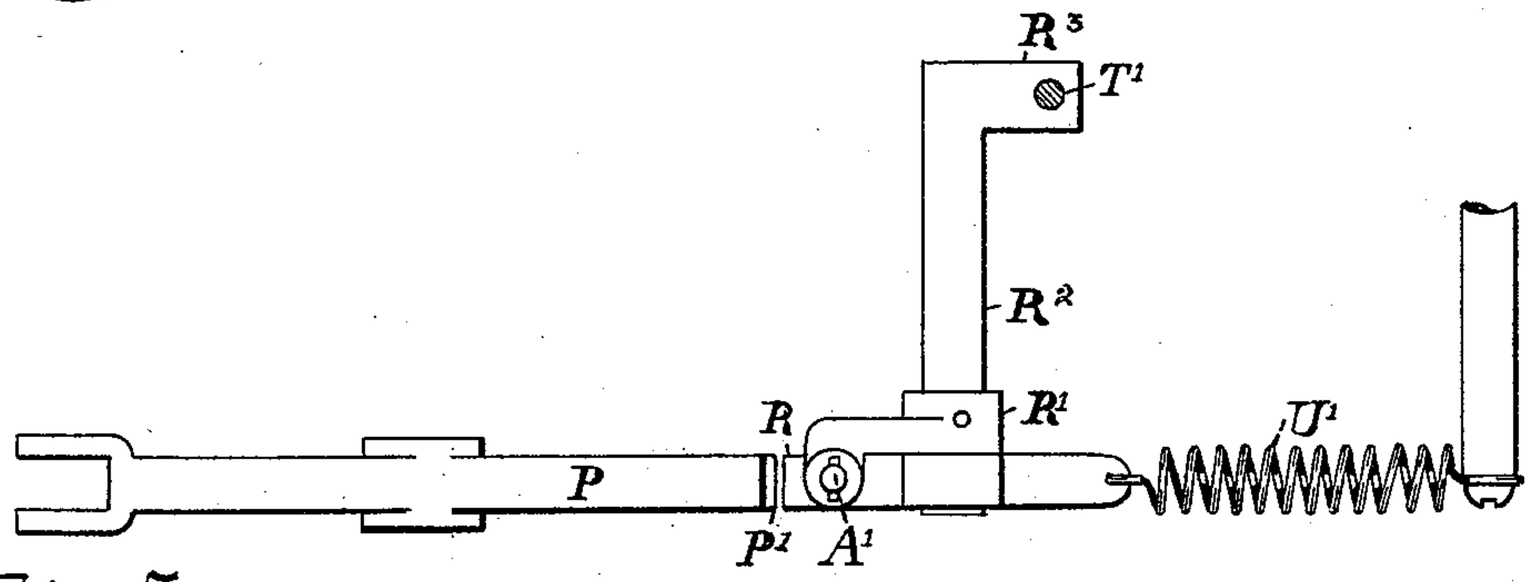


Fig 5

Fig 6

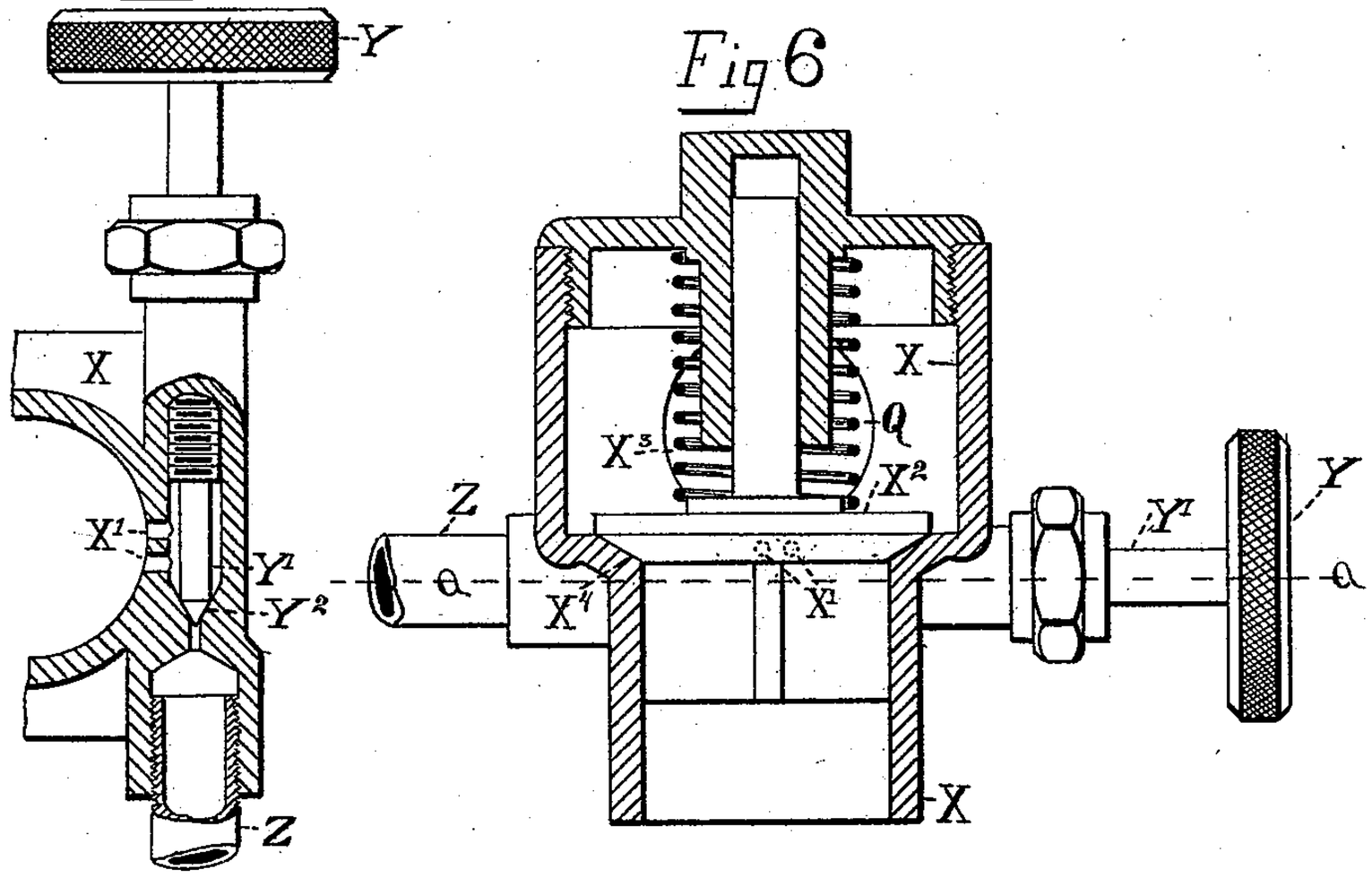


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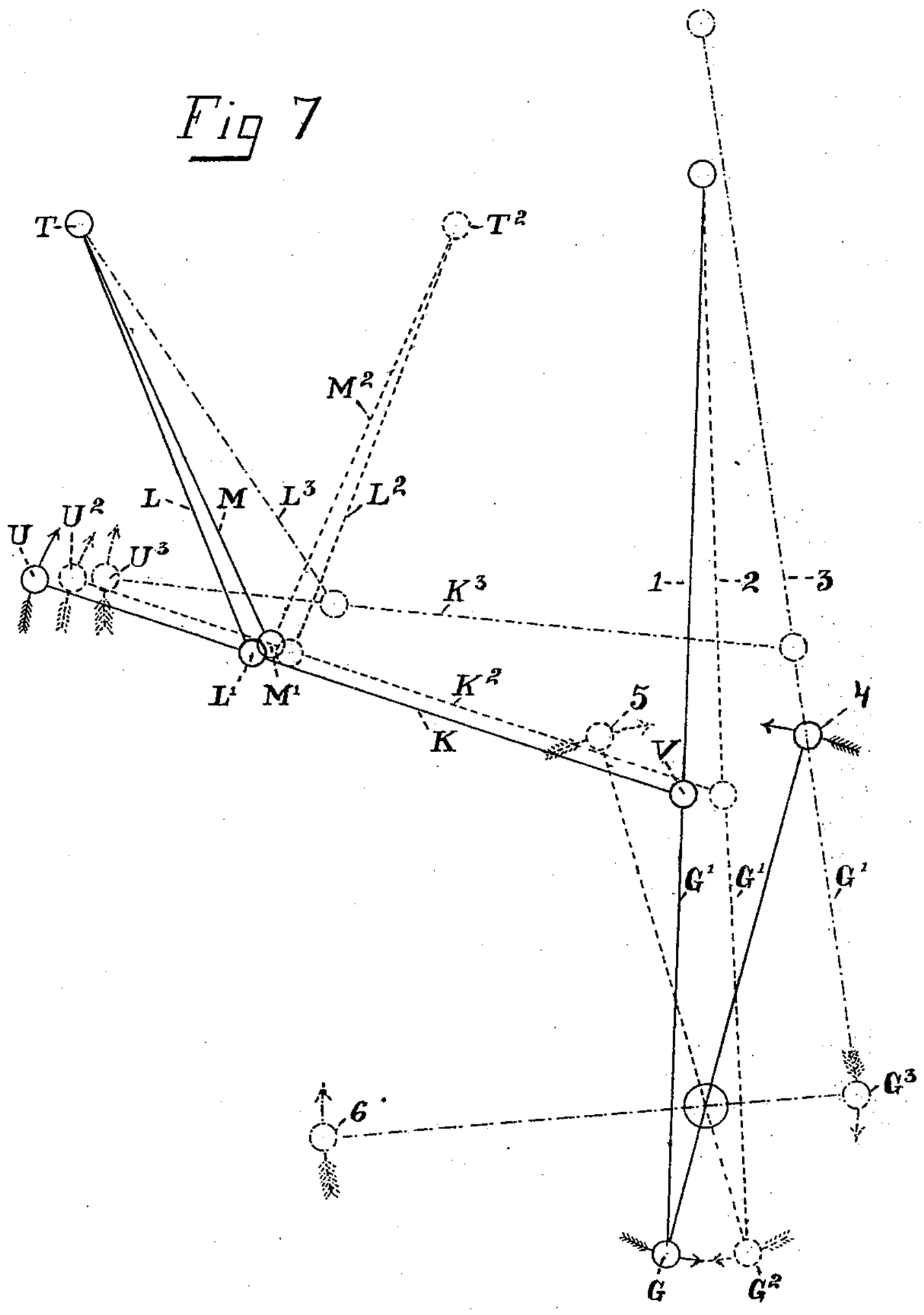
Fig 7



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UNITED STATES PATENT OFFICE.

CLAUDE SINTZ, OF GRAND RAPIDS, MICHIGAN.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 539,710, dated May 21, 1895.

Application filed December 14, 1894. Serial No. 531,801. (No model.)

To all whom it may concern:

Be it known that I, CLAUDE SINTZ, a citizen of the United States, residing at the city of Grand Rapids, in the county of Kent and State of Michigan, have invented certain new and useful Improvements in Gas-Engines, of which the following is a specification.

This invention relates to certain new and useful improvements in gas engines, and is peculiarly adapted for engines in which the gas is generated by means of gasoline, and also in engines known as two-cycles engines, or those which give one impulse at every down stroke of the piston; and the objects of the invention are, first, to take the charge of gas at a point near the top of the piston, thereby keeping the top of the piston cool; second, to provide a new and improved gas exploder; third, to connect with a gas engine suitable mechanism for reversing the engine, and also other novelties in construction and operation hereinafter more fully described. These objects I accomplish by means of the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of an engine constructed in accordance with my invention, with the transfer-port and regulating-valve in section. Fig. 2 is an end elevation of the engine with the fly-wheel removed. Fig. 3 is a sectional view on line of the main shaft of the engine illustrated in Fig. 1. Fig. 4 is an elevation and plan of the exploder, the lower cut of Fig. 4 showing the plan view. Fig. 5 is a sectional view of the generator and valve on line A A of Fig. 6. Fig. 6 is a section of the generator, showing the valve and spring which is used to connect the same, the dotted lines showing the opening for the admission of gasoline. Fig. 7 is a general plan of the operation of the machine, shown by lines in different positions to operate the reversing-gear, illustrating the working arrangement of the combination for reversing the engine and regulating its speed.

Similar letters and numerals refer to similar parts throughout the several views.

A represents the main cylinder having an exhaust port C′ near its upper end, and a charging port C at or near the central part of the cylinder, but above the lowermost line of the piston at its downward stroke, the port C communicating with the base-chamber F, which base-chamber F is preferably in the form of a cylinder. The port C opens into the transfer port D, that is, the gas passes from the base F through C and transfer port D into the cylinder.

B is the exhaust valve chamber, and is provided with a puppet-valve, said puppet-valve having a valve-stem running through the lower part of the chamber B (see Fig. 3), the valve-stem B′ operating the exhaust valve.

B^2 is a connecting rod or pitman which connects the lever K to the lever P, said lever K being pivoted at one end to the eccentric rod G′ at V and at the other end to B^2, at or about the point U, and is pivoted at its central point to the link or lever L at the point L′, as shown in Figs. 2 and 7. The object of this connection is to operate the valve as hereinafter more fully described.

The port C admits the charge into the main cylinder (see Figs. 1 and 3), and is opened and closed by the piston F′ in the manner hereinafter described.

C′ is the exhaust port near the top of the main cylinder A which connects with the valve chamber B. (See Fig. 3.)

E is a valve in the transfer port D which is used for regulating the charge of gas given to the upper part of the main cylinder. (See Fig. 1.) This valve may be operated by hand or by any suitable means. The base-chamber F opens into the main cylinder below the piston and serves as a compression chamber, the charge taken into said base-chamber being compressed by the downward stroke of the piston as hereinafter described. The piston F′ moving in the main cylinder operates the main shaft by means of a crank of the ordinary construction.

G is the eccentric which is provided with an eccentric rod G′ by means of which the exhaust valve B′ is operated, (see Figs. 1, 2 and 7,) and by means of which also the exploder, as shown in Fig. 4, is operated.

H is a walking beam turning on the pivotal point S, and is operated at its inner end by the eccentric G, while its outer end is connected to and operates the water pump I through the connecting rod J and pivot H′, said pivot H′ being the one for the rod J. (See Figs. 1 and 2.)

H^2 is a regulating screw that engages with

the valve stem B′ when eccentric G is near the upper part of its up-stroke. (See Fig. 2.)

M is a lever and link that supports the lever L, and is used for charging the explosive point within the cylinder in order to reverse the engine, and also for regulating the speed of the engine. (See Figs. 1, 2 and 7.)

M′ is the pivotal point of lever M, and the same is also shown in Fig. 7.

N is the lower or bent part of the rod B^2, which may be made integral with the said rod or may be attached thereto. The bent form is merely for the purpose of allowing the clearance of the lever L. (See Figs. 1 and 2.) It is preferably provided with an adjustable nut at the top and bottom as shown at the bottom by N′.

O is a coil spring surrounding the valve stem B′, for the purpose of closing the exhaust valve quickly when the screw H^2 leaves the end of the valve-stem B′, (Figs. 1 and 2.)

P is the lever for operating the exploder. The same is operated by the rod B^2 through the lever K and eccentric G as shown in Figs. 1 and 2.

P′ is a piece of hardened steel or other hardened metal used to prevent wear at the point of contact between the lever P and the contact lever R, said lever turning on R^2 as a center or fulcrum (Figs. 1 and 4), said lever R forming a connection for the springs that operate the contact point for the purpose of producing explosion.

R′ is a lever rigidly connected by pin or otherwise to R^2.

A′ is a pin bearing a coil spring A^2, which spring bears against the end of R′, holding R and R′ in contact, and when pressed down holds R^2 in contact with the explosive point T′. (See Fig. 4.)

R^2 is the exploder-stem. Its outer end is connected to R and R′, and its inner end working within the cylinder and is brought in contact with the lower end of T′, and when suddenly drawn away therefrom produces the spark which explodes the charge within the cylinder.

R^3 is the inner end of R^2 and the same is within the cylinder.

S is the pivotal support of the walking beam H. (See Figs. 1 and 2.)

T is the pivotal support of the link L (Figs. 1 and 2).

T′ is an insulated adjusting screw, the lower end of which forms a contact point, and the sudden removal of R^3 produces the spark causing the explosion. (See Fig. 4.)

U is the lower pivotal connection for the rod N. (See Figs. 1 and 2.)

V is the pivotal connection of the lever K and eccentric rod, (Figs. 1 and 2.)

X is the generating valve operated in connection with the opening through Q into the base-chamber. (See Figs. 5 and 6.)

X′ shows the small openings from the chamber surrounding the valve stem to the generating valve X, which openings extend through the valve seat X^4, as shown in Fig. 6.

X^2 is a puppet-valve seated on the valve seat X^4.

X^3 is a coil spring holding X^2 upon its seat. This spring, however, may be dispensed with in certain cases, but is used when it is desired to seat the valve quickly.

X^4 is the valve seat, having an air-tight fit with X^2.

Y is a hand-wheel or other suitable means for operating the needle valve Y^2 through the valve-stem Y′.

Z is the gasoline pipe communicating from the tank to the generator X for feeding gasoline into the generator chamber.

C^3 is a water space surrounding the main cylinder supplied with water from a pump for the purpose of keeping the cylinder cool.

Referring now to Fig. 7, which is designed to represent the arrangement of the parts designed to reverse the engine and regulate its speed, 1 represents the position of the eccentric rod G′ when the crank is the position for an explosion while it is passing from right to left across the upper center.

2 represents the position of the eccentric rod when the crank is in position for explosion while passing from left to right.

3 represents the eccentric rod at the moment of reversing the engine when the crank is passing from left to right and when the crank is below the center or less than one-half of the upstroke so that the explosion comes before the crank reaches one-half of its upstroke.

4 represents the crank when the eccentric rod is in the position shown in Fig. 1, and passing in the direction shown by its corresponding arrow, eccentric G moving in the direction shown by its arrow drawing the link L to the right, thereby drawing up the point U, moving the lever P upward at its outer end and the point P′ downward, causing the explosion.

5 shows the position of the crank when the eccentric rod is in the position shown by 2.

6 shows the crank when the eccentric is in the position 3 of the crank moving upward.

L, in Fig. 7, shows the position of the link when the eccentric rod is in the position shown by 1.

L^2 shows the position of link L when the eccentric is in the position 2.

L^3 shows the position of L when the eccentric rod is in the position shown by 3.

M, in Fig. 7, shows the position of the lever and link supports when the eccentric is in the position of 1 and 3. M^2 shows its position when the rod is in the position 2.

U, in Fig. 7, shows the point of the lower pivotal connection when the eccentric is in the position shown by G; U^2 when the eccentric is in the position shown by G^2, and U^3 when the eccentric is in the position shown by G^3.

K shows the lever when the eccentric is in the position 1, and K^2 shows the position of the lever when the eccentric is in the position 2, and K^3 shows the lever when the eccentric is in position 3.

G shows the position of the eccentric when the eccentric rod is in position 1.

G^2 shows the position of the eccentric when the eccentric rod is in position 2, and G^3 when the eccentric rod is in position 3.

The above described positions show the various changes made in operating the engine, reversing the engine, &c.

The operation of my invention is as follows: Begin with the piston at the bottom of the stroke, open the needle valve Y^2, the piston is moved upward, drawing in a charge of air through the valve into the valve chamber X, lifting the valve X^2 which opens the holes X′ permitting the gasoline to enter with the air and pass into the base-chamber through the pipe Q. When the piston returns on the down-stroke it compresses the charge into the chamber F until the piston F′ passes the charging port C, when the compressed charge passes through the transferring port D and port C over the top of piston F′ into the upper portion of the cylinder. The piston ascends, compressing the charge into the upper portion of the cylinder until the crank is near the end of the upper stroke. The eccentric G moving down, or opposite the crank, moves the outer end of the lever K upward and through the connection of the rod N and B^2 moves the outward end of the lever P up with the point P′ downward against the point R to the dotted lines shown in Fig. 4, when the point P′ passes, releasing the lever R and driving it upward against R′, which turns the exploder R^2, suddenly jerking the point R^3 from the insulated screw T′ causing an electric spark which ignites the charge, driving the piston downward until it approaches near the port C, when the exhaust valve stem B′ is lifted by the screw H^2 on the lever H, which allows the exploded charge to escape through port C before the piston F′ uncovers the port C, the piston continuing its travel uncovering the port C and permitting the charge in the chamber F to pass through the transfer ports D and C into the cylinder. In reversing the engine a lever M (see Fig. 7) is set in position T, and the crank 4 (Fig. 7) is moved from right to left when the eccentric G is near the lower point of the stroke. The eccentric G passing from left to right draws the link L from left to right, moving the point U of lever K upward, which pushes upward on the outer end of lever P, bringing the point P′ against and past the point R, thereby making the explosion just before the crank arrives at the center of the upper stroke. In order to reverse the engine the link L^2 is moved to the position shown by T^2, the main crank 5 will be in the position 5^2 and the eccentric in position G^2, which will permit the engine to run from left to right or in an opposite direction from what it would when in the position 1. If I now wish to reverse the engine, I move the lever M^2 to position of M and T. Now as the top of the crank turns from left to right the point of explosion will come when the crank is in position 6 and moving upward, which brings the eccentric G^3 in position 3 of eccentric rod, and the outer end U of the rod K in the position of U^3 and rod K^3 which will explode the charge when the piston is in position of less than one-half of the up-stroke. The momentum of the fly-wheel will continue the movement of the piston until the pressure of the exploded charge overcomes the fly-wheel momentum, and the rebounds will drive the piston forward with sufficient force to carry the fly-wheel one full revolution, when the engine will run in the opposite direction.

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

1. In an exploder for a gas or gasoline engine, the combination of an adjustable contact point within the cylinder, a lever having a point within the cylinder adapted to be brought in contact with the contact point and extending without the cylinder, having on its outer end a lever rigidly attached thereto and another lever pivotally connected, and the two outer levers normally held in contact by means of a spring, substantially as described.

2. The combination of an adjustable contact point within the cylinder, a lever having a point within the cylinder adapted to be brought in contact with the adjustable contact point and extending without the cylinder, having on its outer end a lever rigidly connected thereto, another lever pivotally connected, the two outer levers normally held in contact by means of a spring, a secondary spring as U′ adapted to hold the lever which passes through the cylinder normally out of contact with the adjustable contact point, substantially as described.

3. The combination of an adjustable contact point within the cylinder adapted to be brought into contact with the adjustable contact within the cylinder, a lever at its outer end rigidly connected thereto, another lever pivotally connected, the two levers normally held in contact by a spring, a spring as U′ adapted to hold the lever which passes through the cylinder normally out of contact with the adjustable contact point, and a secondary lever as P operating the same, substantially as described.

4. In combination with a lever having a contact point within the cylinder, a lever rigidly connected to said first mentioned lever without the cylinder, a lever pivotally connected to said lever without the cylinder, a spring adapted to hold the two levers normally in contact, another spring as U′ adapted to hold the lever which passes through the cylinder normally out of contact with the adjustable con-

tact point, an operating lever as P and suitable mechanism for giving the required movement to lever P, substantially as described.

5. In a gas or gasoline engine, the combination of a reversing lever, a mediate connection between said lever and the exploding mechanism, a mechanism for exploding the gas in the cylinder chamber whereby the charge may be exploded at different points for the purpose of running the engine in either direction, substantially as described.

6. The combination of the lever M, the lever K, the eccentric rod G′, the eccentric G, connecting rod B^2, lever P and lever R, all substantially as and for the purpose described.

In witness whereof I have hereunto set my hand and seal in the presence of two witnesses.

CLAUDE SINTZ. [L. S.]

Witnesses:
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CHRISTOPHER HONDELINK.