

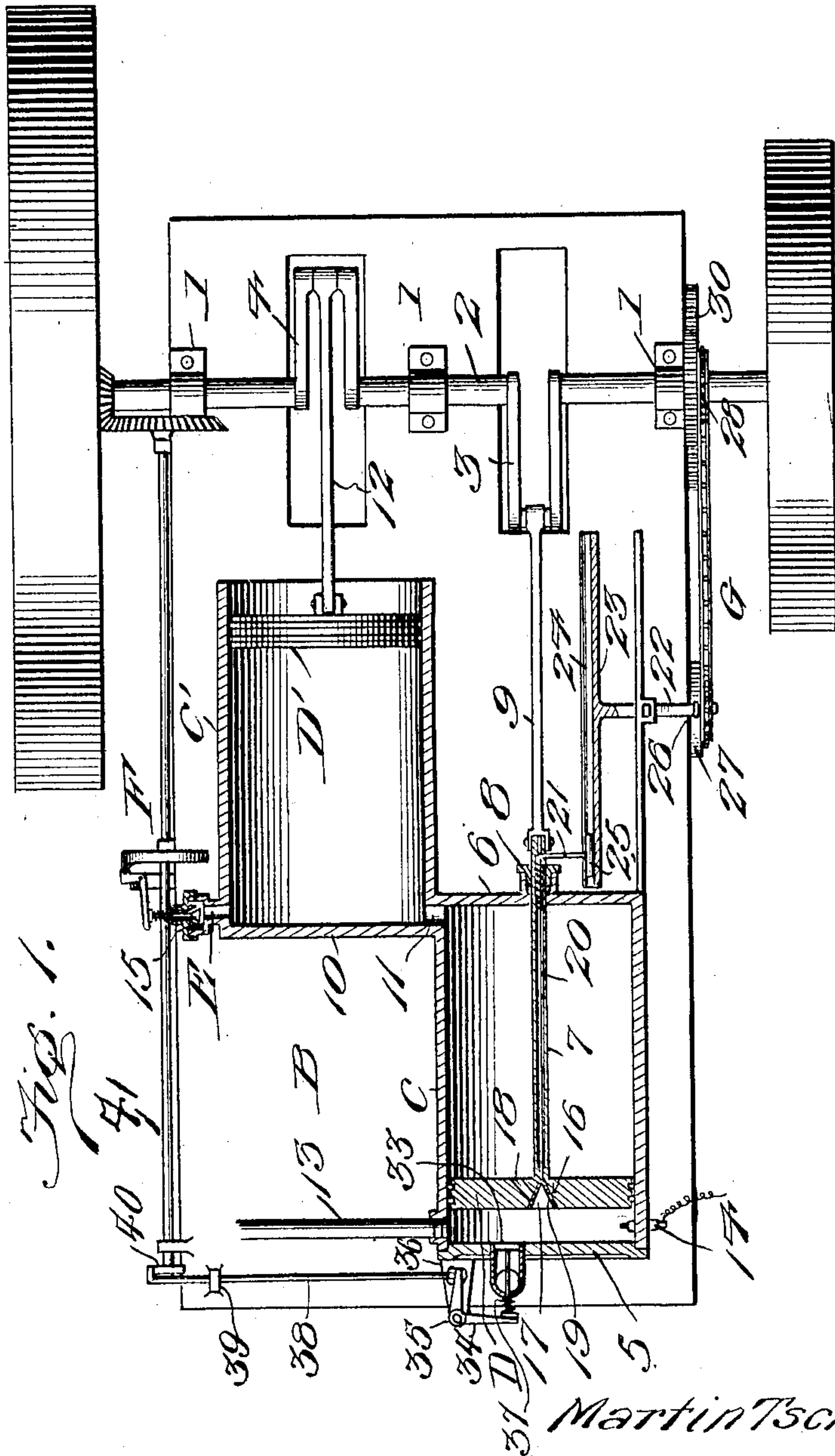
No. 887,549.

PATENTED MAY 12, 1908.

M. TSCHIMPERLE.
ENGINE.

APPLICATION FILED SEPT. 24, 1907.

3 SHEETS—SHEET 1.



Witnesses

Wm North
Wm Bagger

Inventor
Martin Tschimperle,

By *Victor J. Evans*

Attorney

No. 887,549.

PATENTED MAY 12, 1908.

M. TSCHIMPERLE.
ENGINE.

APPLICATION FILED SEPT. 24, 1907.

3 SHEETS—SHEET 2.

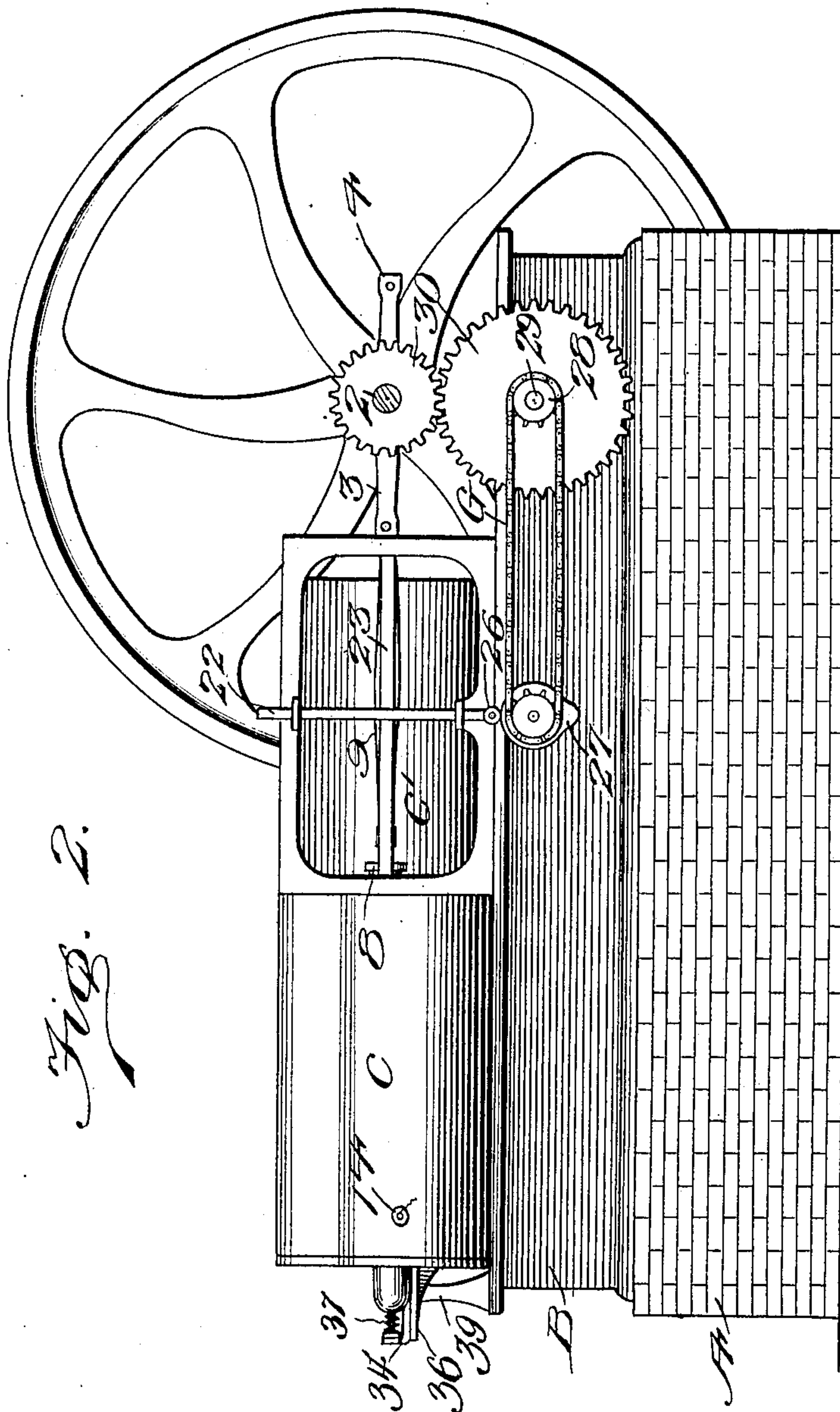


Fig. 2.

Witnesses

Wm. Noerth.
A. Allen.

Inventor

Martin Tschimperle,

By

Victor J. Evans

Attorney

No. 887,549.

PATENTED MAY 12, 1908.

M. TSCHIMPERLE.

ENGINE.

APPLICATION FILED SEPT. 24, 1907.

3 SHEETS—SHEET 3.

Fig. 3.

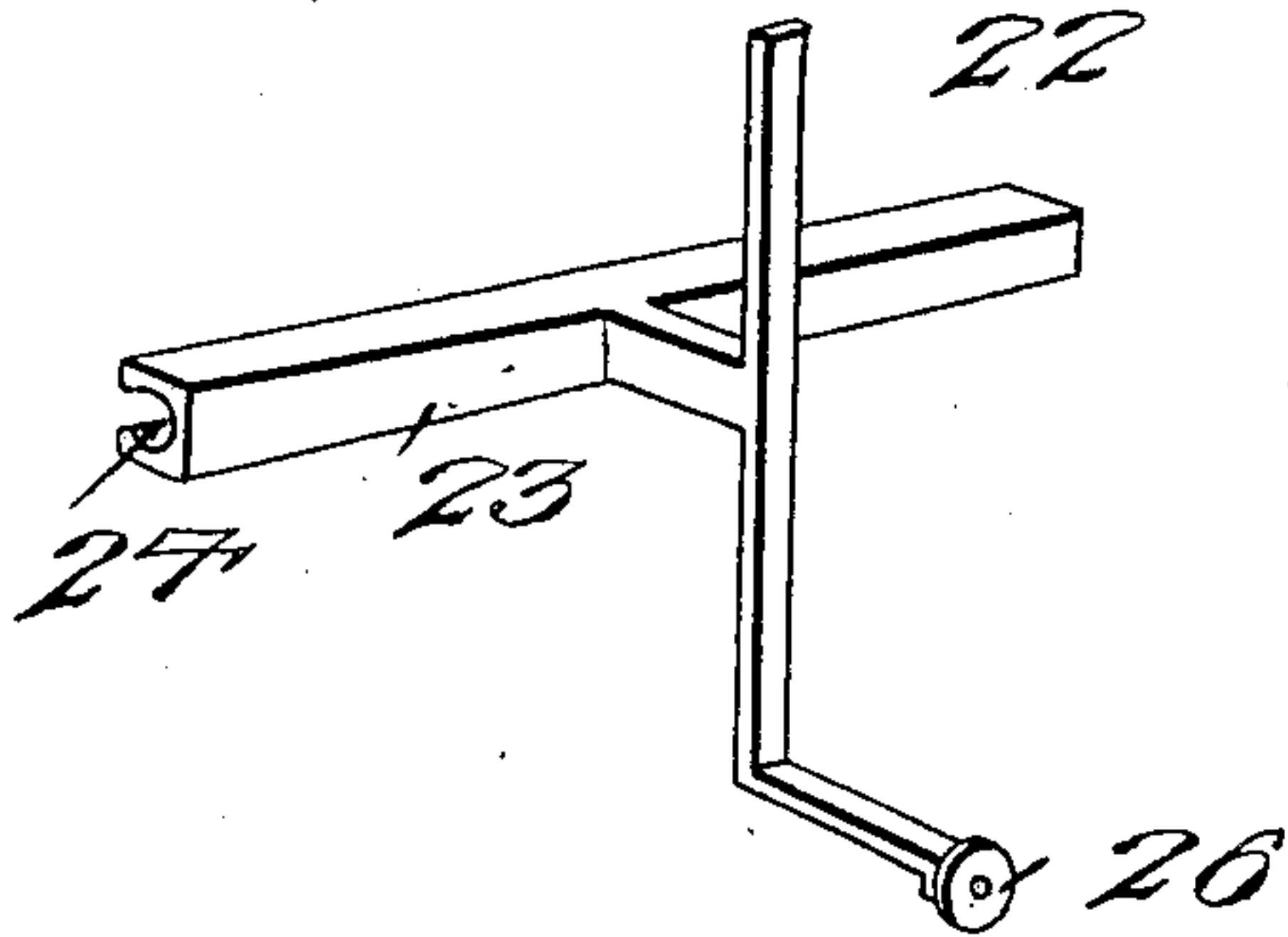


Fig. 7.

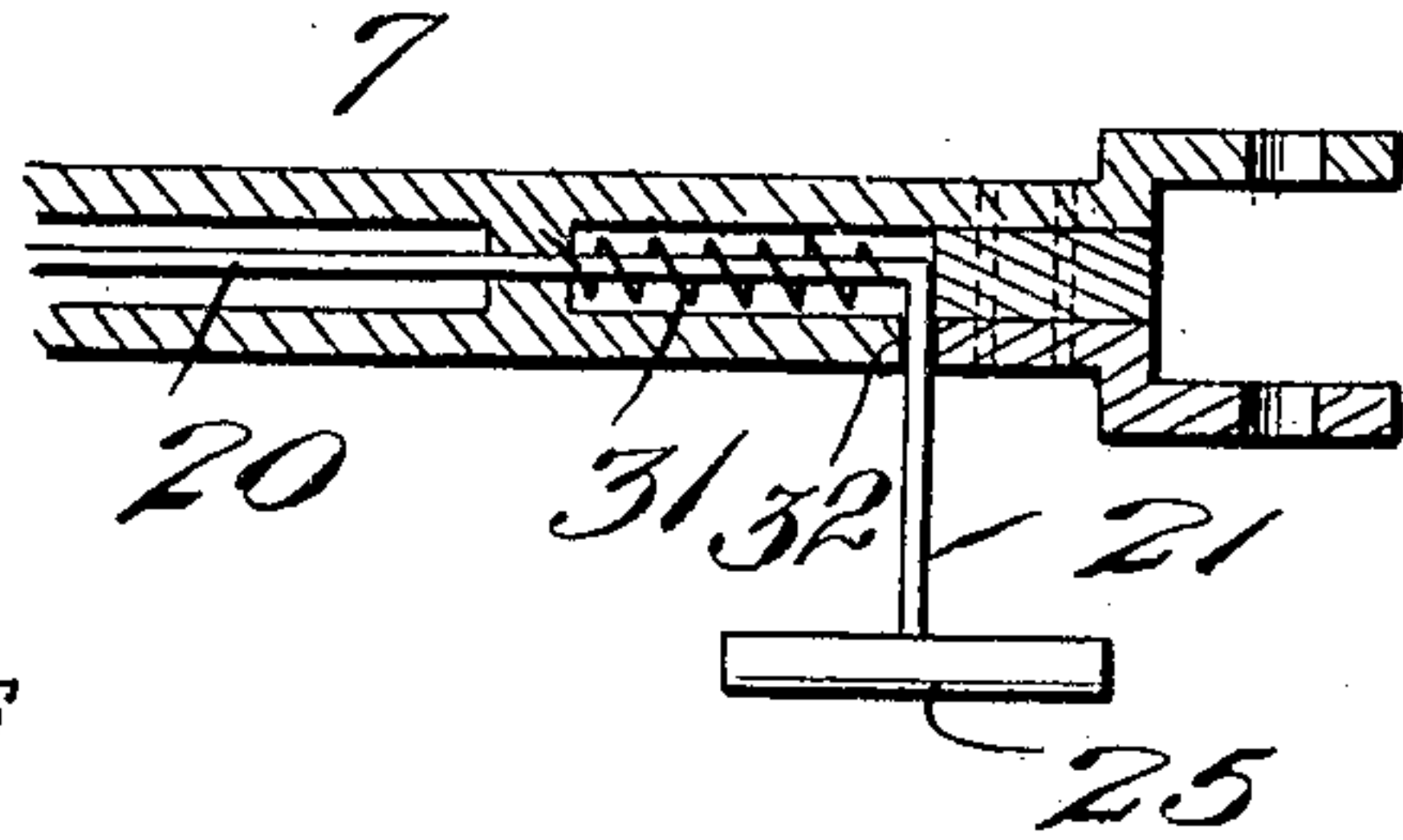


Fig. 5.

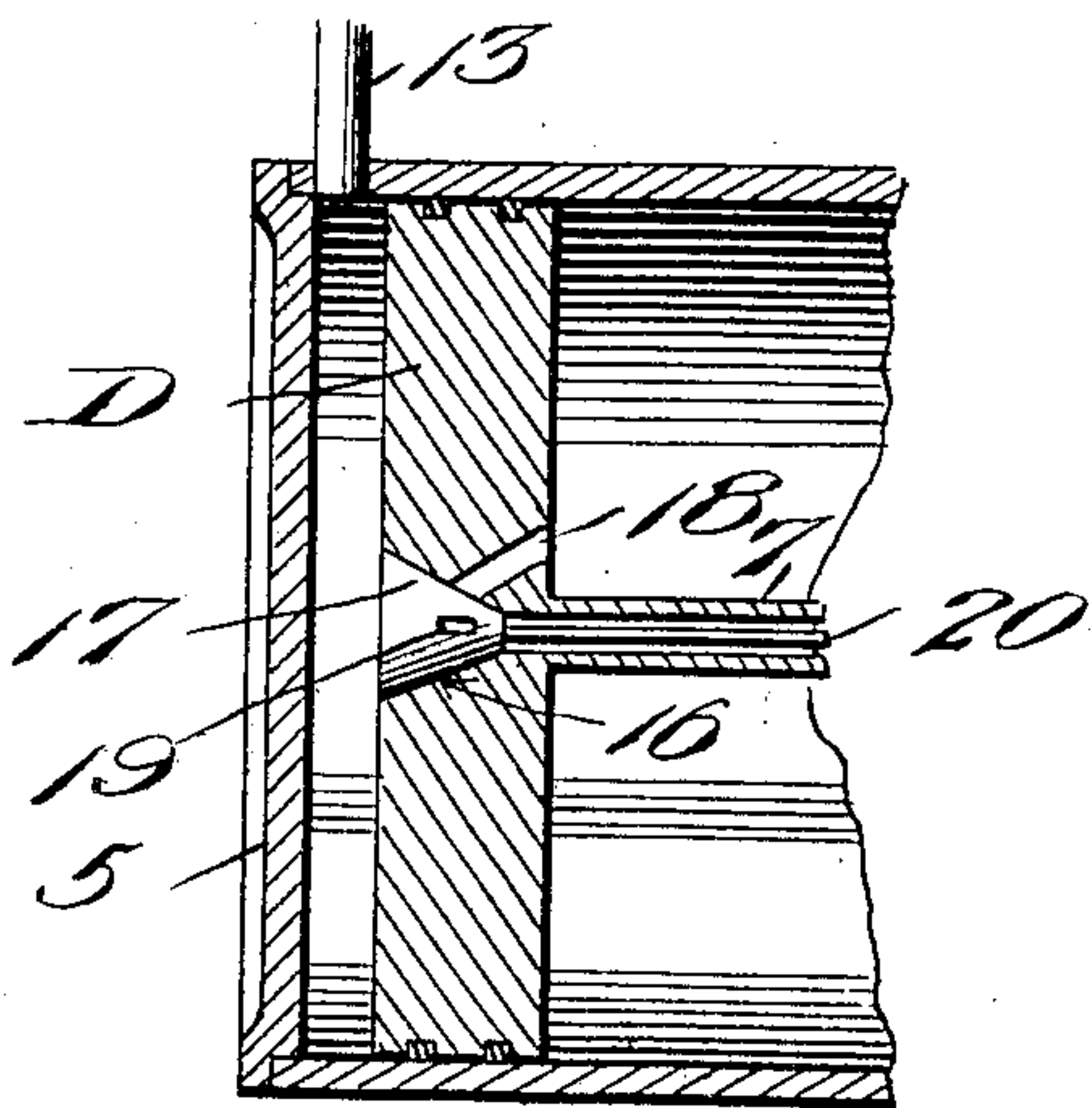
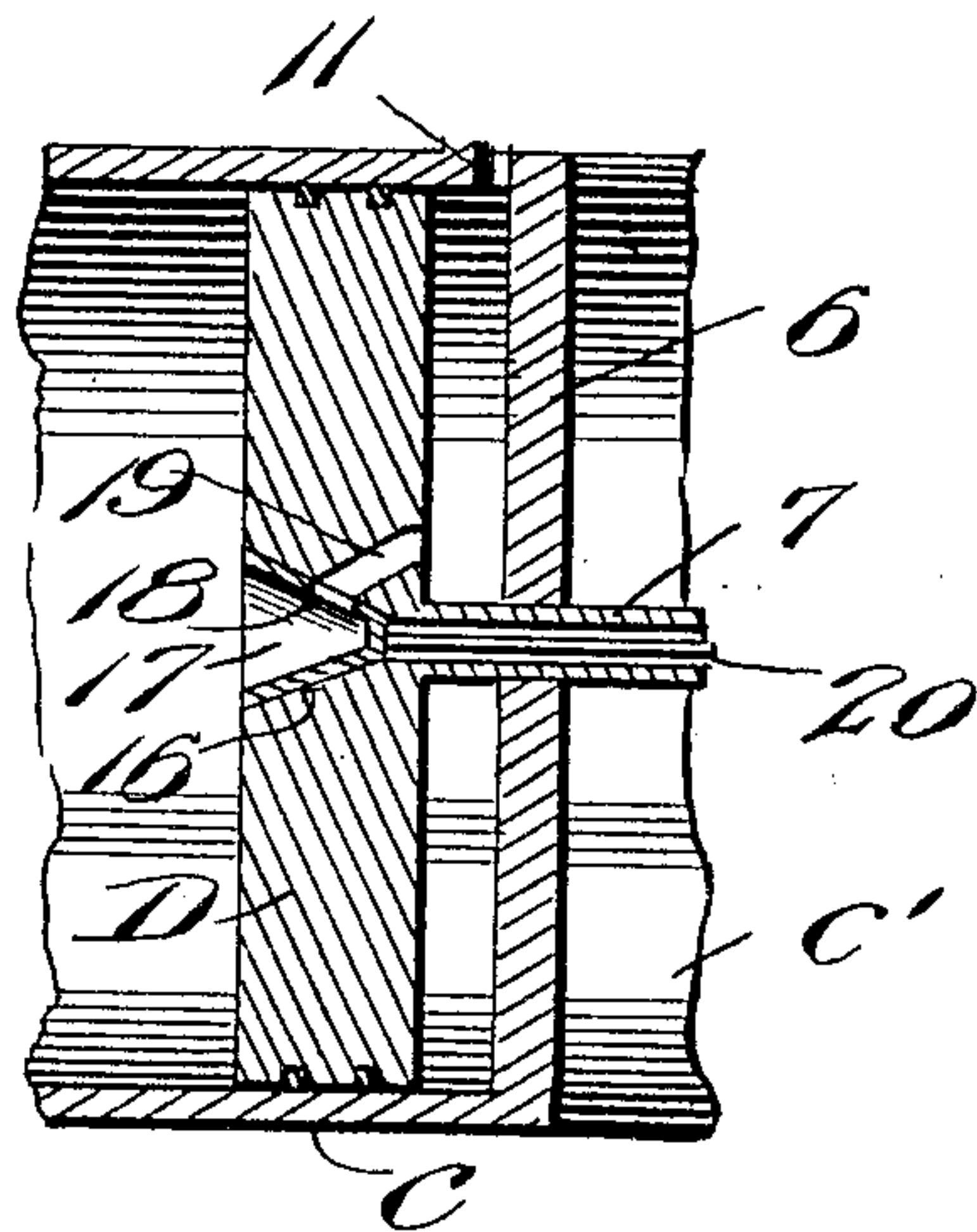


Fig. 6.



Witnesses

Wm. North
R. Allen

Martin Tschimperle, Inventor

By *Victor J. Evans*

Attorney

UNITED STATES PATENT OFFICE.

MARTIN TSCHIMPERLE, OF VICTORIA, MINNESOTA.

ENGINE.

No. 887,549.

Specification of Letters Patent.

Patented May 12, 1908.

Application filed September 24, 1907. Serial No. 394,382.

To all whom it may concern:

Be it known that I, MARTIN TSCHIMPERLE, a citizen of the United States of America, residing at Victoria, in the county of Carver and State of Minnesota, have invented new and useful Improvements in Engines, of which the following is a specification.

This invention relates to compound explosive or other engines of the four cycle class, and relates more particularly to an engine of that type in which the motive fluid is conducted through the piston of a main cylinder at the end of a forward stroke to the auxiliary or low pressure cylinder to act on the piston therein for further abstraction of the energy from the motive fluid.

The invention has for one of its objects to improve and simplify the construction and operation of engines of this class so as to be comparatively easy and inexpensive to manufacture and maintain in repair, thoroughly reliable and efficient in use and composed of comparatively few parts.

A further object of the invention is the provision of an engine having an improved valve mechanism for operating the valve carried by the main piston so as to control communication between high and low pressure cylinders.

With these objects in view and others as will appear as the description proceeds, the invention comprises the various novel features of construction and arrangement of parts which will be more fully described hereinafter and set forth with particularity in the claims appended hereto.

In the accompanying drawings which illustrate one of the embodiments of the invention,—Figure 1 is a plan view of the engine with portions in section. Fig. 2 is a side elevation. Fig. 3 is a perspective view of the lifter included in the valve-actuating mechanism. Fig. 4 is a detail sectional view of a portion of the main piston rod, showing the rocker arm for the valve. Figs. 5 and 6 are detail sectional views, showing the valve in open and closed position while the main piston is at the inner and outer ends of its stroke.

Similar reference characters are employed to designate corresponding parts throughout the several views.

Referring to the drawing A designates the foundation of the engine and B the bed there-

of on which are bearings 1 that receive the crank shaft 2. In the present instance the crank shaft is of the double-throw type and has crank arms 3 and 4 arranged 180 degrees apart.

On the bed B are main and auxiliary cylinders C and C' arranged in offset relation, as shown in Fig. 1. The main or high pressure cylinder C has both ends closed by heads 5 and 6, and reciprocating therein is a main piston D. The piston rod 7, which is hollow, passes through the head 6 of the cylinder, at which point is a stuffing box 8, and between the outer end of the piston rod and crank 3 is a connecting rod 9. The cylinder C' is open at its forward end, while its opposite end is closed by a head 10, and the closed end of the cylinder C' is connected with the forward end of the main cylinder C by a short permanently open passage 11, whereby the motive fluid can enter the auxiliary cylinder after the main piston has finished its forward stroke. The piston D' in the auxiliary cylinder is directly connected with the crank 4 by a connecting rod 12. The motive fluid is admitted to the main cylinder from a carbureter or other suitable source through a pipe 13, and when the engine moves to operate exclusively a spark plug 14 or other ignition device is provided. At the closed end of the cylinder C' is an exhaust port E that is controlled by a valve 15. This valve is mechanically actuated from the engine shaft 2 by a suitable mechanism designated generally by F so that the products of combustion can be discharged from the forward and rearward ends of the cylinders C and C' respectively during the outward stroke of the piston D and inward stroke of the piston D'.

The piston D has a central conical seat 16 for receiving the hollow conical valve 17 that controls the pressure of the motive fluid from the rear to the front side of the piston D through a port or passage 18 in the said piston. The valve 17 is provided with a port 19, which, by a rocking movement of the valve, is brought into alinement with the port 18 for permitting the motive fluid to pass through the latter. The rocking valve 17 is secured to a stem 20 arranged within the hollow piston rod 7, and on the forward end of the stem is a laterally extending arm or rocker 21. The stem and attached parts obviously reciprocate with the piston rod,

To actuate the valve a vertically reciprocating or lifting element driven by the crank shaft is employed. This lifting element 22 has a horizontally extending guide 23 disposed parallel with the piston rod and arranged between the cylinder C and crank shaft. The guide has a way 24 in which slidably engages a head 25 on the extremity of the rocker arm 21. The lifting element 22, which is suitably guided on the frame of the engine, carries a roller 26 at its lower end which rests in contact on a rotary cam 27, which cam is driven by a sprocket and chain mechanism G. The sprocket 28 of the mechanism G is mounted on a stub shaft 29 which rotates at half the speed of the main shaft 2 and is driven through the gear wheels 30 on the shafts. The weight of the lifting element 22, together with the guide 23, will hold the valve 17 in closed position and return the valve to such position after having been opened. To insure the closing of the valve, however, a torsional spring 31 is arranged on the valve stem 20 and housed in the piston rod 7, (Fig. 4) the spring being normally under a tension tending to hold the valve closed. The piston rod 7 has an opening 32 through which the arm 21 extends.

The operation of the engine will be briefly described as follows: When the parts are in the position shown in Fig. 1 the charge of compressed explosive mixture at the rear side of the piston B is ignited by the spark 14 so as to impart a forward impulse to the piston. At the end of the forward stroke the cam 27 raises the lifting element, which by means of the connection between the latter and arm 21 rocks the valve 17 so that the port 19 will register with the passage 18, as shown in Fig. 6. The partially expanded gases are thus admitted to the auxiliary cylinder to act on the piston D', which is at that moment at the inner end of its stroke so as to receive the full impact of the remaining energy in the gases. The outward movement of the piston D' is accompanied by the inward movement of the piston D. During this inward stroke of the main piston the gases on the inner side thereof are exhausted through a suitable mechanically actuated exhaust valve. Upon the next forward stroke of the main piston a new charge of the explosive mixture is drawn into the cylinder C, and simultaneously the auxiliary piston forces out spent products through the exhaust passage E which has been opened by the valve 15 at the proper moment. Since the passage 11 is permanently open the gases will be exhausted from the forward and rearward ends of the cylinders C and C' when the exhaust valve 15 is open. The succeeding stroke compresses the new charge in the main cylinder, which charge is fired as before, with the repetition of the foregoing operation. During the return stroke of the

piston D the pressure valve 17 will be held closed by the combined weight of the element 22 and the effect of the spring 31 to close the valve, thereby insuring compression of the charge on the instroke of the piston D.

Any suitable mechanism may be employed for operating the exhaust valve. The exhaust valve 33, Fig. 1, is opened by a bell crank lever 34 fulcrumed at 35 on a bracket 36, and for closing the valve, a compression spring 37 is arranged on the stem of the valve. The bell crank lever is connected with a rod 38 slidable in a bearing 39 and operated by a cam 40 on the half speed shaft 41 which actuates the exhaust valve E of the secondary cylinder. The parts for actuating the exhaust valve 33 are so arranged that the valve will open during the exhaust stroke of the piston D, so that the spent products of combustion will be discharged from the main cylinder preparatory to the admission of the next charge of explosive mixture.

From the foregoing description, taken in connection with the accompanying drawings, the advantages of the construction and of the method of operation will be readily apparent to those skilled in the art to which the invention appertains, and while I have described the principle of operation of the invention, together with the apparatus which I now consider to be the best embodiment thereof, I desire to have it understood that the apparatus shown is merely illustrative, and that such changes may be made when desired as are within the scope of the claims.

Having thus described the invention, what is claimed as new, is:—

1. In an engine, the combination of a main and auxiliary cylinder connected by a permanently open passage, pistons in the cylinders, and an automatically actuated valve for permitting motive fluid to enter the auxiliary cylinder through the said passage after the fluid has acted on the piston in the main cylinder, with a mechanism for actuating the valve, said mechanism comprising a rod connected with the valve and mounted on the piston to move back and forth therewith, a cam-actuated element, and means slidably connecting the element and rod for opening the valve by the element.

2. In an engine, the combination of a pair of cylinders connected by a permanently open passage, pistons in the cylinders, means for admitting fluid to one of the cylinders to act immediately on the piston therein, and an automatically actuated valve on such piston for permitting the fluid to traverse the said passage and act on the other piston, with a mechanism for actuating the valve, said mechanism comprising a rod carried by the piston and connected with the valve, an element movable downwardly by its own weight, means for periodically raising the element, and a connection between the rod and

element for opening the valve when the latter is raised and for closing the valve when the latter drops by its own weight.

3. In an engine, the combination of a main cylinder having closed ends, a second cylinder closed at one end and having such end connected with the outer end of the main cylinder by a passage, pistons in the cylinders, a valve carried by the piston in the main cylinder for permitting motive fluid to pass to the opposite side of the piston after the latter reaches the end of its stroke and to enter the second cylinder through the said passage for acting on the second piston, a power driven mechanism located outside the main cylinder and connected with the valve for opening the latter, said mechanism including an element mounted to return to normal position by gravity for closing the said valve and an exhaust valve for the auxiliary cylinder.

4. In an engine, the combination of main and auxiliary cylinders, pistons therein, a valveless connection between the cylinders, a port in the main piston for permitting motive fluid to pass to the forward side of the latter at the end of the forward stroke, an oscillatory valve mounted on the piston for controlling the said port, a member outside the cylinder and connected with the valve for oscillating the same, a cam rotating in timed relation with the movement of the main piston, an element mounted to be raised by the cam and to return to normal position by gravity and supported on the cam, means between the element and member for actuating the latter, and means for admitting motive fluid to the rear side of the main piston.

5. In an engine, the combination of a piston, a port therein, an oscillating valve controlling the port, a crank shaft driven by the piston, an element exterior to the cylinder and operated by the shaft, and means movable with the piston and located between the element and valve for oscillating the latter by the element.

6. In an engine, the combination of a piston, a port therein, an oscillating valve con-

trolling the port, a reciprocating element, a member connected with the valve for rocking the same, and a connection between the element and member permitting of movement of the latter with the piston.

7. In an engine, the combination of a cylinder, a piston therein, a port in the piston, a valve controlling the port and carried by the piston, a stem connected with the valve, a reciprocating element, a guide carried thereby, and means on the stem engaging in the guide for oscillating the valve by the said element.

8. In an engine, the combination of a cylinder, a piston therein, a port in the piston, a valve controlling the port, a stem, a spring on the stem tending to close the valve, an arm connected to the stem, a movable element, and a connection between the arm and element permitting of relative sliding movement for oscillating the valve by the element.

9. In an engine, the combination of a cylinder, a piston, a crank shaft driven by the piston, a valve seat on the piston, a valve cooperating therewith, a port in the piston controlled by the valve, a hollow piston rod, a stem therein, a spring housed in the rod and connected with the stem for closing the valve, and means actuated by the crank shaft to rock the stem.

10. In an engine, the combination of a cylinder, a piston, a crank shaft driven by the piston, a valve seat on the piston, a valve cooperating therewith, a port in the piston controlled by the valve, a hollow piston rod, a stem therein, a spring housed in the rod and connected with the stem for closing the valve, an arm on the stem, a head on the arm, a member in which the head slides, an element connected with the member for moving the same, and means driven by the crank shaft for actuating the element.

In testimony whereof I affix my signature in presence of two witnesses.

MARTIN TSCHIMPERLE.

Witnesses:

GEO. A. DU TOIT,
K. K. KLONMER.