

No. 744,547.

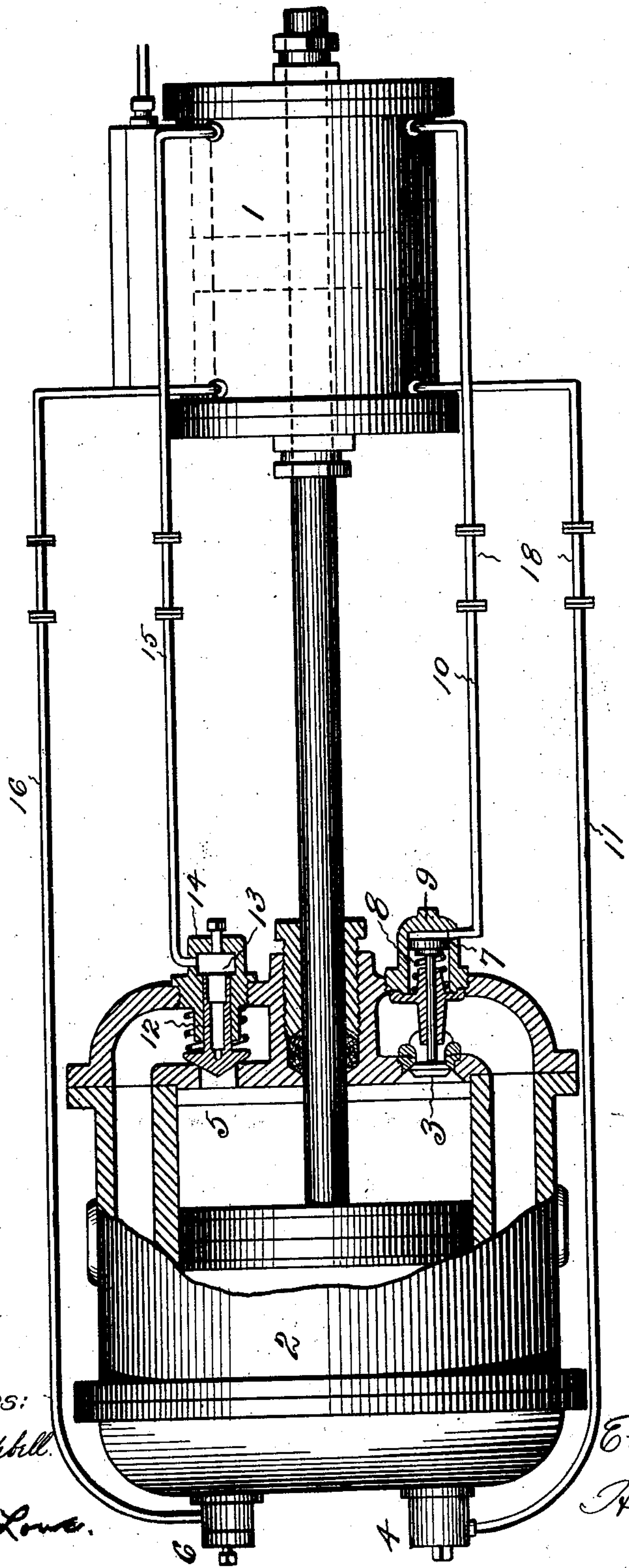
PATENTED NOV. 17, 1903.

E. HILL.
PUMPING ENGINE.
APPLICATION FILED FEB. 14, 1903.

NO MODEL.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

J. G. Campbell.

Edw. M. Lowe.

Inventor:

Charles Hill by
Harry P. Williams
att.

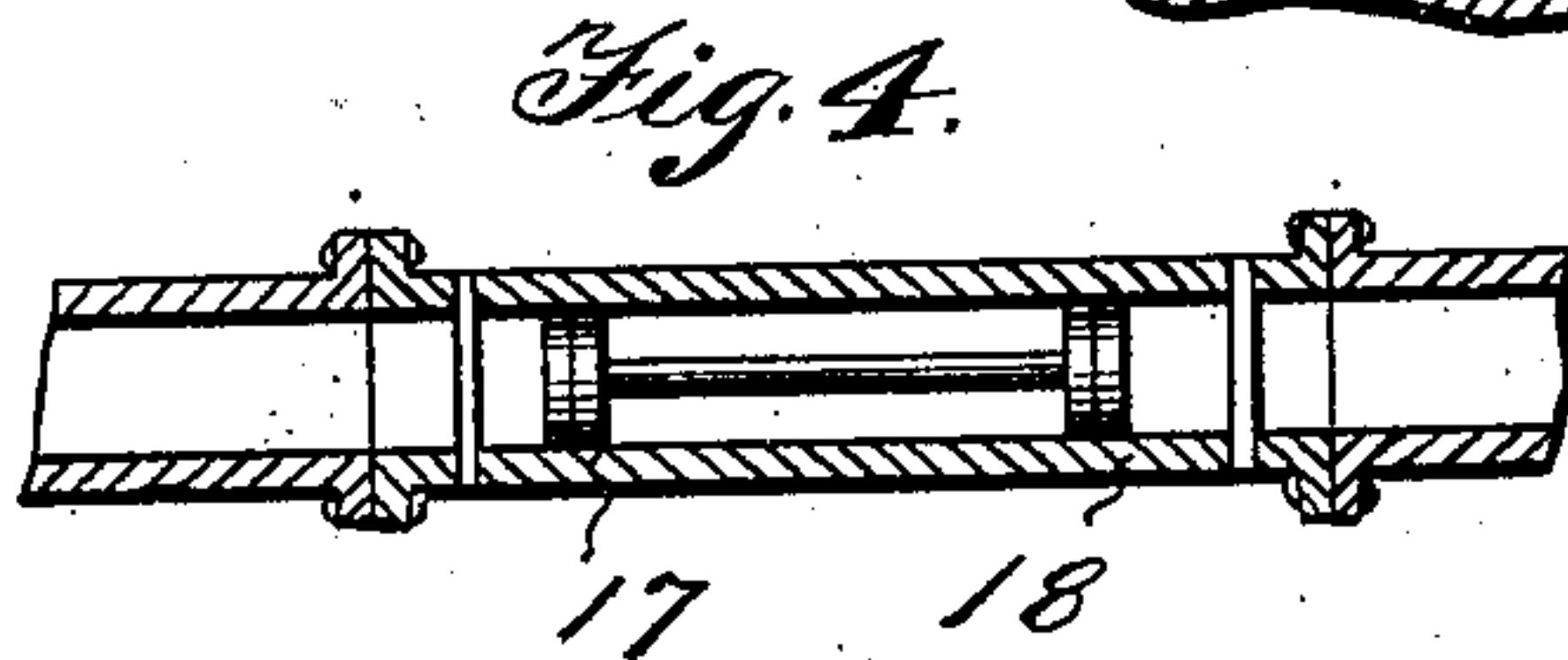
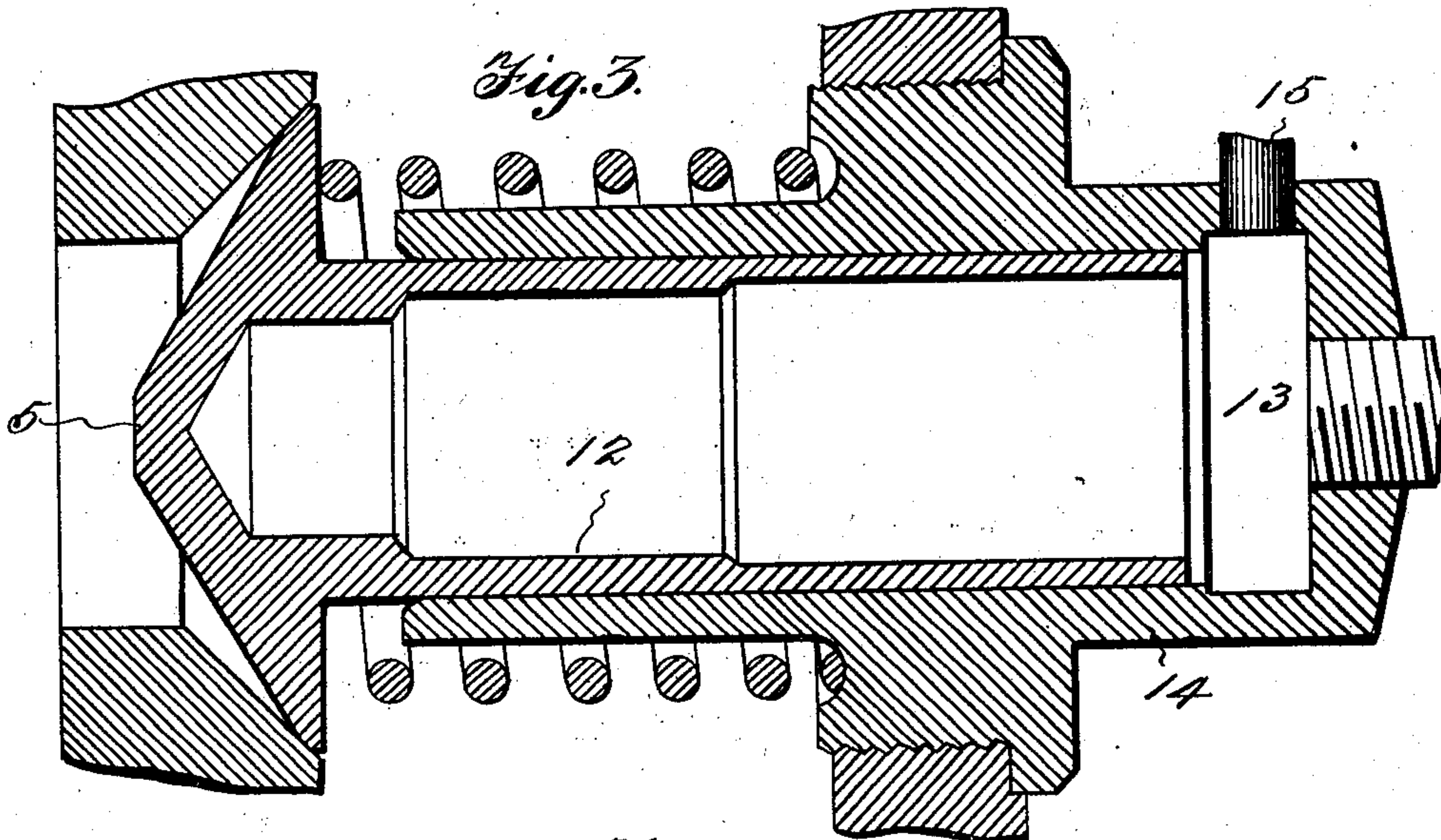
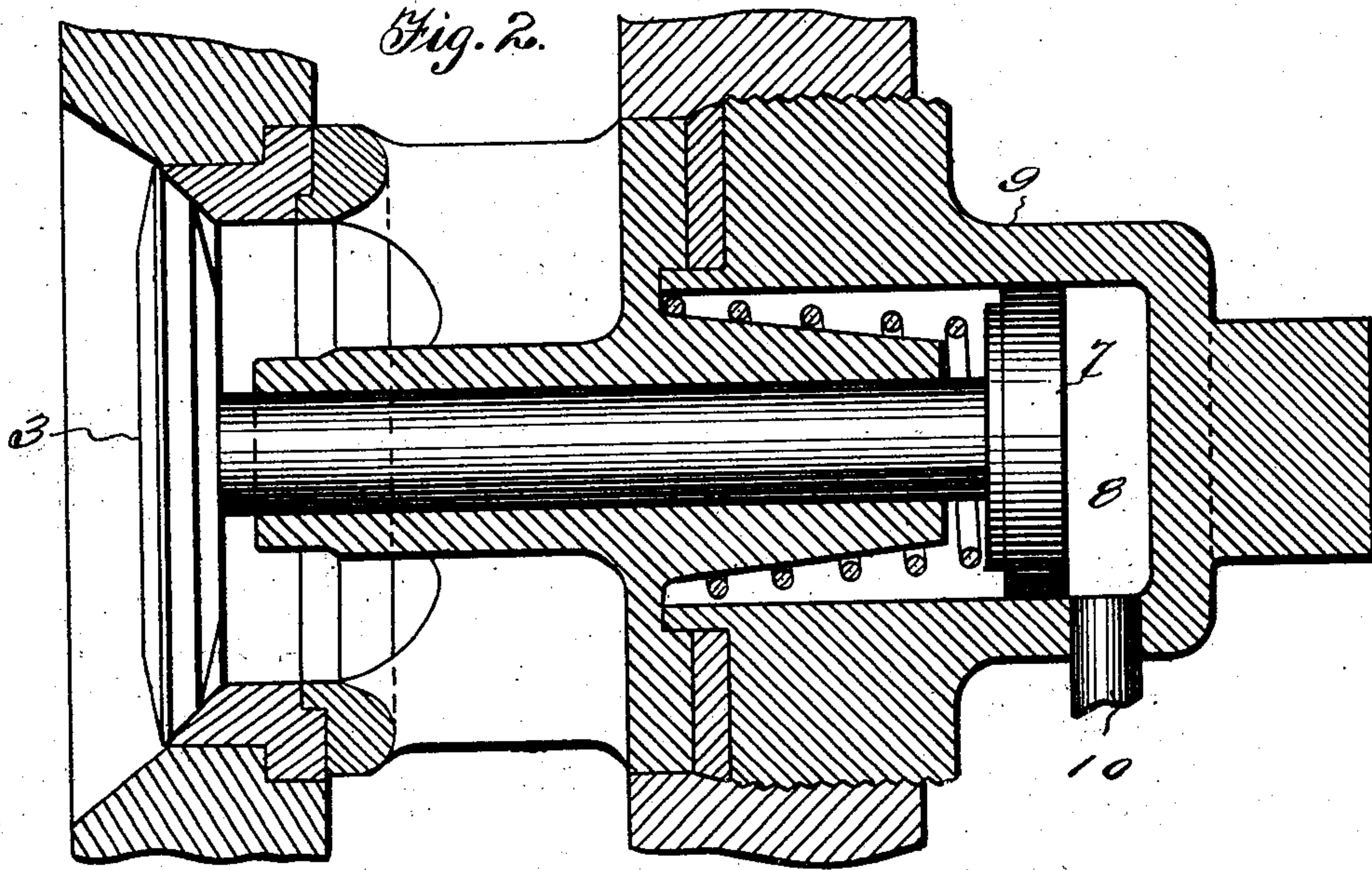
No. 744,547.

PATENTED NOV. 17, 1903.

E. HILL.
PUMPING ENGINE.
APPLICATION FILED FEB. 14, 1903.

NO MODEL.

2 SHEETS—SHEET 2.



Witnesses:

G. G. Campbell.
Chas. M. Lowe.

Inventor:

Ebenezer Hill, Jr.
Harry P. Williams
Atty.

UNITED STATES PATENT OFFICE.

EBENEZER HILL, OF NORWALK, CONNECTICUT.

PUMPING-ENGINE.

SPECIFICATION forming part of Letters Patent No. 744,547, dated November 17, 1903.

Application filed February 14, 1903. Serial No. 143,371. (No model.)

To all whom it may concern:

Be it known that I, EBENEZER HILL, a citizen of the United States, residing at Norwalk, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Pumping-Engines, of which the following is a specification.

This invention relates to a pumping-engine having means for opening and closing the pump-valves by fluid moved independently of the pumping-piston.

The object of the invention is to so construct a pumping-engine that the pump-valves will be operated energetically by fluid pulsation effected by the action of the fluid that drives the motive piston in order that the entire action of the pumping-piston will be effective for pumping fluid.

The invention is particularly adapted to air-pumping engines; but it is applicable to engines for pumping other fluids.

In the accompanying drawings, which illustrate an embodiment of the invention designed for compressing air, the pumping-cylinder inlet-valve chambers are connected with opposite ends of the steam-cylinder, and the pumping-cylinder discharge-valve chambers are connected with opposite ends of the steam-cylinder, so that the operation of the inlet and discharge valves is accelerated by the action of the steam that drives the motive piston.

Figure 1 of the drawings is a plan, with parts broken away, of a steam-cylinder and an air-cylinder of an air-compressor that embodies the invention. Fig. 2 is a detail sectional view, on larger scale, of one of the inlet-valves. Fig. 3 is a detail view, on large scale, of one of the discharge-valves. Fig. 4 is an enlarged section of a portion of one of the fluid-conduits, showing a contemplated arrangement.

The piston in the steam-cylinder 1 and the piston in the air-cylinder 2 are constructed and connected in the usual manner. The inlet-valves 3 and 4 at opposite ends of the air-cylinder and the discharge-valves 5 and 6 at opposite ends of the air-cylinder are of common form and arrangement. A piston or movable diaphragm 7 is fitted in the cylindrical chamber 8 in each plug 9 that supports an in-

let-valve. This piston may be secured to or may be detached from the end of the adjacent valve-stem. The end of the chamber of the inlet-valve 3 is connected by a pipe 10 with one end of the steam-cylinder, and the end of the chamber of the inlet-valve 4 is connected by a pipe 11 with the other end of the steam-cylinder.

Each discharge-valve has a cylindrical stem 12, that fits as a piston in the cylindrical chamber 13 in each plug 14.

The end of the chamber of the discharge-valve 5 is connected by a pipe 15 with one end of the steam-cylinder, and the end of the chamber of the discharge-valve 6 is connected by a pipe 16 with the other end of the steam-cylinder.

When steam is admitted to one end of the steam-cylinder for driving the main steam-piston forwardly, the steam-pressure is exerted through the pipe 10 against the piston 7 in the inlet-valve chamber, so as to open the inlet-valve 3, and is exerted through the pipe 15, so as to close the discharge-valve 5. At this time the exhaust of pressure from the other end of the steam-cylinder causes a reduction of pressure in the pipe 11, which tends to close the inlet-valve 4 and causes a reduction of pressure in the pipe 16, which tends to open the discharge-valve 6. When the steam is admitted to the other end of the steam-cylinder and exhausted from the opposite end, the reverse of this action takes place—that is, the pressure through the pipe 11 opens the inlet-valve 4 and through the pipe 16 closes the discharge-valve 6, while the exhaust effects the closing of the inlet-valve 3 and the opening of the discharge-valve 5. By means of this construction the inlet and discharge valves are caused to act the instant the steam-valve is changed for reversing the steam-piston by the direct pressure of the steam. This accelerates the actions of the valves, so that the pumping-piston is not required to expend any energy opening or closing the valves. Thus the full effect of the action of the pumping-piston is obtained.

If it is desired, a plunger 17 may be inserted in a short section 18 of each conduit, as illustrated in Fig. 4. This piston is actuated at the proper time by the steam, and the air

or other fluid which is between the plunger and the valve-chamber effects the operation of the valve as the plunger is moved. With this arrangement the steam does not act directly upon the valve, as in the other case. 5 The fluid between the plunger and the valve-chamber may be air, water, or other substance.

The drawings show all of the inlet and discharge valves connected with the steam-cylinder. In some cases it is not necessary to connect all of the valves. The pipes may, as desired, be led from the steam-cylinder to either the discharge-valves or the inlet-valves or to one inlet and one discharge valve. 10

As a result of this invention a pumping-engine may be constructed in which one or more of the pumping-cylinder valves will be quickly moved to proper position just as the steam-piston dwells and is about to begin its return stroke. This method of operating the valve is simple, and the action of the valves is so accelerated that they offer no resistance to the incoming and outgoing fluid, and thus allow the pump-piston when driven at high speed to receive and force out a full supply of fluid. 15 20 25

I claim as my invention—

1. A pumping-engine having a pump-cylinder with a piston and inlet and discharge valves, chambers containing parts connected with the pump-valves, a steam-cylinder with a piston that is connected with the pump-piston, and pipes communicating with these chambers and with the steam-cylinder whereby the pump-valves are actuated by the changes of pressure in the pipes due to the changes of pressure in the steam-cylinder, substantially as specified. 30 35

2. A pumping-engine having a pump-cylinder with a piston and an inlet-valve and discharge-valve, a steam-cylinder with a piston that is connected with the pump-piston, and a pipe communicating with a pump-valve and with the steam-cylinder whereby the pump-valve is actuated by the changes of pressure in the pipe due to the changes of pressure in the steam-cylinder, substantially as specified. 40 45

EBENEZER HILL.

Witnesses:

EBENEZER HILL, Jr.,
J. E. SLATER.