

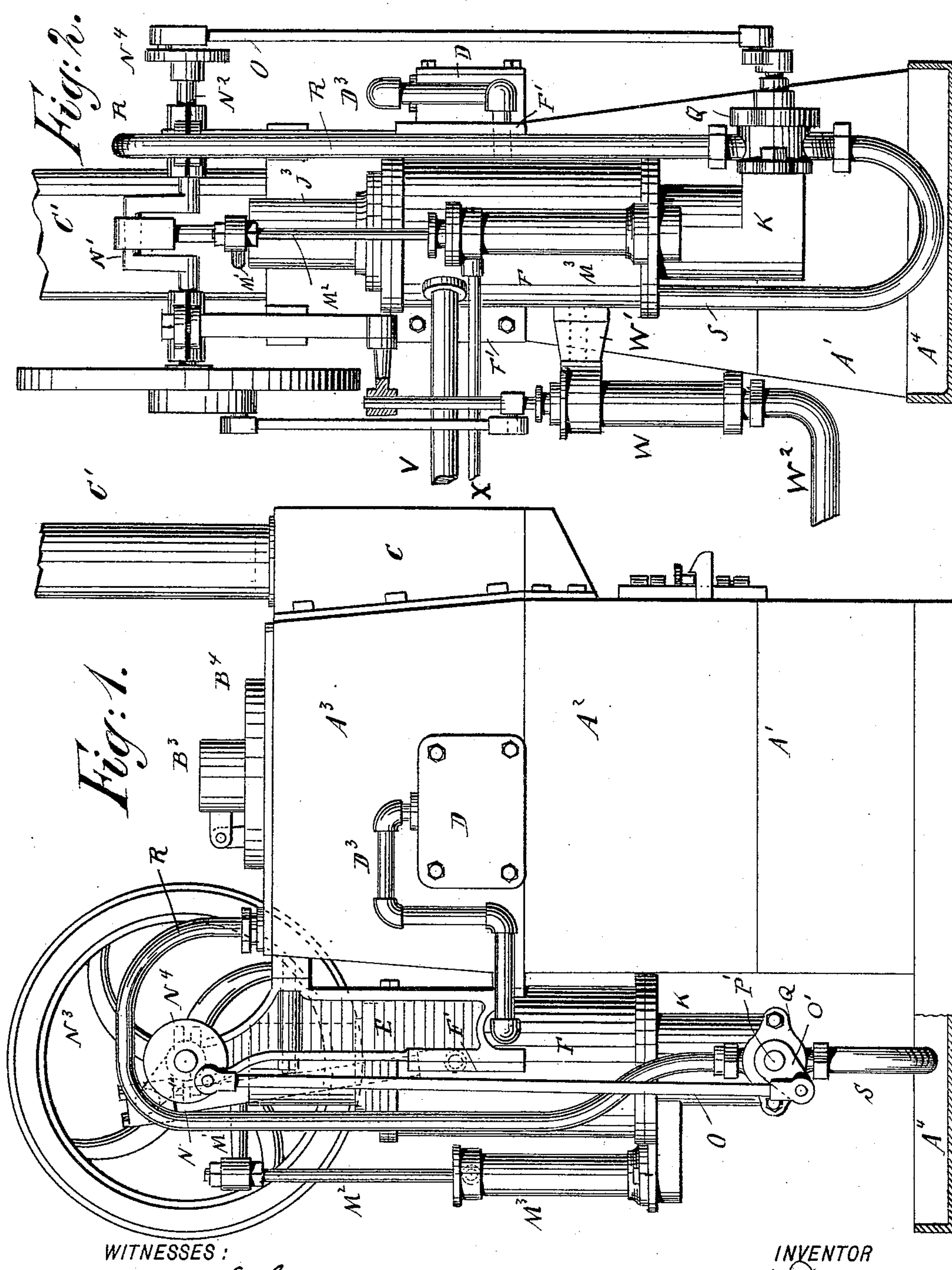
(No Model.)

3 Sheets—Sheet 1.

H. DENNEY.
VACUUM ENGINE.

No. 495,243.

Patented Apr. 11, 1893.



WITNESSES:

Marion Hall
William D. D. D.

INVENTOR

H. Denney.

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(No Model.)

3 Sheets—Sheet 2.

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Fig: 6.

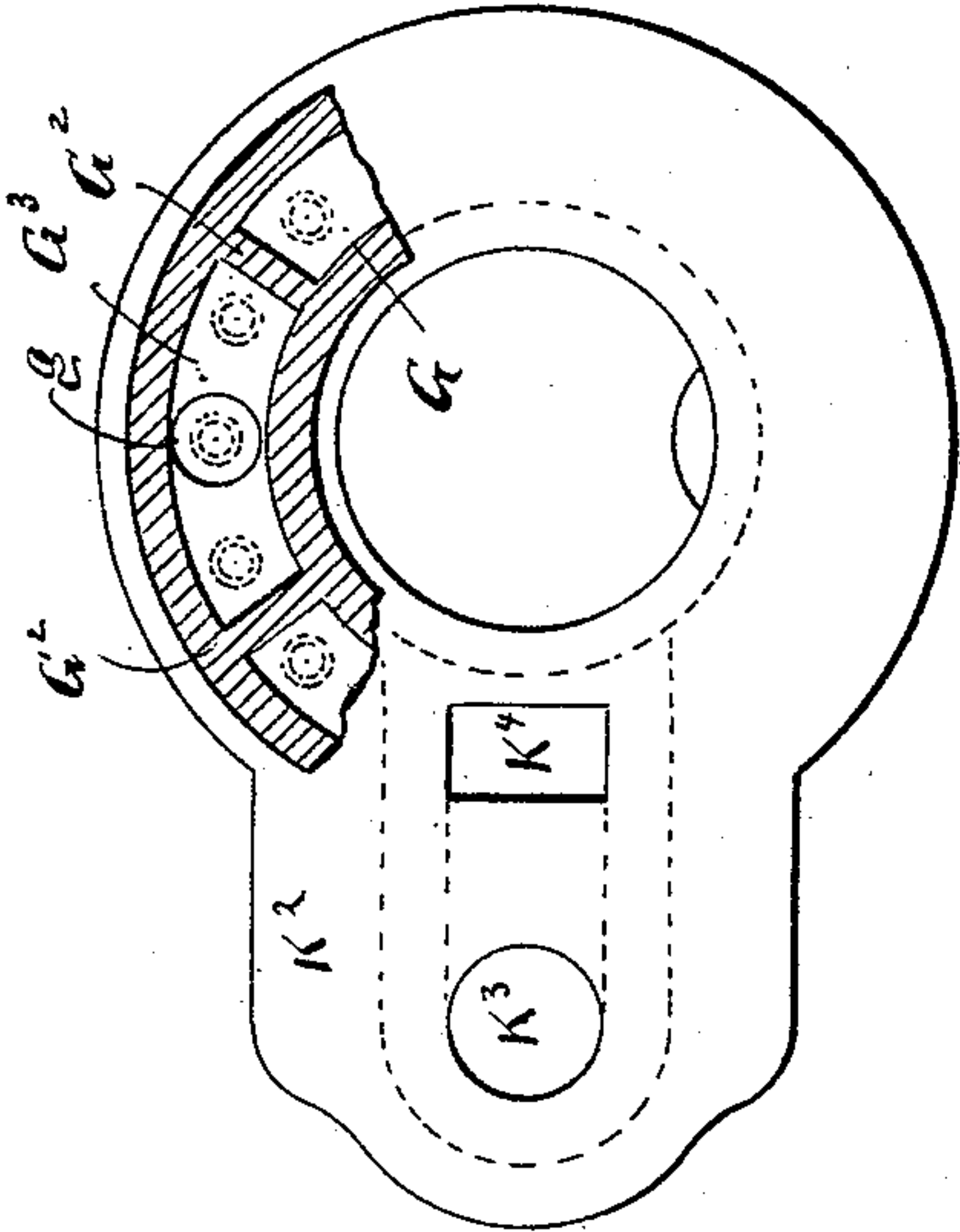


Fig: 7.

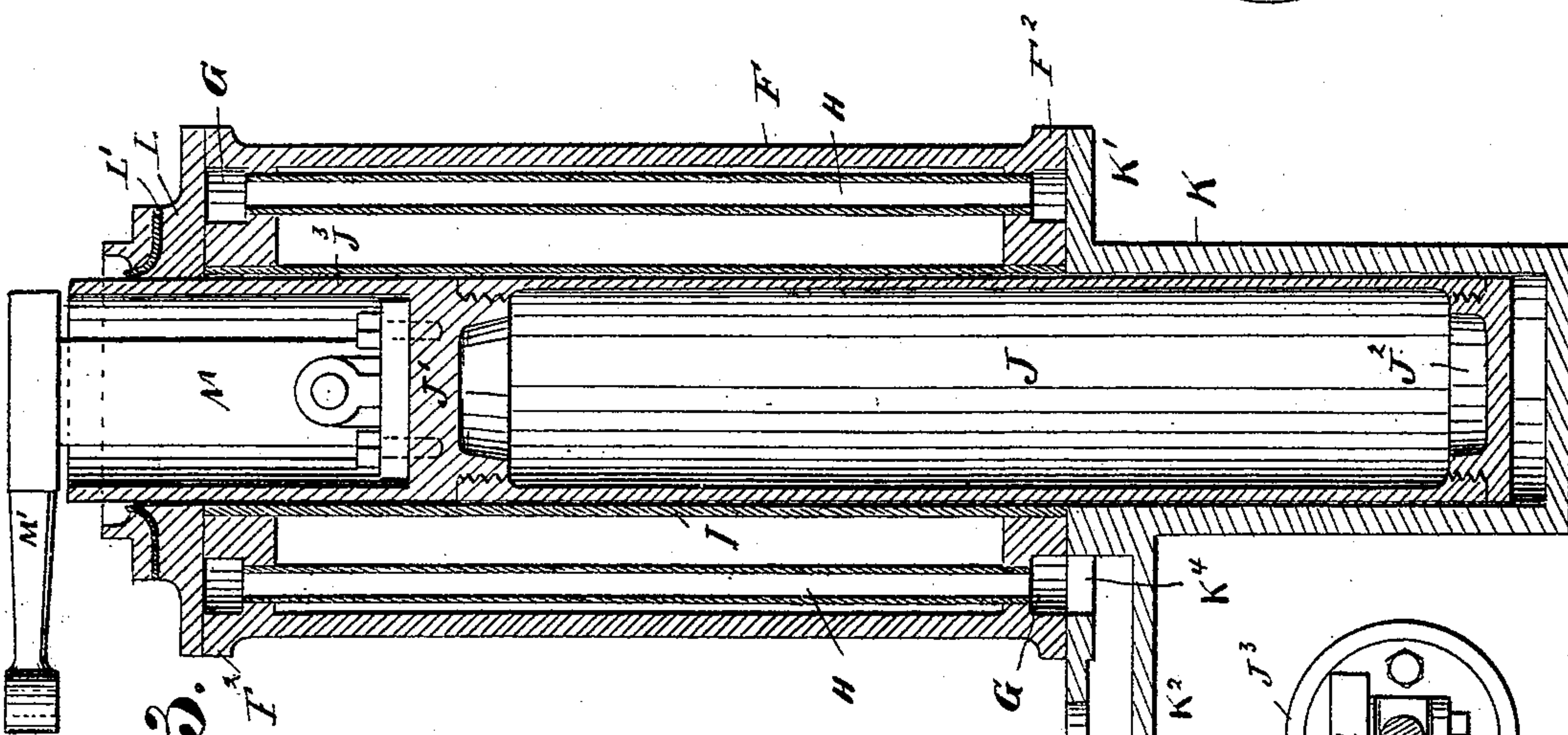
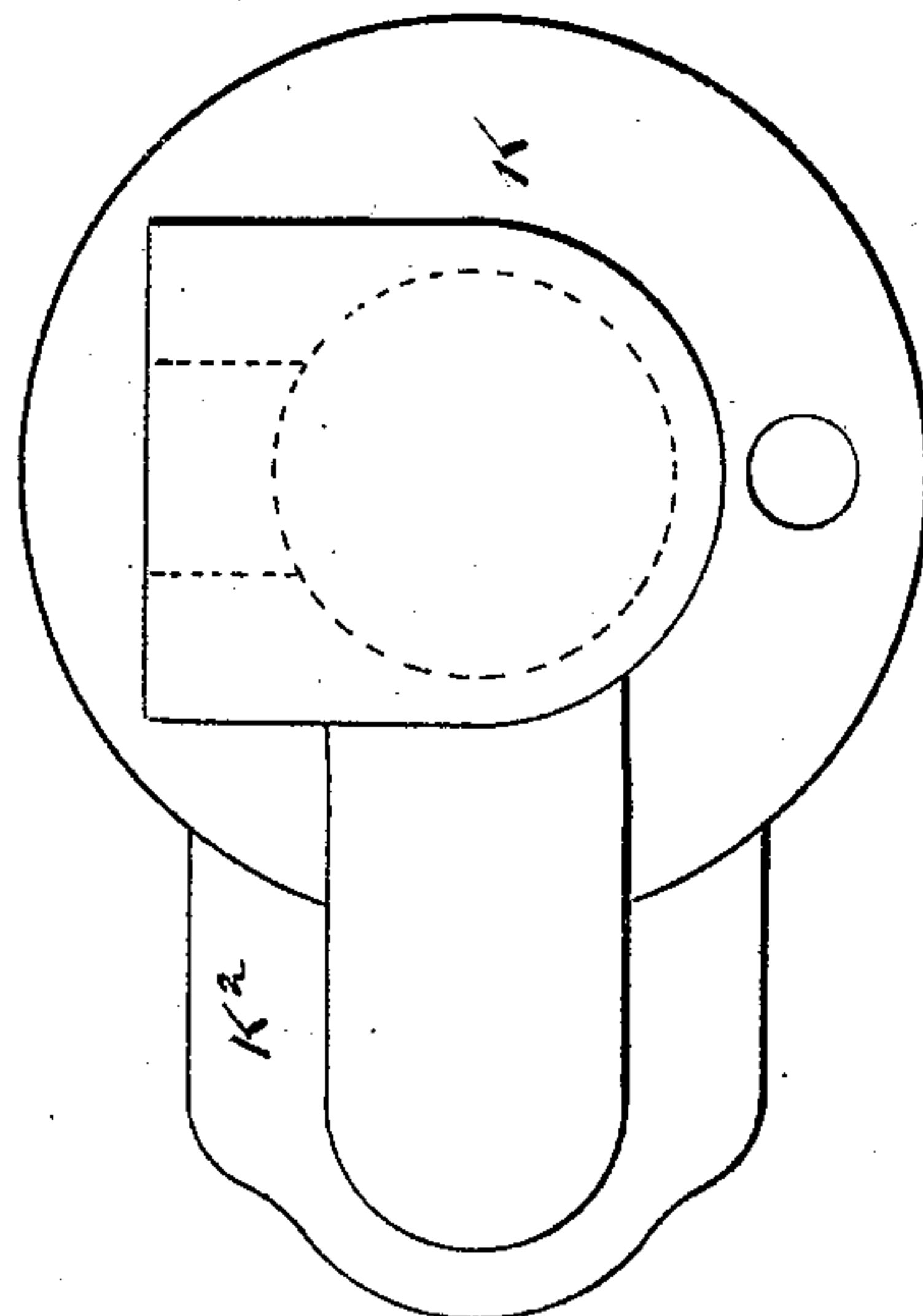


Fig: 3.

Fig: 4.

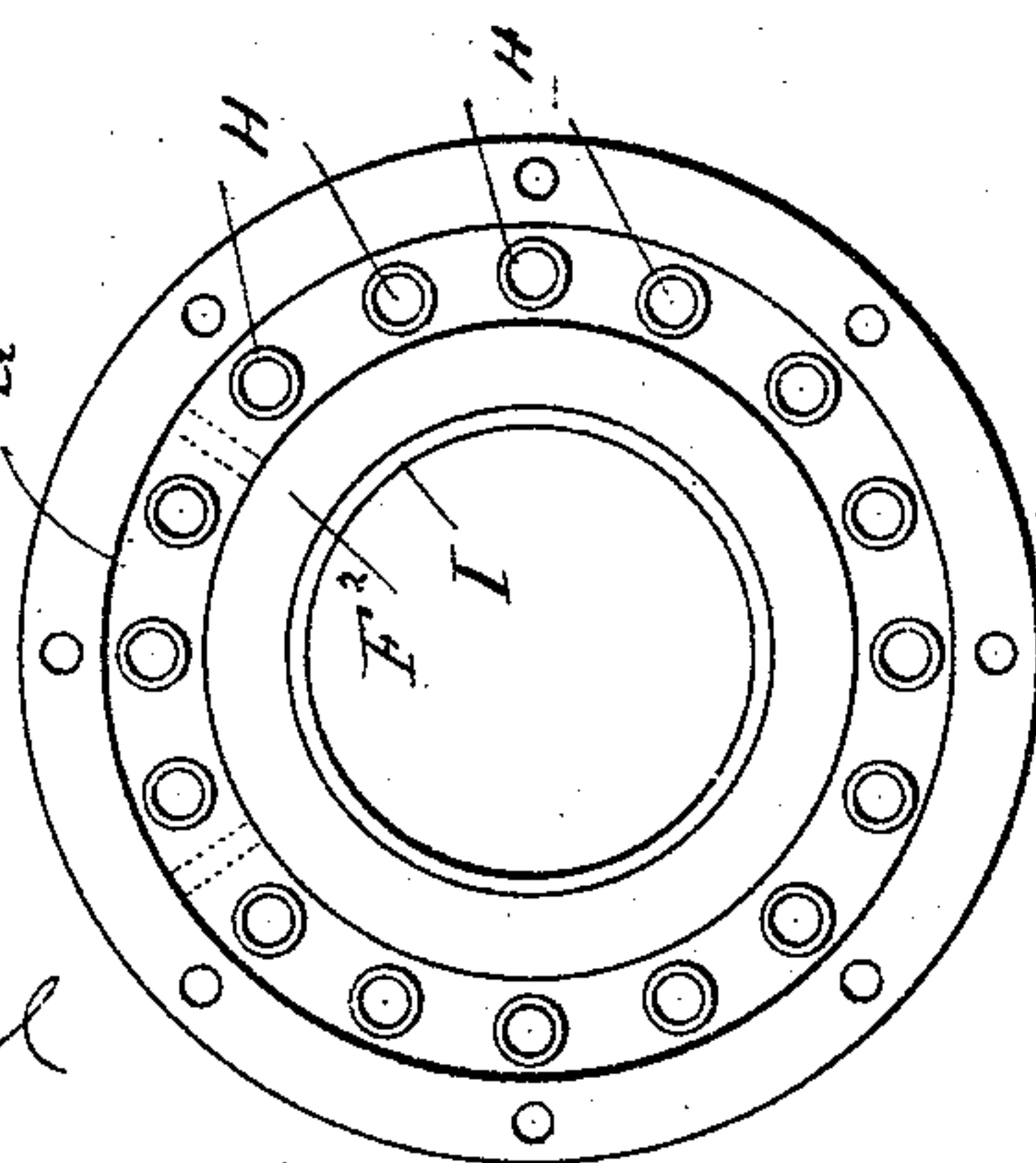
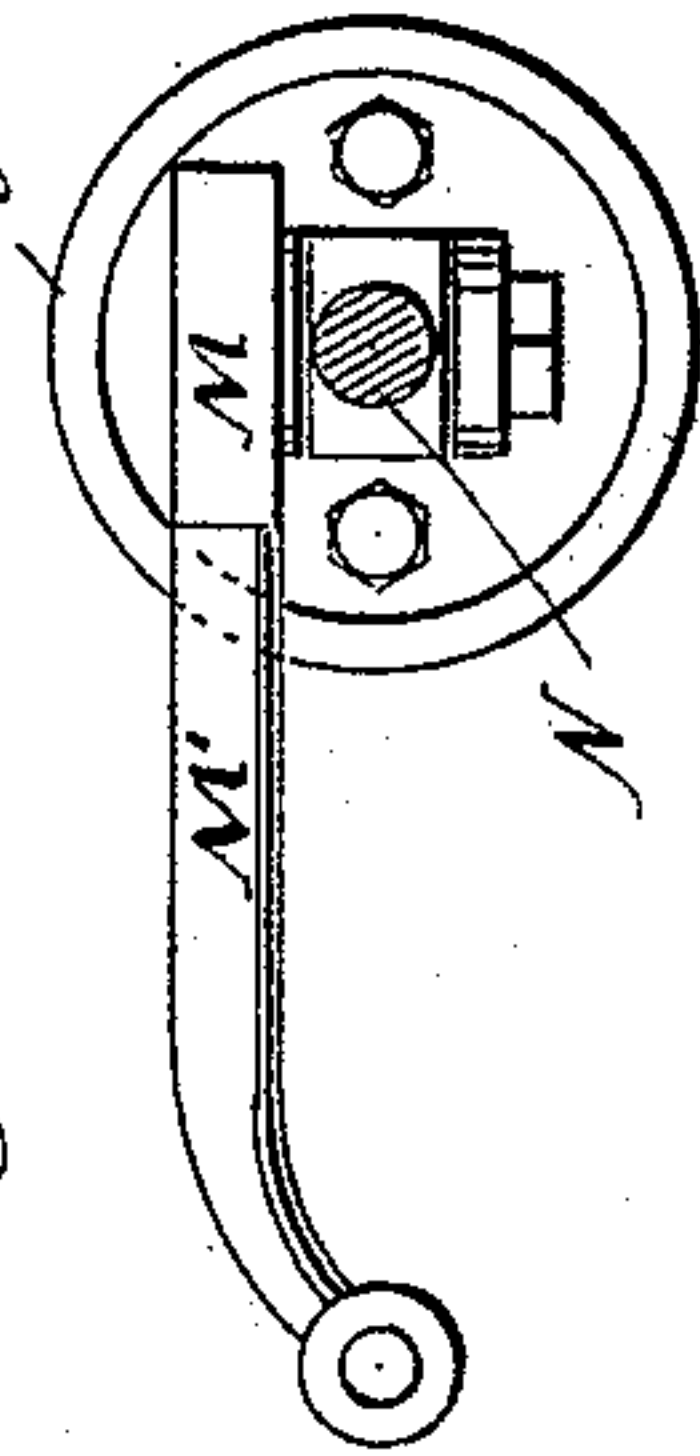


Fig: 5.



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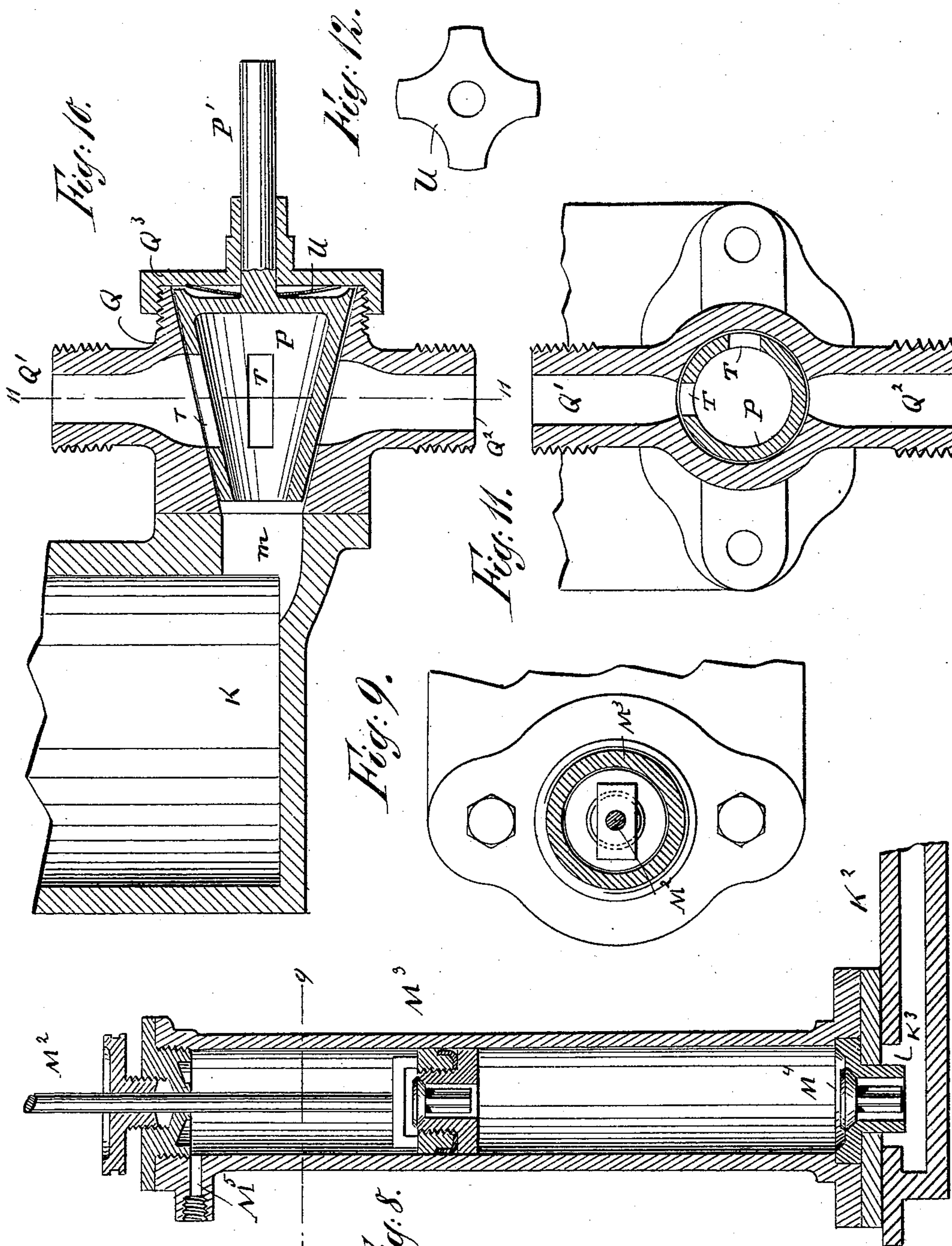
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UNITED STATES PATENT OFFICE.

HARMER DENNEY, OF NEW YORK, N. Y.

VACUUM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 495,243, dated April 11, 1893.

Application filed April 19, 1892. Serial No. 429,744. (No model.)

To all whom it may concern:

Be it known that I, HARMER DENNEY, a citizen of the United States, and a resident of New York city, in the county and State of New York, have invented certain new and useful Improvements in Vacuum-Engines, of which the following is a specification.

This invention relates to improvements in that class of engines and motors in which a vacuum is formed in the cylinder by the condensation of steam, so that the pressure of the air can force the piston downward.

The object of my invention is to simplify the construction of the machine so as to reduce its cost and its liability to get out of order, and also to facilitate an easy adjustment in combining the parts.

The invention consists in a vacuum-engine having a power-cylinder, provided with an upward extension, which upward extension is surrounded by a condenser, which in turn is in communication with the vacuum-pump, that is operated directly from the piston in said cylinder and its extension.

The invention also consists in the combination, with a generator, of brackets on the same, a power-cylinder and condenser surrounding the same, supported on said brackets, and a crank-shaft driven from the piston in said cylinder, which crank-shaft is also mounted on said brackets.

The invention also consists in the construction and combination of parts and details which will be fully described hereinafter and finally pointed out in the claims.

In the accompanying drawings, Figure 1 is a side-view of my improved vacuum engine, parts being broken out and others in section. Fig. 2 is a front elevation of the same, parts being broken out and others in section. Fig. 3 is a vertical longitudinal sectional view of the cylinder and condenser surrounding the same, and of the piston in the cylinder. Fig. 4 is a top view of the cylinder and condenser, the top plate being removed. Fig. 5 is a plan view of the piston and the arm on the same. Fig. 6 is a plan view of the bottom supporting plate for the condenser, parts being broken out and others being in section. Fig. 7 is a plan view of the under side of the supporting plate for the condenser. Fig. 8 is a vertical longitudinal sectional view through the vacu-

um pump. Fig. 9 is a sectional plan-view of the same, on the line 9 9, of Fig. 8. Fig. 10 is an enlarged detail sectional view of the lower part of the cylinder and the rocking controlling valve. Fig. 11 is a sectional view, on line 11—11, Fig. 10. Fig. 12 is a face view of the spring washer of the rocking controlling valve.

Similar letters of reference indicate corresponding parts.

In the drawings A^1 A^2 A^3 are the three sections of the steam-generator.

C is an extension supporting a smoke-flue C' .

B^4 is a ring projecting upward from the top of the generator and B^3 is a safety-valve.

D is a water-box at the side of the generator and D^3 is a pipe leading to the same.

A^4 is the base of the generator.

On the front end of the generator two vertical brackets E are bolted so as to project a greater or less distance from said front end of the generator. Between said brackets E the condenser F is located, which is provided with two side-wings F' that are bolted to the fronts of the brackets E, for the purpose of supporting said condenser.

The condenser consists of a cylinder cast integral with the annular heads F^2 , each provided with an annular groove G, which grooves G of the top and bottom heads F^2 are connected by a series of tubes H arranged within the condenser and parallel to the longitudinal axis of the same. In each annular groove G two radial projections G^2 are formed a greater or less distance from each other, and form a separate compartment G^3 , which compartments G^3 of the top and bottom head are also connected with each other by some of the pipes H, as mentioned. The cylinder I forms the inner annular wall of the condenser and also forms a guide for the cylindrical piston J, the lower part of which works in the cylinder K cast integral with the top-plate K' that is bolted to the bottom-head F^2 of the condenser. Said top-plate K' of the cylinder K is provided with a hollow bracket K^2 having a top opening K^3 for the bottom of the vacuum pump, to be described hereinafter, and also having a top opening K^4 , which is in communication with the bottom annular groove G of the bottom-head F^2 of the condenser F. The cylindrical piston J is formed

with the top and bottom heads J' and J^2 , which are screwed into the cylindrical portion, the top head having a cylindrical extension J^3 that projects above the top of the cylinder I when the said cylindrical piston is in its lowest position. A top-plate L , in which a leather packing ring L' is held, is fastened to the top head F^2 of the condenser, the inner edge of said leather packing ring L' resting against the outer surface of the upper projecting part of the cylindrical piston J , so as to form a close joint. The upper head J' of the cylindrical piston J is provided with an upwardly-projecting standard M , from the top of which an arm M' projects laterally and with said arm M' the piston rod M^2 of a vacuum pump M^3 is connected, that rests upon the end of the hollow bracket K^2 of the cylinder K . The vacuum pump M^3 is provided with the check valve M^4 and with the upper outlet neck M^5 . The piston J is also connected at or near its upper end by a suitable connecting-rod N with a crank N' of a crank-shaft N^2 , which shaft is mounted in the upper extensions of the brackets E . On one end of said shaft a fly-wheel N^3 is fixed, and the opposite end carries a disk N^4 , which disk is connected eccentrically by a connecting-rod O with the arm O' fixed on the stem P' of a conical hollow valve P mounted to rock in the conoidal seat of a valve casing Q having the opposite necks Q' and Q^2 . The neck Q' is connected by a curved pipe R with the top of the steam generator, and the neck Q^2 is connected by the curved pipe S with the bottom annular groove G of the condenser, as shown at g in Fig. 6. The conoidal rocking-valve P is closed at its larger outer end and is open at the smaller inner end, and has two slots or ports T , which are a quadrant from each other. A dished spring U is arranged between the closed wider end of the conoidal valve and the cap Q^3 screwed on the casing Q , so as to exert a gentle but constant pressure on the conoidal valve and to hold the same close against its seat. A channel leads from the seat of the conoidal valve to the bottom part of the cylinder K , as shown in Fig. 10. A water pump W is supported by a bracket W' from the side of the condenser and is connected with the suction pipe W^2 , and through the bracket W' the water is forced into the condenser and passes out from the same through the pipe V . X is the outlet pipe of the vacuum pump.

The operation is as follows:—To start the engine, the fly-wheel is turned one or more times. Every time that the piston makes an upward stroke, steam is admitted into the cylinder, and when the piston has completed its upward stroke, the valve P is in such a position as to establish communication through the channel m and the pipe S with the condenser, in which condenser there is a vacuum. The steam immediately passes from the cylinder into the condenser, whereby a vacuum is created in the cylinder, permitting the air-

pressure to force the cylinder downward. The piston is then raised by the impetus of the fly-wheel and again steam is admitted into the cylinder and again passes into the vacuum-chamber and so on. The valve P oscillates and alternately establishes communication between the cylinder and steam-supply pipe and the cylinder and steam condenser. The water raised by the pump W passes through the condenser and keeps the pipes of the same cool, so that the steam is condensed instantly in said condenser. The pump M^3 which is connected with the bottom part of the condenser pumps the water of condensation out of the same, thus keeping the condenser free from water. Pressure of the steam is not called upon to act in this machine. All that the steam is required for, is to fill the cylinder when the piston is in raised position, to be then condensed for producing a vacuum, and thus the steam is required only as a vacuum-producer. The pump can easily be stopped whenever desired by simply supplying sufficient friction to the fly-wheel to stop the same. As the pressure of the steam is not called into action, there is no danger of an explosion, and this is furthermore prevented by a safety-valve B^3 which is so weighted as to rise, as soon as there is a slight pressure in the generator.

The machine is entirely automatic and requires no attention, further than keeping the fire provided with a sufficient fuel and the fire-doors in proper position.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a vacuum engine, the combination with a cylinder, of a condenser upon the cylinder, which condenser has a central bore that forms a continuation of the cylinder, a piston working in said cylinder, the length of which piston is greater than the length of the cylinder proper, a pipe for conducting steam into the lower part of said cylinder, a valve in said pipe, a shaft driven from the piston in the cylinder and means for operating said valve from said shaft, substantially as set forth.

2. In a vacuum-engine, the combination, with a steam-cylinder, of an upward extension on the same, a condenser surrounding said upward extension, a cylindrical piston in said cylinder and extension, and arm on said piston, and a vacuum pump operated by said arm, substantially as set forth.

3. In a vacuum-engine, the combination, with a steam-cylinder having a hollow bracket, of a condenser placed on said cylinder and bracket, the inner tube of said condenser forming an extension of the steam-cylinder, a vacuum-pump on said bracket and in communication with the condenser and means for operating said pump from a piston in the cylinder, substantially as set forth.

4. In a vacuum-engine, the combination, with a cylinder, of a condenser placed upon

the same, the central tube of the condenser forming an extension of the cylinder, a piston in said cylinder and extension, a cylindrical piece on the upper end of the piston, a leather packing ring resting upon the top plate of the condenser, the inner edge of said ring resting against the outer surface of the cylindrical piston and its top cylindrical piece, substantially as set forth.

5. In a vacuum-engine, the combination, with a steam-cylinder, of an upward extension on the same, heads on the end of said extension, tubes secured in said heads, a channel formed in each head for bringing the ends of the tubes in communication, and a vacuum-pump in communication with said tubes and channels, substantially as set forth.

6. In a vacuum-engine, the combination, with a steam-cylinder, of a condenser on the same, a cylindrical-piston working in the central tube of the condenser and in the steam-cylinder, and a vacuum-pump in communication with the condenser and supported on the steam cylinder, substantially as set forth.

7. In a vacuum-engine, the combination, with a steam-generator, of brackets on the same, a power-cylinder, a condenser surrounding the same, which power-cylinder and condenser are supported on the brackets, and a crank-shaft driven from the power-cylinder also supported in said brackets, substantially as set forth.

8. In a vacuum-engine, the combination, with a steam-generator, of brackets on the same, a power-cylinder, a condenser surrounding the same, a crank-shaft, which cylinder, condenser and crank-shaft are all supported on said brackets, and a vacuum-pump supported on a bracket of the power-cylinder, substantially as set forth.

9. In a vacuum-engine, the combination, with a steam-generator, formed of a bottom section, intermediate section and top section, brackets on the top section, a cylinder and condenser surrounding the same, and supported by said brackets and a crank-shaft also supported on said brackets, substantially as set forth.

10. The combination, with a power-cylinder having an upward extension, of a condenser surrounding said extension, a pump driven from a piston in the power-cylinder and in the extension, said pump being connected by a channel with the condenser, so as to deliver its water into the condenser, and a pipe for taking the water from the condenser, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

HARMER DENNEY.

Witnesses:

OSCAR F. GUNZ,
CHARLES SCHROEDER.