(No Model.)

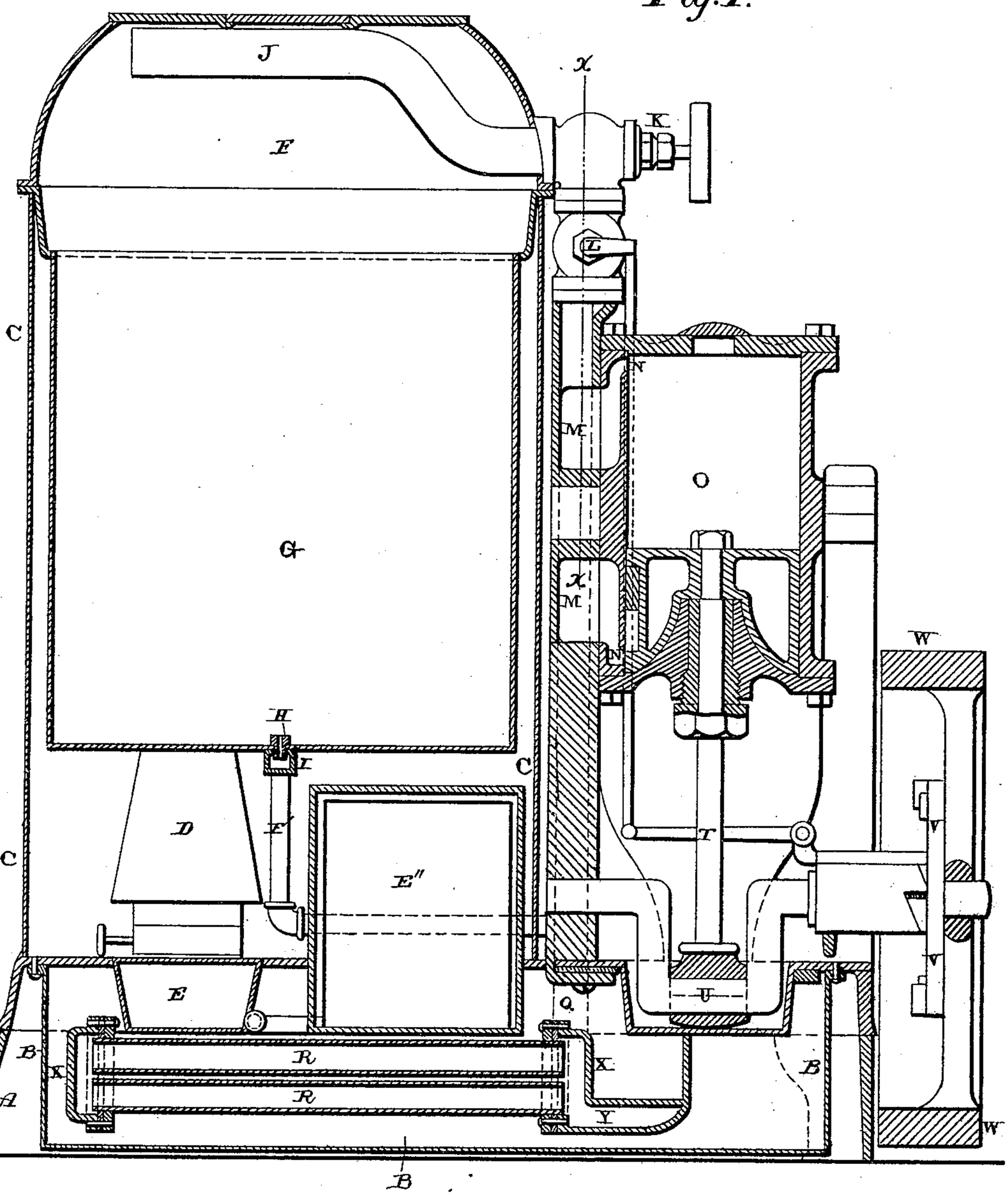
4 Sheets—Sheet 1.

L. A. BROTT.

VACUUM ENGINE.

No. 448,907. Patented Mar. 24, 1891.

Fig. 1.



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(No Model.) 4 Sheets—Sheet 2.

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Fig. 2.

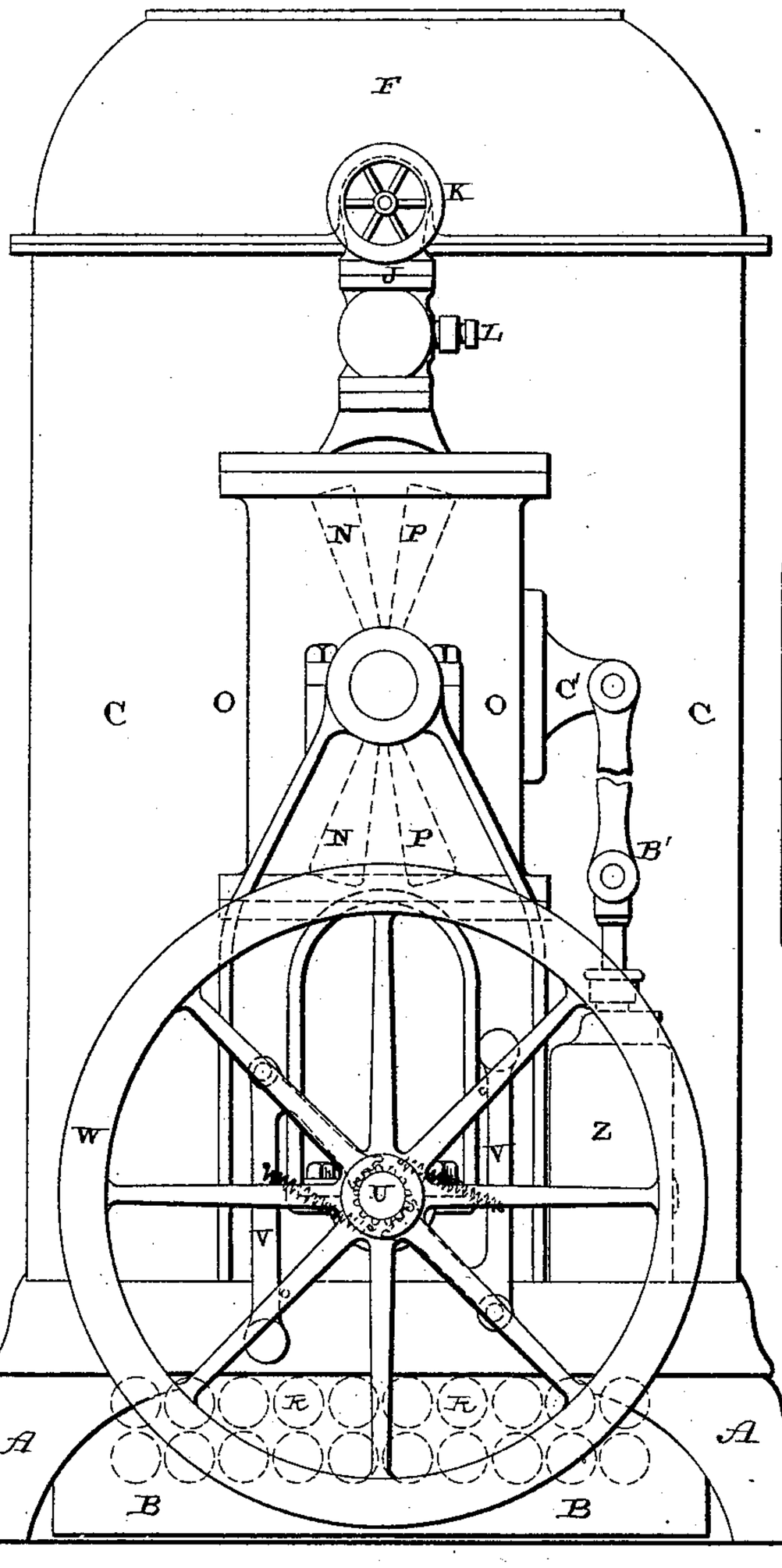
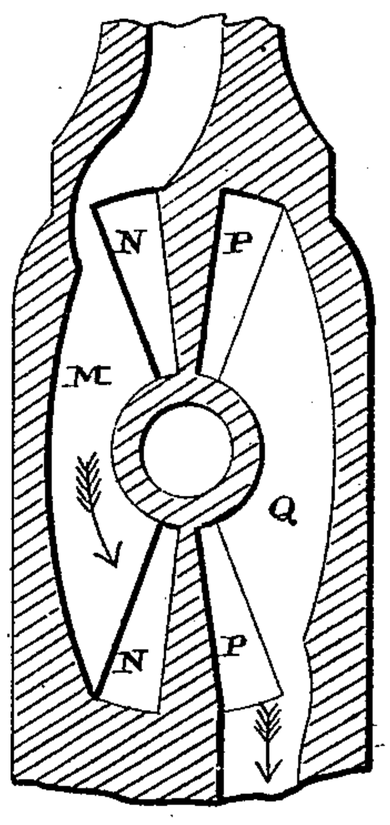


Fig. 7.



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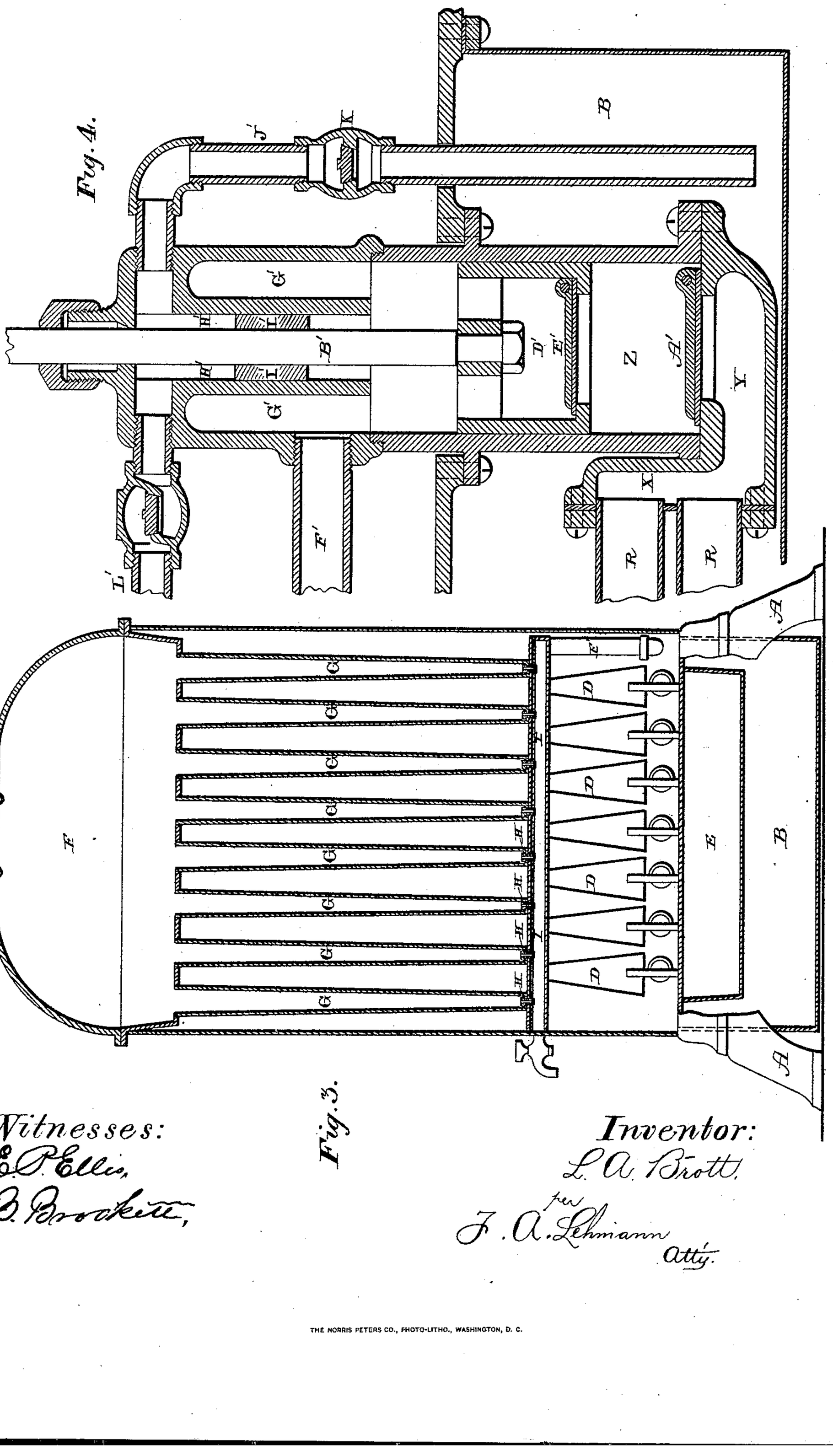

Fig. 4.

Fig. 3.

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VACUUM ENGINE.

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Fig. 5.

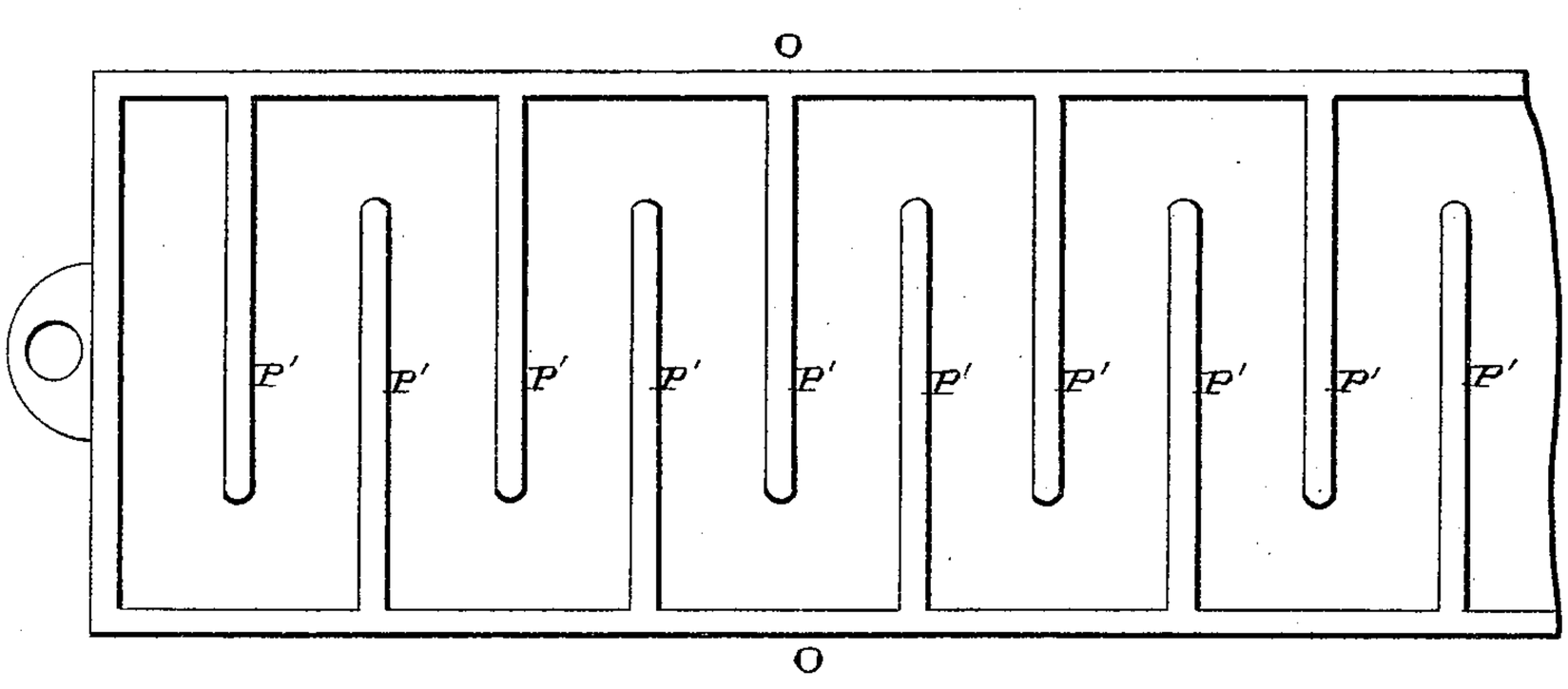
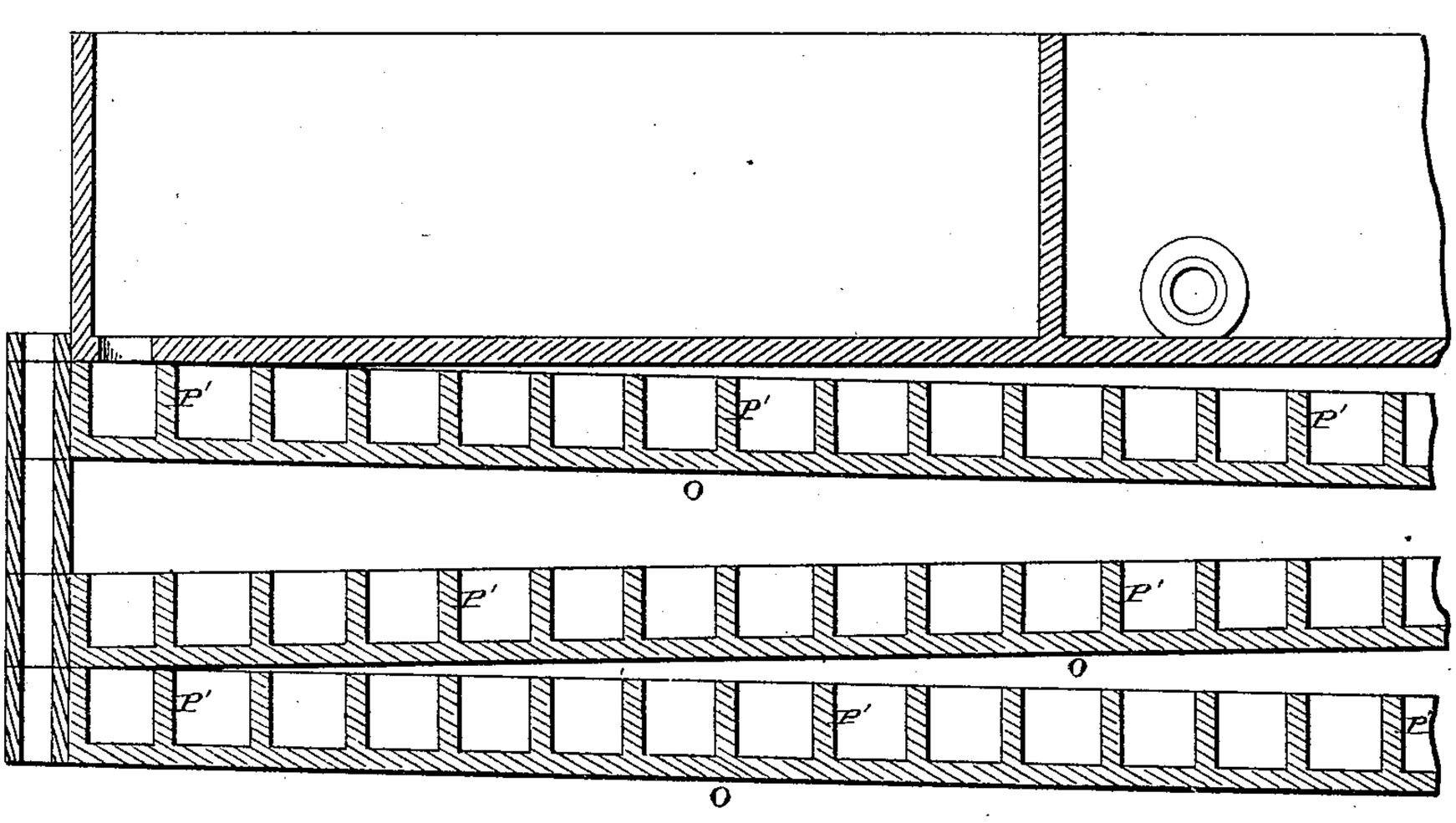


Fig. 6.



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UNITED STATES PATENT OFFICE.

LUCIEN A. BROTT, OF GROTON, NEW YORK.

VACUUM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 448,907, dated March 24, 1891.

Application filed May 17, 1890. Serial No. 352,194. (No model.)

To all whom it may concern:

Be it known that I, LUCIEN A. BROTT, of Groton, in the county of Tompkins and State of New York, have invented certain new and useful Improvements in Vacuum-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to an improvement in vacuum-engines; and it consists in the arrangement and combination of parts which will be more fully described hereinafter.

The objects of my invention are to produce a vacuum-engine in which the parts are few and simple and which are not likely to get out of order while in operation, to produce a vacuum-engine which is especially adapted for small power, and to provide a means for keeping the water in the tank always about the same temperature of the surrounding atmosphere.

Figure 1 is a vertical section of an engine which embodies my invention. Fig. 2 is a front elevation of the same. Fig. 3 is a vertical section taken through the boiler. Fig. 4 is an enlarged vertical section of the pump and its attachments. Figs. 5 and 6 are detail views. Fig. 7 is a vertical section of the face of the engine-frame, taken on the dotted line *x x* of Fig. 1.

A represents the base of the engine, inside of which is placed the water-tank B for the sake of compactness. Rising from the top of this base is the inclosing case C, which may be of any desired shape, and in the lower part of which are placed the burners and chimneys D of the lamps, by means of which the heat is produced. The reservoirs E of these lamps are placed in the upper part of the water-tank B for the purpose of keeping the parts cool. In order to decrease the amount of attention necessary in the running of the engine, the reservoir E may be connected with a reservoir E″, containing a considerable quantity of oil, and the flow of oil to the reservoir E be regulated by a float in the usual manner. The reservoir E is made shallow, so that the incombustible wicks used will always be connected with the oil, and thus burn indefinitely without any further care and attention than to merely light the lamps in the first instance. As it is only necessary to raise the water in the boiler F to the boiling-point, lamps answer every purpose, and thus dispense with all necessity for the use of a stack or pipe, which would have to be used if wood or coal were used for fuel.

The boiler F consists of the dome and a bottom, as shown in Fig. 3, the bottom piece being provided with transverse slots or openings which extend from nearly one side to the other, and secured in these openings are the pockets G, which are preferably made of sheet-copper and which taper toward their lower ends. Through the bottom of each one of the pockets G are formed suitable openings, and through these openings pass the perforated screw nuts or clamps H, by means of which the lower ends of the pockets are connected to the pipe I, which projects through one side of the casing C, where it is provided with a faucet. Through this faucet the water is drawn from the boiler. An opening is made through the top of the dome, and this opening is closed by a loose plate, which acts as a safety-valve. The steam passes from the top of the dome through the pipe J, which is provided with a valve K and a regulating-valve L, which is connected to and operated by a governor in the fly-wheel. The steam passes from the pipe J into a chamber M, and from this chamber it passes through the two ports N into the oscillating cylinder O. The steam is discharged from the cylinder through the ports P into the chamber Q, which connects at its lower end with the condenser R, placed in the water-tank B.

The water in the boiler generates steam under very slight pressure, and the steam passing into the cylinder through the ports N displaces the air therein, and thence passes to the condenser through the ports P and chamber Q, where on cooling a vacuum is formed, which, pulling on the piston, again sucks the cylinder full of steam, which is again condensed. The water in the condenser, which accumulates there as the steam is condensed, is drawn therefrom and forced into the boiler and again condensed into steam, as will be described hereinafter.

Ordinarily oscillating engines have not

proved economical because of the great pressure of the cylinder against its bearing-face in order to make a tight joint. As high-pressure steam is not used in this instance, the pressure of the atmosphere presses the cylinder against its bearing-face with sufficient force to form all of the joint that is necessary. The piston-rod T is connected at its lower end to the crank-shaft U, upon which the fly-wheel is placed. To this fly-wheel are connected weighted rods V, which are held pressed in toward each other at their inner ends by means of springs, and which are moved outward by centrifugal force when the wheel W runs beyond a certain regulated speed, and the movement of these governor-rods V is communicated to the valve L, so as to shut off a portion of the steam from the cylinder O, and thus the governor is made automatic in its operation.

The condenser R consists of a series of pipes which are placed in the water-tank and are connected by the cast-iron heads X, as shown, one of the heads being provided with a partition, so that the steam passes from the chamber Q through one-half of the pipes upon one side of the partition and returns upon the other. The steam is thus condensed and the water of condensation then passes into the chamber Y under the bottom of the pump-cylinder Z, which is provided with the foot-valve A′. The piston-rod B′ is connected at its upper end to an extension C′, which is formed upon the side of the cylinder O, so that as the cylinder oscillates the piston-rod B′ is given a vertical movement. Upon the lower end of this piston-rod is secured the piston D′, which is provided with a valve E′, and by means of which the water of condensation is forced through the pipes F′ and I back into the boiler. The upper portion of the cylinder Z is cored out, as shown in Fig. 4, so as to form an air-chamber G′, which assists in pumping the water back into the boiler. In the top of this cylinder Z is formed a second cylinder H′, and secured to the piston-rod B′ is a piston I′, which, as it is caused to reciprocate in its cylinder H′, lifts the water through the valved pipe J′ from the water-tank B and forces it through the valved pipe L′ into the cooler O, which is located in any convenient relation to the engine and from which the water returns to the tank from its own gravity. This cooler O consists of a number of troughs placed one upon the top of the other, and each one is provided with a series of partitions P′, which alternately extend from opposite sides, as shown in Fig. 5. These partitions P′ in each section of the cooler form a very long channel, through which the water from the tank B is constantly passing, and as the water runs from each section, which is placed at a slight angle into the other, it is in direct contact with the air, and hence the water is always by the time it runs back into the tank after passing through this cooler reduced in temperature to about that of the surrounding atmosphere. The consequence is that the water in the tank B is always kept cool and instantly condenses the exhaust-steam when admitted into the condenser R. This cooler O′ is also adapted to be used in connection with gas, air, and other engines.

A vacuum-engine constructed as here shown and described is especially adapted for a small power—such as one horse and less—and is especially intended to be placed anywhere without any connection whatever—such as smoke-stack, water-supply, &c.—and will run for hours without any attention whatever. As no pressure in the boiler is used, it is only necessary to boil the water and raise it to a temperature of 212°. By the use of the cooler, which is portable and not connected in any way with anything except the condenser tank or piping, the connections for a water-supply for cooling the condenser and all of the plumbing that is usually necessary are entirely done away with.

In case it is so desired wire screens may be used for cooling the water instead of the cooling devices above described. If screens are used, the water will be allowed to run over them, and thus expose the water freely to the surrounding atmosphere.

Having thus described my invention, I claim—

1. In a condensing steam-engine, the combination of a boiler having a supporting-base which extends to one side thereof, a condenser within the said base and extending to one side of the boiler, a cylinder-frame upon the said extension directly over the said condenser and having exhaust-channels which communicate with the boiler, and the boiler and cylinder, whereby all of the parts are compactly assembled, substantially as shown and described.

2. In a condensing steam-engine, the combination of a boiler having a base which extends to one side thereof, a horizontal water-chamber within the said base and which extends to one side of the boiler, horizontal pipes within the said water-chamber having a chamber Y, which extends under the extended end of the said base, a pump having its lower end resting upon and directly communicating with the said chamber Y, a cylinder-frame upon the said extension having an exhaust-channel which communicates with the chamber Y, and an inlet-channel which communicates with the boiler and the cylinder, substantially as specified.

3. In a condensing steam-engine, the combination of the boiler having a series of vertical pockets, a pipe extending transversely across their lower ends and communicating therewith, a cylinder and chambers communicating with the boiler and cylinder, a condenser and channels communicating therewith and with the cylinder, and a pump connected with the condenser and the said pipe, whereby the water from the condenser is distributed

throughout the pockets, substantially as described.

4. In a condensing steam-engine, the combination of the boiler having a base, the cylinder, a condensing-chamber within the base below the boiler, a series of lamps having reservoirs which extend into the condensing-chamber, whereby the fluid is kept cool, and communication between the cylinder, boiler, and condenser, substantially as described.

5. In a condensing steam-engine, the combination of the boiler, a water-chamber, the condenser therein, the cylinder, a cooler, and the pump which has its lower end connected with the condenser and the boiler and its upper end with both the water-chamber and the cooler, and valves within the said communications, whereby water is forced from the water-chamber to the cooler and from the condenser to the boiler, substantially as specified.

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

LUCIEN A. BROTT.

Witnesses:
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