

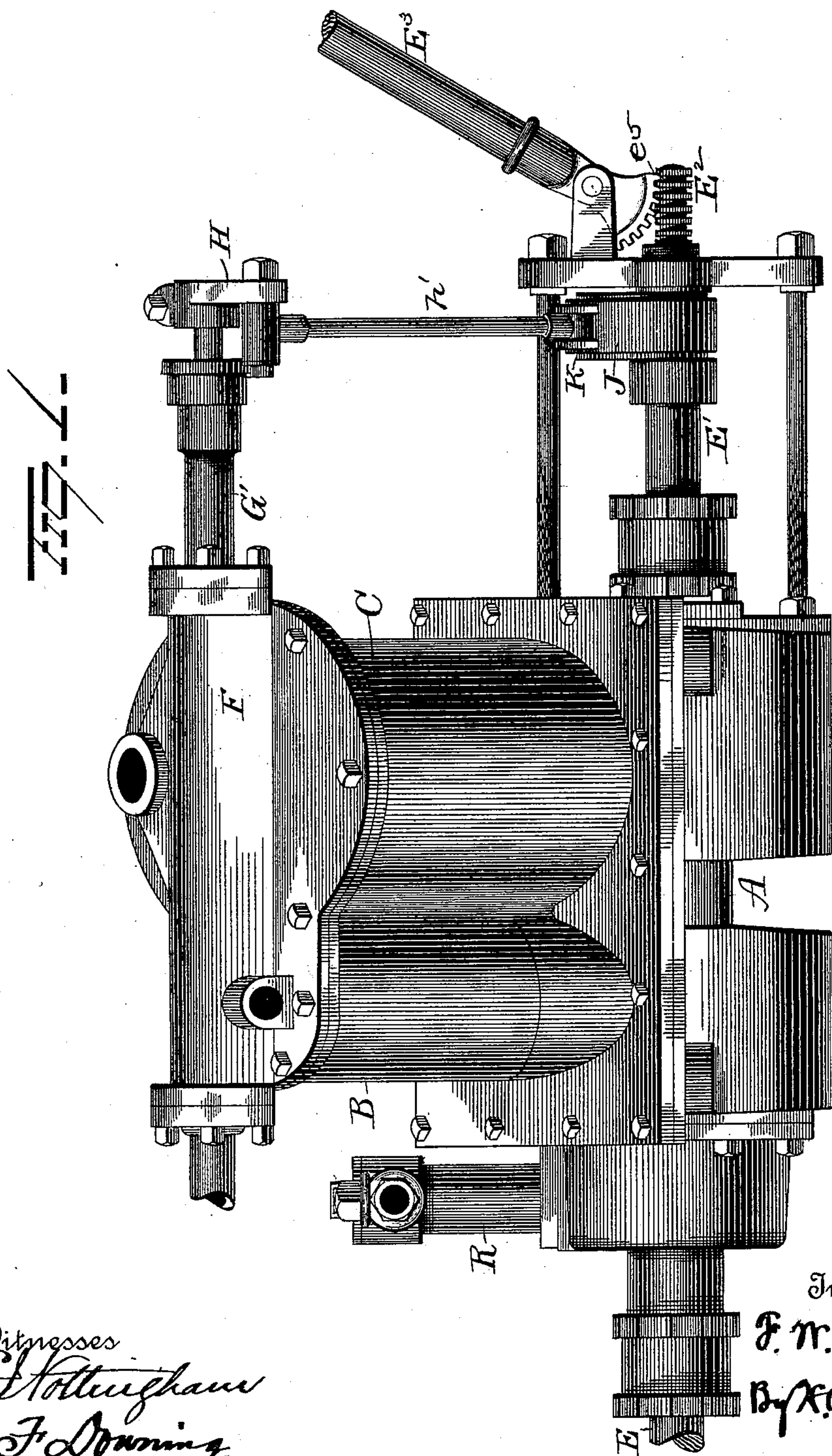
(No Model.)

4 Sheets—Sheet 1.

F. W. OFELDT.  
VAPOR ENGINE.

No. 538,694.

Patented May 7, 1895.



Witnesses  
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 G. F. Downing.

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Attorney



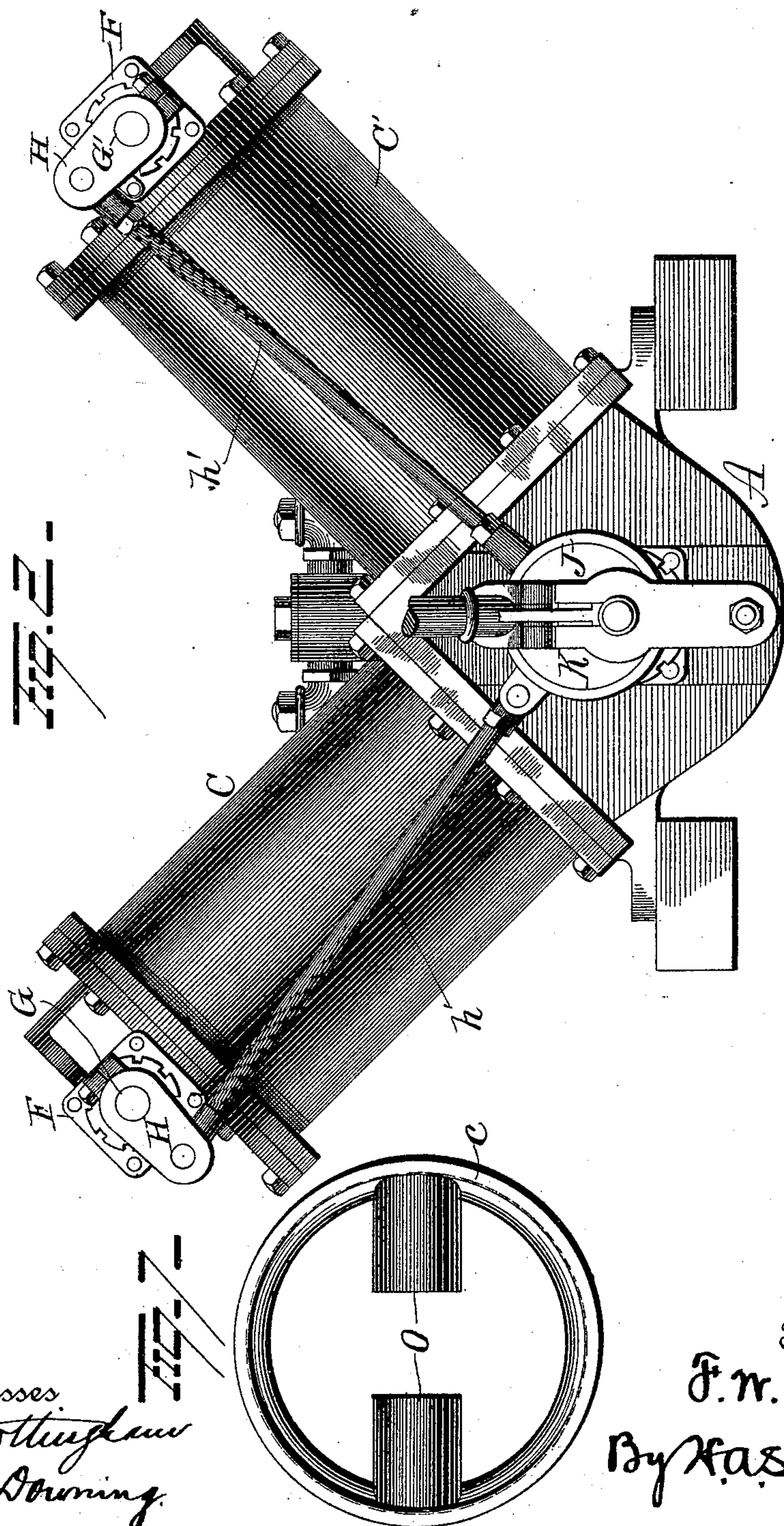
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4 Sheets—Sheet 2.

F. W. OFELDT.  
VAPOR ENGINE.

No. 538,694.

Patented May 7, 1895.



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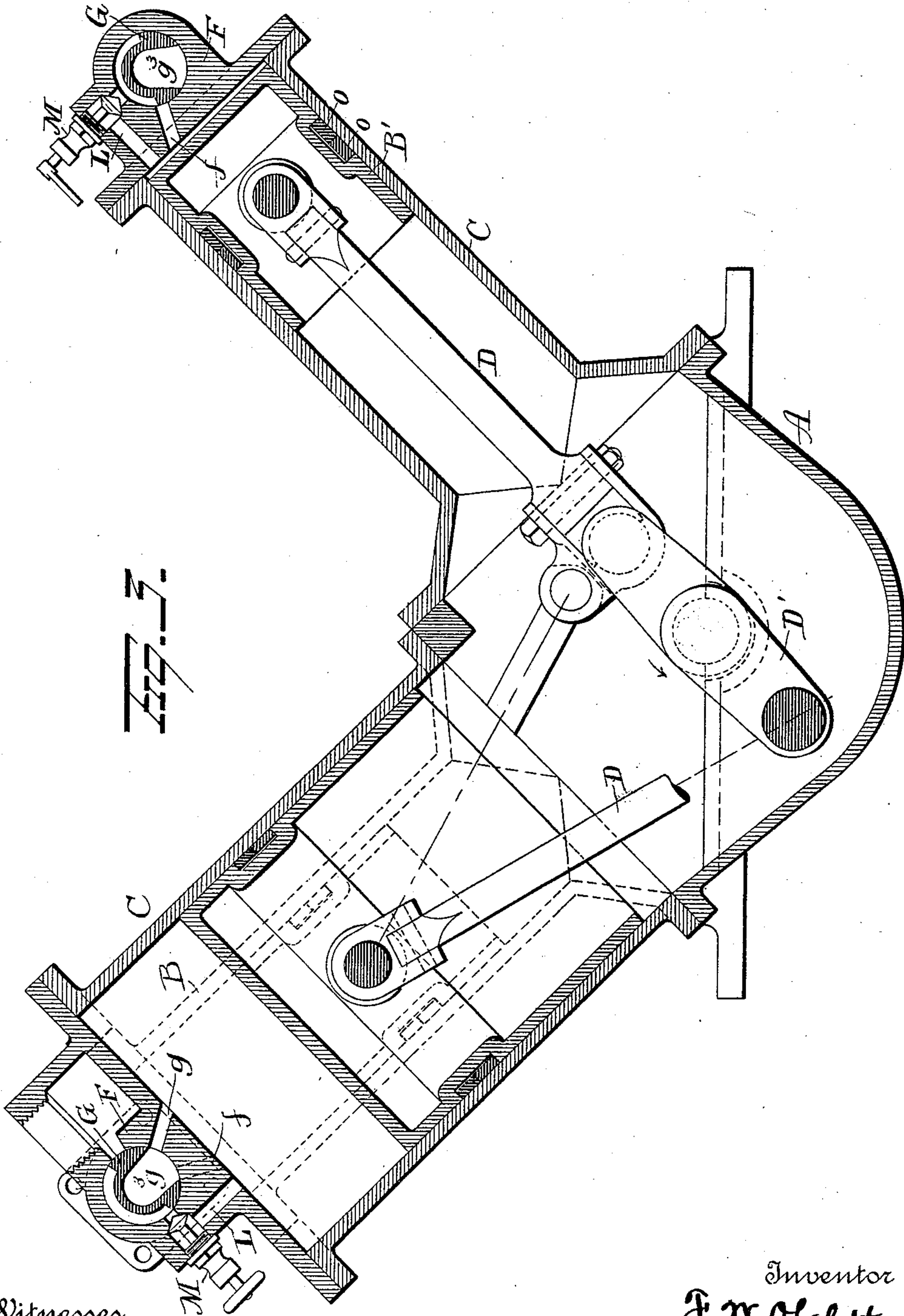
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4 Sheets—Sheet 3.

F. W. OFELDT  
VAPOR ENGINE.

No. 538,694.

Patented May 7, 1895.



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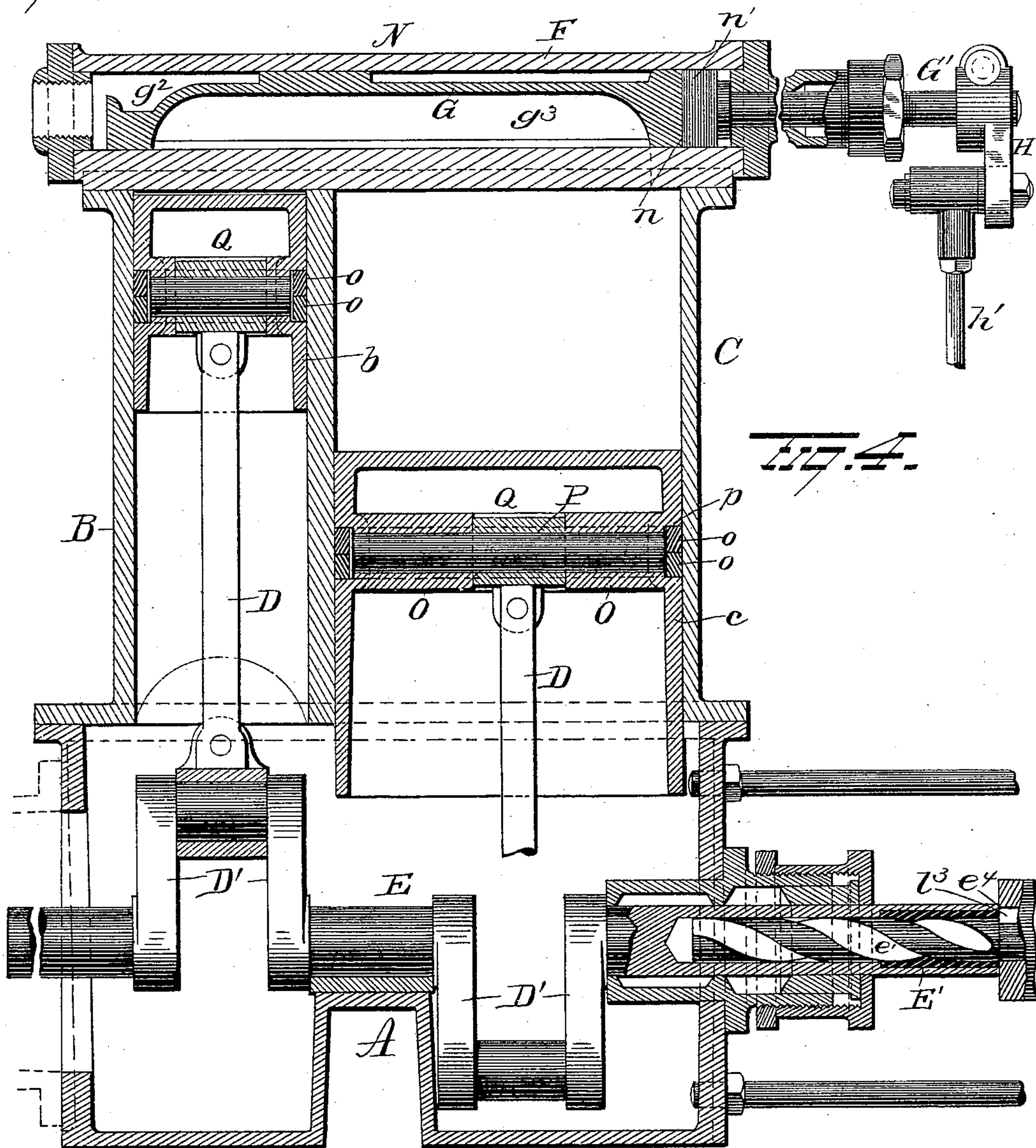
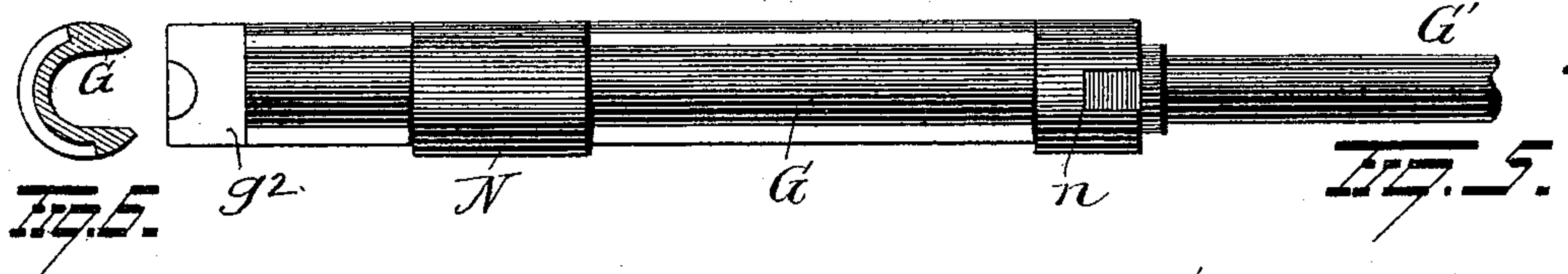
(No Model.)

4 Sheets—Sheet 4.

F. W. OFELDT.  
VAPOR ENGINE.

No. 538,694.

Patented May 7, 1895.



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# UNITED STATES PATENT OFFICE.

FRANK W. OFELDT, OF JERSEY CITY, NEW JERSEY, ASSIGNOR TO THE  
MARINE VAPOR ENGINE COMPANY, OF SAME PLACE.

## VAPOR-ENGINE.

SPECIFICATION forming part of Letters Patent No. 538,694, dated May 7, 1895.

Application filed December 21, 1893. Serial No. 494,344. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK W. OFELDT, of Jersey City, in the county of Hudson and State of New Jersey, have invented certain  
5 new and useful Improvements in Vapor-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 appertains to make and use  
10 the same.

My invention relates to an improvement in vapor engines, the object being to provide a compact and light running engine more particularly adapted for use in connection with  
15 launches in which vapor is used as the motive power.

In the accompanying drawings, Figure 1 is a view in side elevation. Fig. 2 is an end elevation. Fig. 3 is an enlarged sectional view  
20 through one high-pressure and one low-pressure cylinder. Fig. 4 is a section taken at right angles to the section shown in Fig. 3. Figs. 5, 6, and 7 are detail views.

A represents the trunk of the engine and  
25 B, C, and B', C' are high and low pressure cylinders arranged as shown, a high and low pressure cylinder lying side by side and preferably integral with each other and the two sets of cylinders extending out at an angle to  
30 each other, usually at right angles to each other as shown in Figs. 2 and 3. In these cylinders pistons *b*, *c* and *b'*, *c'* are respectively fitted and adapted to reciprocate. These pistons are connected by means of piston rods  
35 D, D, to the cranks D', D' on the main crank shaft E. A valve-box F extends transversely across the outer head of each pair of cylinders the heads and valve box being preferably integral and ports *f* and *g* are formed in the  
40 outer heads of the cylinders for the passage of vapor under the control of the valve therein to the high pressure cylinders, from the high pressure cylinders to the low pressure cylinders and from the low pressure cylinders to  
45 the exhaust and thence preferably to a condenser (not shown).

The valves G G, are both just alike and only one need be described. These valves are fitted in their respective valve boxes and are  
50 adapted to be rocked back and forth axially

therein. These valves are each provided with a crank arm H secured on the outer end of the stem G' of the valve. Piston rods *h* *h'* extend from these cranks to a strap head J, the rod *h* being secured thereto and the rod  
55 *h'* hinged thereto to allow for the motion which must take place in the strap head. The strap head is fitted to an eccentric K keyed on the extensible portion E' of the main crank shaft E, so that the valves are con-  
60 trolled in the usual manner by the rocking motion of the main shaft. Just in this connection it may be stated that the portion E' of the shaft E is capable of being moved end-  
65 wise relative to the main shaft E whereby it is rocked axially to reverse the engine and to this end the portion E' is provided with a spiral groove *e'* and the main portion of the shaft E with the groove to cause the portion E' to  
70 turn relative to the main portion of the shaft E as the portion E' is shifted endwise. This movable portion E' is provided with a key *l*<sup>3</sup> which extends into a groove *e*<sup>4</sup> in the eccentric K and its hub in which it slides as it is  
75 turned and in this manner the reversing of the valves is accomplished. The outer end of the portion E' has a rack E<sup>2</sup> thereon and a lever E<sup>3</sup> fulcrumed in proximity thereto is provided with a toothed segment *e*<sup>5</sup> the teeth  
80 of which engage the rack teeth for the purpose of sliding portion E' endwise.

The valve G itself is fitted to the bored out center of the valve box whereby it may be rocked freely therein. The supply port *g*<sup>2</sup> receives the vapor from the generator and a  
85 port *f* leading through the head of the high pressure cylinder conducts vapor from this supply port into the outer end of the high pressure cylinder when the valve is rocked over far enough to establish this communica-  
90 tion. A port *g* leading into the low pressure cylinder is adapted to receive the vapor exhausted from the high pressure cylinder and communication between the two is established through the port *g*<sup>3</sup> of the valve G and the ex-  
95 haust from the low pressure cylinder to the condenser or other place is effected through this port *g*<sup>3</sup> when the latter is rocked into the proper position for this exhaust. So in the  
100 operation of the valve or valves, vapor is first



admitted simultaneously on the two high pressure pistons through the ports  $f$ ,  $f$ , the high pressure pistons being forced inward thereby. The valves then rock so as to establish communication between the ports  $f$  and  $g$  through the port  $g^3$  so that the vapor which has done its work upon the high pressure pistons is exhausted upon the low pressure pistons. When the valves rock back again the supply port  $g^2$  is made to communicate with the port  $f$  leading into the high pressure cylinder and the port  $g$  in communication with the exhaust, so that when vapor is being conducted to the high pressure cylinder vapor is being discharged from the low pressure cylinder and when the vapor is being conducted from one cylinder to the other the supply and exhaust are cut off.

It frequently happens that when the engine is stopped the valves  $G$  are in such position that some provision has to be made whereby to introduce the vapor on the right piston to start the engine in the right direction. This I accomplish by means of a by-pass  $L$  in which is placed a valve  $M$ . This by-pass leads from the valve box into the head of the cylinder and the valve operates in it to open and close it and the by-pass leads from the box at a point where the vapor supply port is always in communication with it no matter what the position of the valve. In this way before the valve  $G$  is in operation by simply opening the valve  $M$  vapor is allowed to follow the by-pass  $L$  and act upon one of the low pressure pistons or on one of the high pressure pistons or the two simultaneously accordingly as one or both of the valves  $M$  are opened. When the pistons are in the positions shown in Fig. 3 and it is desired to rotate the shaft in the direction indicated by the arrow, the piston rods from the high pressure pistons being on one crank pin and the piston rods from the low pressure pistons being on the other pin, the initial pressure to start the pistons must be on a piston or pistons whose crank pin is beyond a dead center and on the side of the center to give the right direction to the shaft. In Fig. 3 the vapor is discharged direct upon the high pressure piston on the left hand side first but the valves  $f$  and  $g$  being in communication with each other the vapor passes onto the low pressure piston to start the shaft in the direction indicated by the arrow. Then if the valve  $M$  on the right hand side is opened, the vapor on that side is discharged direct upon the high pressure piston. In this way the engine is started. Once started in this way valves  $M$  may be closed if desired or they may be left open just as the engineer may see fit, as the vapor in any event comes from the same source and is applied upon the same piston.

A few details will now be described which contribute largely to the success of the engine and which at the same time might be varied or even omitted without materially changing the machine. First, the valve  $G$ . This valve is provided with a reinforcing band  $N$  which

performs three functions. It serves as a bearing, it strengthens the valve and it closes the supply port. Another detail in connection with the valve consists in the joint formed between the valve and its stem. The valve is provided with a transverse slot  $n$  in one end and the valve stem has a corresponding lug  $n'$  on the end which is adapted to fit and enter the slot whereby the valve and stem are locked together and the former is turned by the latter after the manner of a screw driver driving a screw. Consider next the manner of connecting the pistons and piston rods together. The piston heads are provided with inwardly projecting hollow bosses  $O$ ,  $O$ , and a rod  $P$  passes through these hollow bosses and through the sleeve  $Q$  to connect the sleeve to the piston head. The sleeve in turn is connected to the piston rod. Packing rings  $o$ ,  $o$  are placed in the annular recess  $p$  formed around the piston head as shown.

An alcohol pump  $R$  is located in position to be operated by the engine and an oil pump is also provided for supplying oil to the burner (not shown). It may be added in this connection that the burner and a generator to which the alcohol is fed are described in a concurrently pending application and hence no further reference is made to them here.

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

1. In a vapor engine, the combination with a high and low pressure cylinder, and pistons therein, of a valve box, a rock valve therein, by-passes leading into the high and low pressure cylinders and valves in the by-passes, substantially as set forth.

2. In a vapor engine, the combination with two high and low pressure engines radiating from a common center, pistons in said cylinders, a common crank shaft and piston rods extending from both high pressure pistons to one crank pin and from both low pressure pistons to another crank pin, of valve boxes, a rock valve in each of said boxes, and valve rods extending from said rock valves to the crank shaft, substantially as set forth.

3. In a vapor engine, the combination with high and low pressure cylinders arranged in two pairs radiating from a common center, pistons in said cylinders, a crank shaft, and piston rods extending from the pistons to the crank shaft, of a rock valve, ports therein, ports leading into the several cylinders from this valve, by-passes, and valves in said by-passes, substantially as set forth.

4. In a reversing engine, the combination of the crank shaft, a main valve, an eccentric axially movable upon the crank shaft for operating the main valve, a reciprocating screw between the eccentric and shaft and concentric with the latter and having upon its free end a series of collars for changing the lead of the eccentric, and a movable hand operated rack working in connection with the collars for moving the screw whereby said collars



may rotate while meshing with the rack and the same leverage with great movement of the screw is secured.

5 In an engine the combination of two pairs  
of cylinders arranged at an angle to each other  
and each pair consisting of a high pressure  
cylinder and a low pressure cylinder, and a  
single valve for each pair of cylinders, a crank  
shaft common to both pairs of cylinders, and  
10 a single valve mechanism connecting said  
shaft with both valves.

6. In an engine, the combination of high and  
low pressure cylinders in pairs and said pairs  
of cylinders being arranged at an angle to each  
15 other, a common crank shaft, a separate valve  
for each pair of cylinders, valve mechanism  
from the crank shaft to both valves consisting  
of a single movable eccentric on the crank  
shaft and separate connections between each  
20 valve and eccentric, and hand controlled de-  
vices for shifting the eccentric axially upon  
its shaft for changing the lead of the two  
valves simultaneously to reverse the engine.

7. A base or bed frame closed on the bottom  
25 and open on the top and having two oblique  
bearing surfaces arranged at an angle to each  
other, in combination with two pairs of cylin-  
ders one pair secured upon each of the oblique  
bearing surfaces so that the two pairs of cyl-  
30 inders are at an angle to each other, a crank  
shaft journaled in bearings in the base or bed  
frame and having two cranks, pistons in said  
cylinders, and connecting rods for the cranks,  
and in which a piston of each pair of cylinders  
35 is connected to a single crank and valve mech-

anism for the several cylinders and operated  
from the crank shaft.

8. In a vapor engine, the combination of  
two pairs of high and low pressure cylinders  
and pistons arranged at an angle to each other, 40  
with a valve box extending across the outer  
heads of the two cylinders of each pair, and a  
separate rock valve operating in each of said  
boxes to control the passage of vapor to and  
45 from the cylinders of each pair and from the  
high to the low pressure cylinder of each pair,  
a common crank shaft, and valve mechanism  
from said shaft to the two rock valves whereby  
the vapor is admitted to and exhausted from  
50 each cylinder at a different time.

9. In a vapor engine the combination with a  
high and low pressure cylinder, pistons there-  
for, a valve box extending transversely across  
the outer heads of the cylinders and integral  
55 with said heads, ports leading from the valve  
box into the cylinders and to the exhaust, and  
a valve fitted to the interior of the box having  
a longitudinal groove and bearing faces and  
adapted to rock therein axially a distance suf-  
60 ficient to cause said groove to alternately in-  
clude the two steam ports or port of the low  
pressure cylinder and exhaust ports in pairs.

In testimony whereof I have signed this  
specification in the presence of two subscrib-  
ing witnesses.

FRANK W. OFELDT.

Witnesses:

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OSCAR G. LUNDAUER.