

No. 683,407.

Patented Sept. 24, 1901.

H. A. JENSENIUS.  
VERTICAL DIRECT ACTING ENGINE.

(Application filed Jan. 26, 1901.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

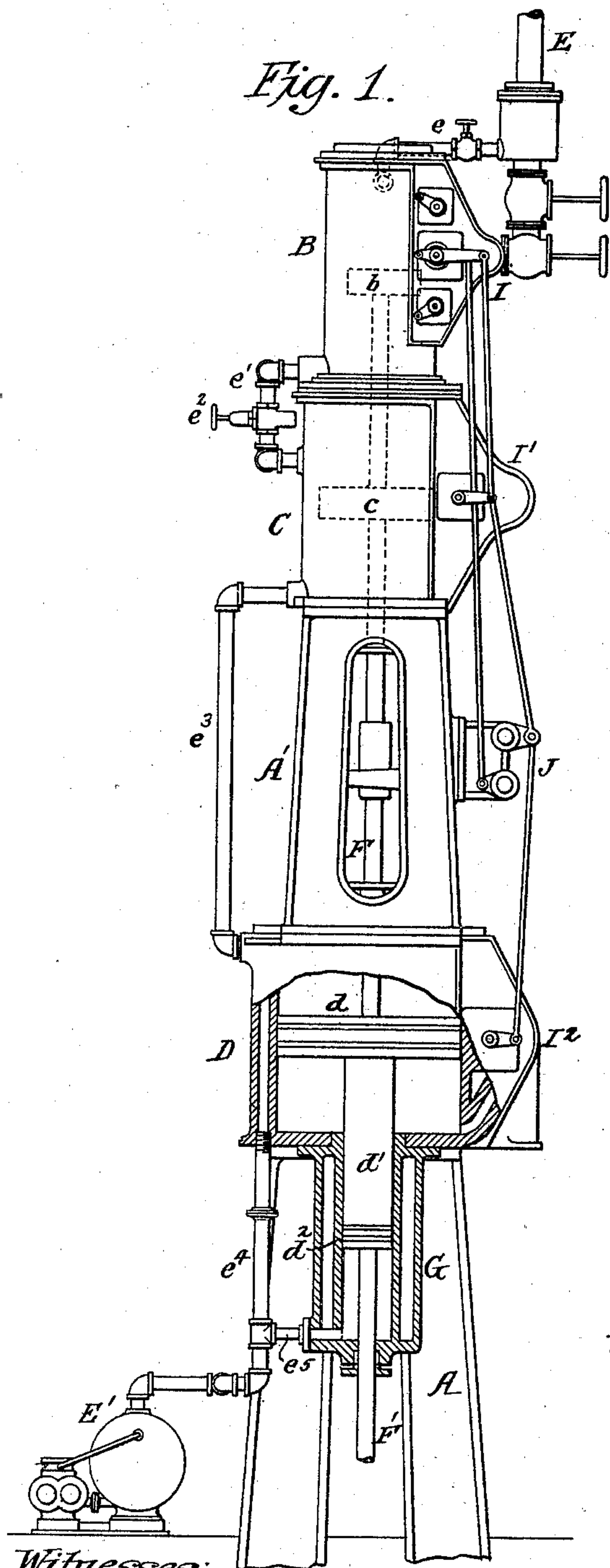
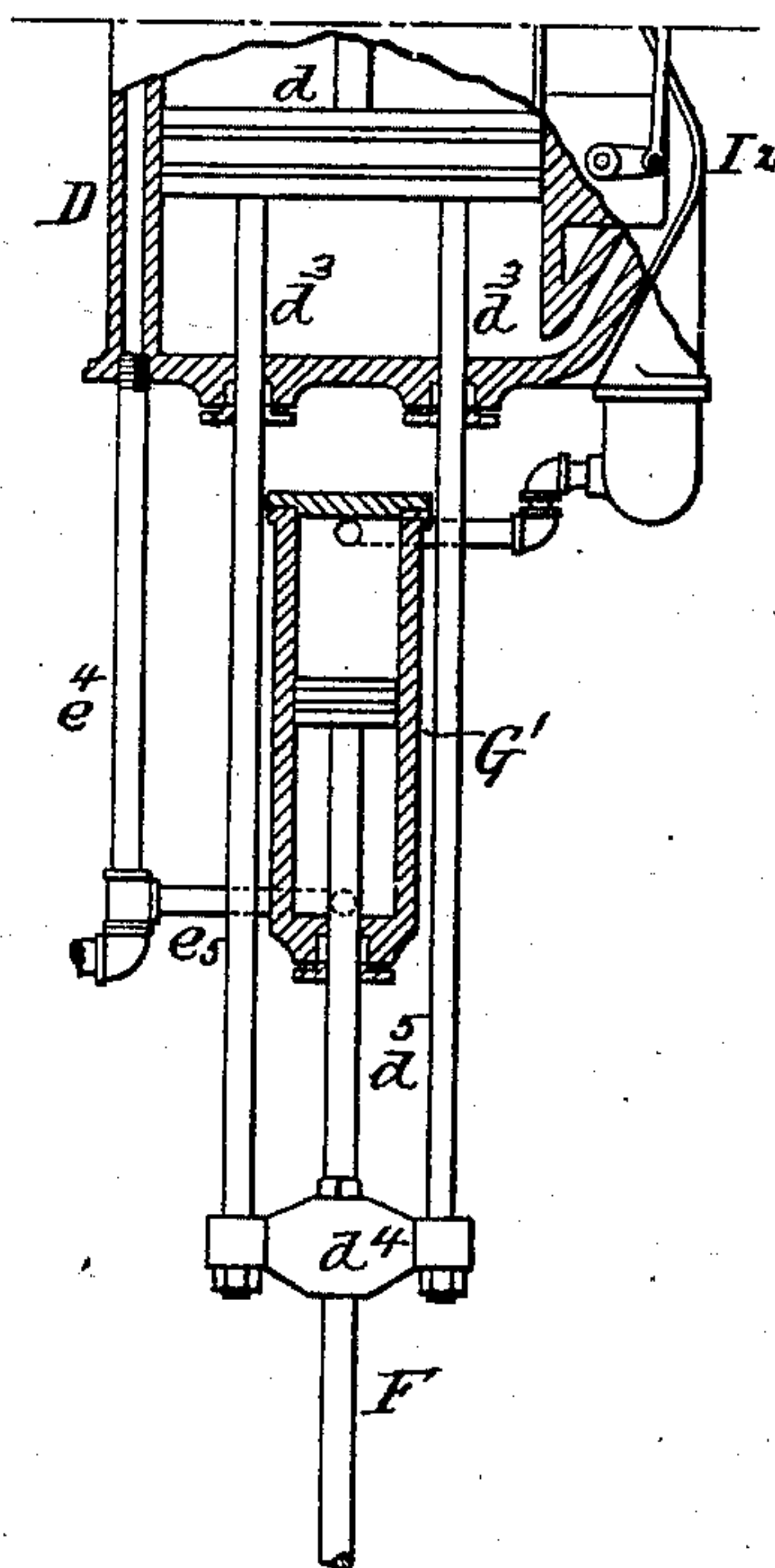


Fig. 3.



Witnesses:  
Herman G. Matus.  
Lionel L. Whitehead

Inventor:-  
Herman A. Jensenius  
by his Attorneys:-  
Herman & Hiram

No. 683,407.

Patented Sept. 24, 1901.

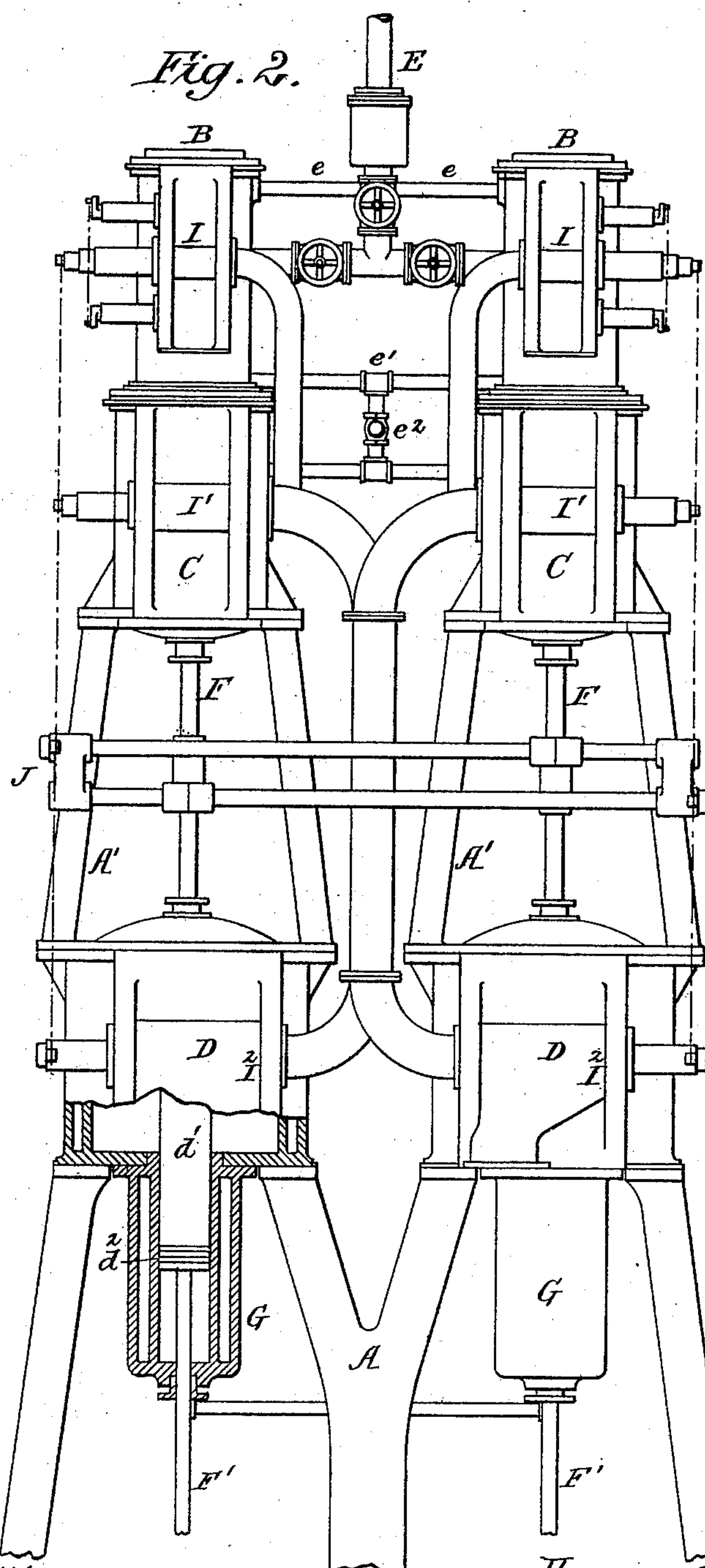
H. A. JENSENIUS.

VERTICAL DIRECT ACTING ENGINE.

(Application filed Jan. 26, 1901.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses:-

Herman C. McKus.

Louis H. Holmsted

Inventor:

Herman A. Jensenius

by his Attorneys:-

Howe & Howe



# UNITED STATES PATENT OFFICE.

HERMAN A. JENSENIUS, OF CAMDEN, NEW JERSEY, ASSIGNOR TO THE  
CAMDEN IRON WORKS, OF SAME PLACE.

## VERTICAL DIRECT-ACTING ENGINE.

SPECIFICATION forming part of Letters Patent No. 683,407, dated September 24, 1901.

Application filed January 26, 1901. Serial No. 44,859. (No model.)

*To all whom it may concern:*

Be it known that I, HERMAN A. JENSENIUS, a citizen of the United States, and a resident of Camden, New Jersey, have invented certain  
5 Improvements in Vertical Direct-Acting Engines, of which the following is a specification.

My invention relates to certain improvements in vertically-arranged direct-acting  
10 pumping-engines of the triple-expansion type.

The object of my invention is to counterbalance the weight of the several pistons, so that the engine will act uniformly. This object I attain in the following manner, reference being had to the accompanying drawings, in which—

Figure 1 is a view in elevation of the steam end of a vertical triple-expansion pumping-engine, partly in section. Fig. 2 is a front elevation of Fig. 1, partly in section; and Fig. 3 is a view of a modification of my invention.

I have shown my invention applied to a triple-expansion duplex pumping-engine.  
25 The two engines are identical, and in the following description I will allude to only one of the engines.

It will be understood that my invention can be applied to other than duplex engines and  
30 the engine may have one or more cylinders.

A A are the standards supporting the steam portion of a pumping-engine in the present instance.

B is the high-pressure cylinder.

35 C is the intermediate cylinder, and D is the low-pressure cylinder. The cylinder D is mounted directly upon the standards A, and supported by this cylinder is a standard A', supporting the cylinder C, on which is mounted the cylinder B. By this construction I  
40 am enabled to gain access to each of the cylinders; and while I prefer to use this construction it is not essential in carrying out my invention.

45 Each of the cylinders B, C, and D is jacketed. The steam enters the jacket of the cylinder B through the pipe  $e$  from the main steam-supply pipe E, and steam is exhausted from the jacket of the cylinder B through the

pipe  $e'$  into the jacket of the cylinder C. A  
50 reducing-valve  $e^2$  in this pipe controls the passage of steam therethrough and regulates the pressure of steam in the counterbalancing-cylinder. A pipe  $e^3$  connects the jacket of the cylinder C with the jacket of the cylinder  
55 D, and the jacket of the cylinder D is connected by a pipe  $e^4$  to an automatic pump E' or trap, which carries off all water of condensation.

$b$  is the piston of the high-pressure cylinder  
60 B,  $c$  is the piston of the intermediate cylinder C, and  $d$  is the piston of the low-pressure cylinder D. These cylinders are connected by a rod F. Extending from a piston  $d$  is a plunger  $d'$ , which enters a cylinder G, secured  
65 to the under side of the cylinder D, and this cylinder communicates with the pipe  $e^4$  through the pipe  $e^5$ . A piston-rod F' extends from this plunger  $d'$  to the pump-plungers.  
70 The plunger  $d'$  has suitable packing  $d^2$ , and the area of the plunger is figured according to the diameters of the several cylinders, so as to counterbalance the weight of the unbalanced moving parts of the engine, such as  
75 the pistons, rods, &c.

I find that I can obtain sufficient pressure from the steam utilized in the jackets of the several cylinders to counterbalance the pistons.

I I' I<sup>2</sup> are the valves of the several cylinders B, C, and D, and these valves are connected by rods to valve mechanism J, actuated by a projection on the piston-rod F. It will be understood, however, that this valve mechanism does not form a part of my present invention.  
85

It will be understood that while I have shown my invention as applied to a triple-expansion vertical engine, either single or duplex, it may be used in connection with one  
90 or more cylinders vertically arranged without departing from my invention.

Fig. 3 is a view showing the counterbalancing-cylinder G' directly under the lowermost cylinder of the series, but supported independently thereof, the piston of the lowermost cylinder being connected to the pump-rod by two piston-rods  $d^3$   $d^3$  and the piston  
95



of the counterbalancing-cylinder being connected to the cross-head  $d^4$  by a rod  $d^5$ , as clearly shown.

I claim as my invention—

5 1. The combination of a steam-engine having one or more cylinders vertically arranged, said cylinders being jacketed, another cylinder having its interior connected by piping to the jackets of the above-mentioned cylinders, a plunger in said other cylinder operatively connected to the pistons of said cylinders, the steam from said jackets acting on the plunger in said cylinder to counterbalance the weight of the unbalanced moving portions of the engine, substantially as described.

20 2. The combination in a triple-expansion engine having the cylinders vertically arranged, of the three cylinders, each cylinder being jacketed, pipes forming communication between the several jackets of the cylinders, a cylinder under the lowermost cylinder and connected by piping to the jackets of the engine-cylinders, a plunger extending from the piston of the lowermost cylinder and working in the cylinder communicating with the jackets said plunger being actuated by steam from said jackets to counterbalance the weight of the unbalanced moving portions of the engine, substantially as described.

30 3. The combination in a triple-expansion engine having the cylinders vertically arranged, of the three cylinders, one mounted above another, each cylinder being jacketed, a steam-supply pipe, a pipe leading from the steam-supply pipe to the jacket of the high-pressure cylinder, a pipe communicating the jacket of the high-pressure cylinder with the jacket of the intermediate cylinder, a pipe forming communication between the jacket of the intermediate cylinder with the jacket

of the low-pressure cylinder, a pipe leading from the jacket of the low-pressure cylinder and connected to a suction-pump, a cylinder secured to the under side of the low-pressure cylinder and connected to the pipe leading to the pump or trap, a piston for each of the high, intermediate and low pressure cylinders, said pistons being connected together, a plunger connected to the low-pressure piston and working in the cylinder coupled to the jackets, and a rod coupling the said plunger to the pumping mechanism, substantially as described.

4. The combination in a triple-expansion engine having the cylinders vertically arranged, of the three cylinders one mounted above another, each cylinder being jacketed, a steam-supply pipe, pipes connecting the several cylinders, a pipe leading to a pump or trap, a cylinder under the lowermost cylinder of the series, a plunger in said cylinder for counterbalancing the unbalanced moving parts of the engine, said cylinder being connected to the jackets of the engine-cylinders, and a reducing-valve for regulating the pressure of steam in the counterbalancing-cylinder, substantially as described.

5. The combination in a steam-engine, having one or more cylinders vertically arranged, said cylinders being jacketed, a cylinder connected by piping to the jackets of the engine-cylinders, and a plunger in said cylinder coupled to the pump-rod and to one of the engine-pistons, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HERMAN A. JENSENIUS.

Witnesses:

WILL. A. BARR,  
JOS. H. KLEIN.