No. 630,838. Patented Aug. 15, 1899.

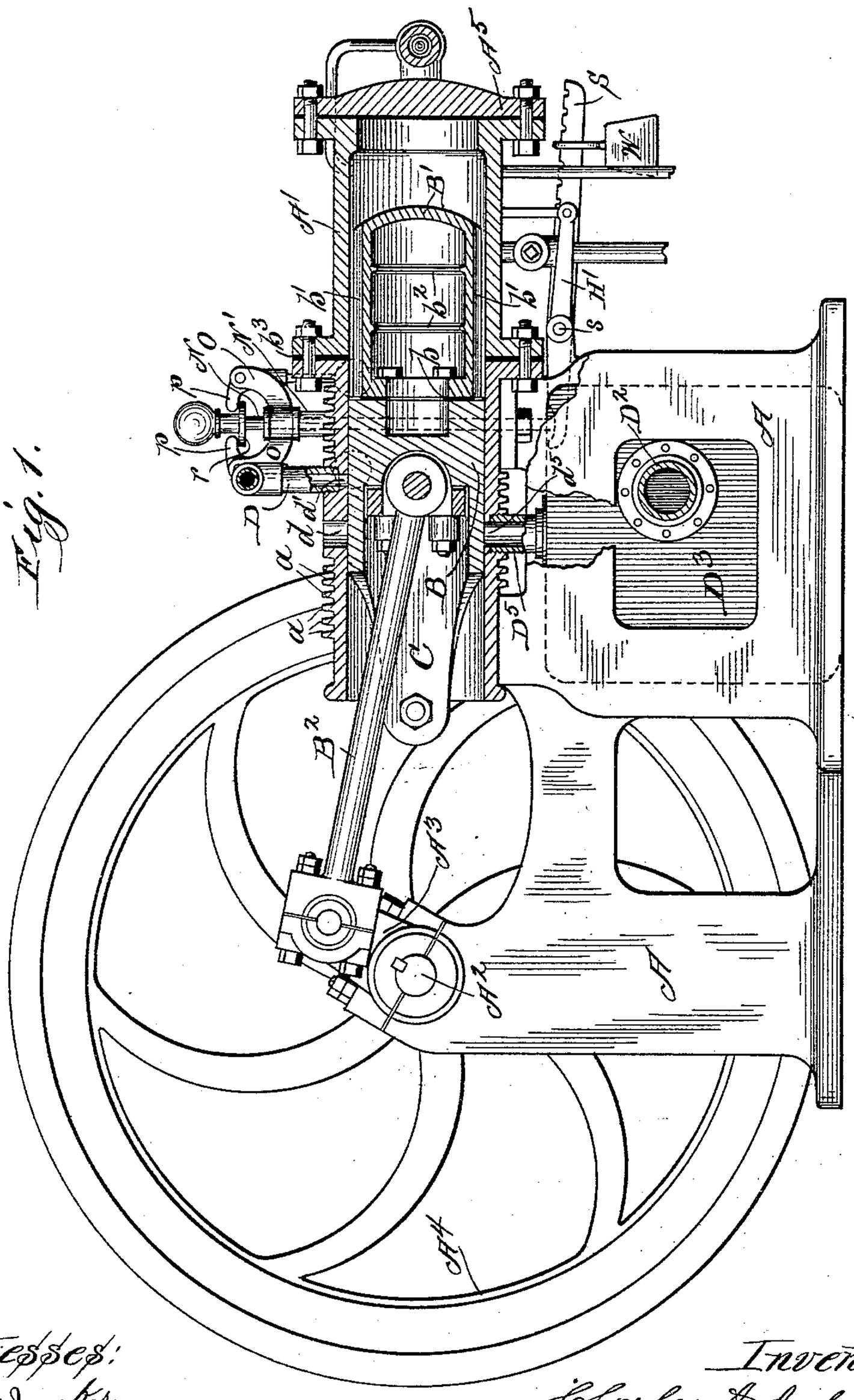
C. A. ANDERSON & E. A. ERICKSSON.

GAS OR OIL ENGINE.

(Application filed Apr. 25, 1898.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



Witnesses:
R. J. Jacker.
E. A. Duggan.

Inventors:
Charles A. Anderson and
Erick A. Eriksson.
By Chas. C. Tillman
Atty.

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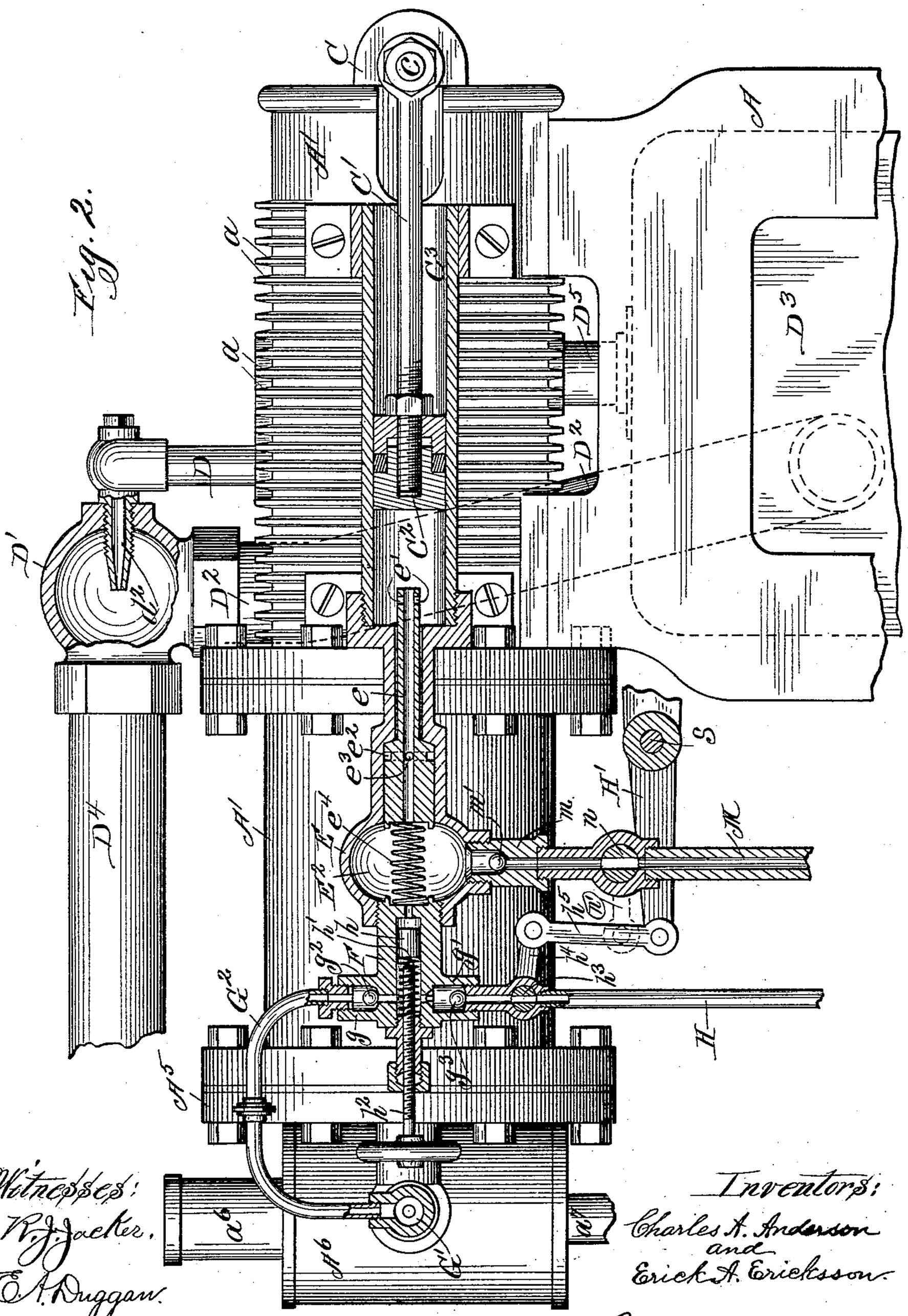
Fig. 2.



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Charles A. Anderson
and
Erick A. Ericksson.

By Chas. C. Tillman, Atty.

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Fig. 4.

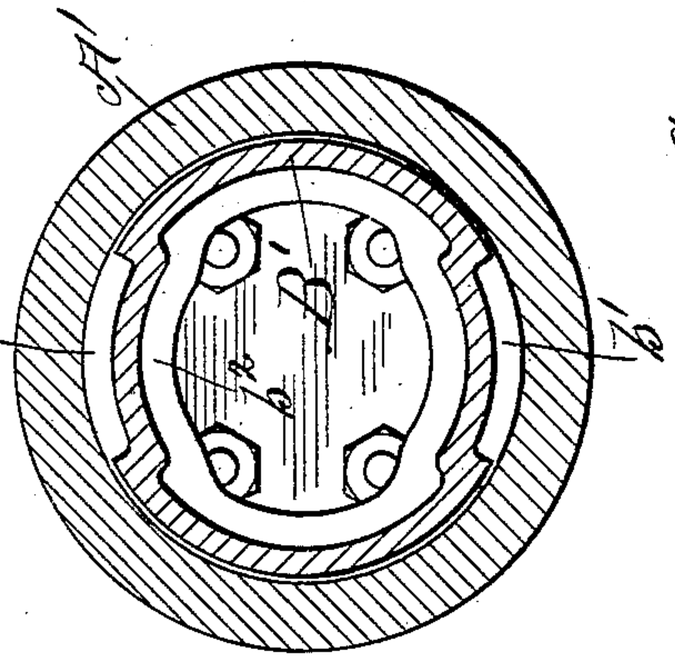

Fig. 3.

Witnesses:
P. J. Jacker.
E. A. Duggan.

Inventors:
Charles A. Anderson and
Erick A. Ericksson.
By Chas. C. Tillman
Atty.

UNITED STATES PATENT OFFICE.

CHARLES A. ANDERSON AND ERICK A. ERICKSSON, OF CHICAGO, ILLINOIS.

GAS OR OIL ENGINE.

SPECIFICATION forming part of Letters Patent No. 630,838, dated August 15, 1899.

Application filed April 25, 1898. Serial No. 678,704. (No model.)

To all whom it may concern:

Be it known that we, CHARLES A. ANDERSON and ERICK A. ERICKSSON, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Gas or Oil Engines, of which the following is a specification.

This invention relates to improvements in gas or oil engines; and it consists in certain novel features of the construction and combinations and arrangements of parts, as will be hereinafter more fully set forth, and specifically claimed.

In order to enable others skilled in the art to which our invention pertains to make and use the same, we will now proceed to describe it, referring to the accompanying drawings, in which—

Figure 1 is a view in side elevation, partly in section, of an engine embodying our invention. Fig. 2 is a similar but enlarged view of the reverse side of the engine. Fig. 3 is a plan view, partly in section and partly in elevation, showing a part of the cylinder and the air or gas and oil compressing mechanism or pump; and Fig. 4 is a cross-sectional view taken on line 4 4 of Fig. 3, looking in the direction indicated by the arrows.

Similar letters refer to like parts throughout the different views of the drawings.

A represents the main frame or support on which the cylinder A′ is mounted and in which the shaft A^2 for the crank A^3 and fly-wheel A^4 has its bearings. Within the cylinder A′ is located a working piston B, which has secured to its inner end or rear portion, yet separated therefrom by means of a disk *b*, of non-heat-conducting material, a hollow piston or portion B′, which is somewhat smaller than the interior of the cylinder, and is provided at its upper and lower portions and on the outer surface thereof with grooves *b*′ for the passage of air and gases. The hollow portion B′ forms a part of the working piston B and is provided internally with annular ribs b^2 for strengthening purposes. Connected to the piston B is a pitman B^2, whose other end is suitably connected to the crank on the crank-shaft. The front portion of the piston B is provided with a forwardly-extending arm C, to which is secured at one of its ends by means of a laterally-extending arm *c* the piston-rod C′, which has secured to its other end a piston C^2, located and operating in the pump or compressor cylinder C^3, which is located near one side of the main or working piston, a portion of the latter-named cylinder being provided with external annular corrugations *a* to afford a greater radiating-surface in order to dispense with the use of water in a water-jacket for cooling the cylinder, as is employed in engines of the ordinary construction. Secured to the rear end of the cylinder A′ is a cylinder-head A^5, which is formed or provided with a combustion or explosion chamber *a*′, communicating through channels a^2, a^3, and a^4 with the interior of the working cylinder. Around the casing a^5 of the combustion-chamber *a*′ is located a fire-box A^6, whose upper portion is provided with a pipe a^6 for the outlet of the products of combustion from the fuel, which may be supplied to within the lower portion of the fire-box by means of a blowpipe-burner a^7, communicating with a suitable supply or source.

It will be observed by reference to Figs. 1, 2, and 3 of the drawings that the working cylinder is composed of two sections hinged together, but having interposed between their meeting ends a ring b^3 or quantity of non-heat-conducting material to prevent the heat from the rear portion of the cylinder passing to the front part thereof.

The upper portion of the corrugated part of the cylinder A′ is provided with an opening *d* for the admission of air and at some distance to the rear of said opening with a primary exhaust-port *d*′ for the passage of the burned gases while yet under pressure. Communicating at one of its ends with the port *d*′ is a pipe D, communicating with whose upper portion is a nozzle d^2, having a channel or opening therethrough, which is reduced at the free end of the nozzle, as is shown in Fig. 2 of the drawings. This nozzle extends into a hollow casing D′, located on the upper end of a pipe D^2, which communicates at its other end with an air-tight vessel or tank D^3, preferably located beneath the cylinder. Also communicating with the casing D′ is a discharge or exhaust pipe D^4, which may lead to any proper point and desired direction. The lower portion of the corrugated part of the cylinder

A′ is formed with a secondary exhaust-port d^3, communicating at one of its ends with a pipe D^5 and communicating at its other end with the upper portion of the vessel or tank D^3, the function of which will be presently explained. Secured to and communicating with the rear end of the pump or compressor cylinder C^3 is a valve-casing E for the sliding valve E′, located therein, and which valve is hollow and provided with a tubular stem *e*, extending at its front end into the cylinder C^3 and provided near said end with an opening *e* for the admission of air when the end of the stem is in contact with the piston C^2 of the pump or compressor cylinder. The valve E′ is provided in its enlarged portion with an annular groove e^2, which communicates through an opening e^3 with the hollow of said valve. The rear portion of the valve-casing E is enlarged to form a chamber E^2, within which is located a spring e^4 to actuate the valve E′ and to normally hold it in a closed position, as shown in the drawings. Communicating with the hollow of the valve-casing E, through an opening e^5, is a tubular extension E^3, within which is located a check-valve e^6, normally held in a closed position by a spring e^7, located in said extension. Secured to the rear portion of the valve-casing E and communicating with the chamber E^2 thereof is a cylinder F, having valve-casings *g* and *g′* for the ball-valves g^2 and g^3, respectively. Within the cylinder F is located and operates a piston *h*, which is pressed by a spring *h′* and whose movement may be regulated by means of a screw rod or stem h^2, extending into said cylinder. Communicating with the valve-casing *g′* is a pipe H, which communicates at its other end with an oil tank or vessel, (not shown,) and which pipe is provided with a shut-off valve *h*, having rigidly secured thereto an arm h^4, which is connected to the lever H′ by means of the rod or bar h^5, pivotally secured to said arm and lever. Extending into the channels a^3 and a^4, leading to the combustion-chamber and main cylinder, is a nozzle or jet G, whose cavity is enlarged at the outer end of the nozzle-piece to form a mixing-chamber G′, within which we usually place a quantity of wire gauze or netting g^4 to cause the air and oil to be sprayed or more thoroughly mixed.

Communicating with the chamber G′ of the nozzle is a pipe G^2, whose outer end communicates with the valve-casing *g* and is for the passage of oil. Communicating with the outer end of the chamber G′ of the nozzle and with the tubular extension E^3 of the valve-casing E is a pipe I for the passage of air or gas, having a shut-off valve *i*, which may be provided with a hand-wheel for turning the same. In the lower portion of the chamber E^2 of the valve-casing E is located a valve-casing *m*, having a ball-valve *m′*, and to which casing is connected a pipe M, communicating at its other end, when gas is used, with a suitable source of supply, but when air and oil are used in the engine may be open or free at its lower end. This pipe is provided with a shut-off valve *n*, which when gas is used in the engine may be connected to the rod h^5 by means of an arm *n′*, rigidly secured on one end of said valve. The lever H′ is connected to or impinges near one of its ends the governor-rod N, which is vertically supported by means of a tube N′, on the upper portion of which is secured brackets *o*, to which are pivotally secured bell-crank levers *p*, to the lower arms of which are connected the governor-balls and whose upper arms rest on a disk *r* on the upper portion of the governor-rod. Secured to the fulcrum *s* of the lever H′ is a counterbalancing-arm S, on which may be secured a weight *w* to regulate the speed of the engine.

The operation of our engine is as follows: When the working piston is at the limit of its rear stroke, the gas within the cylinder will be compressed and exploded, which operation will force the piston toward the forward end of the cylinder, thus opening the port *d′*, and as the burned gas or charge is still under pressure it will discharge through the pipe D and nozzle d^2 into and through the chamber of the casing D′ and exhaust-pipe D^4 with great force, thus producing suction through the pipe D^2 and a partial vacuum in the air-tight vessel or tank D^3, and as the piston progresses further in the forward stroke the openings or ports *d* and *d* will be opened, thereby allowing air to enter through the opening *d* and the remaining portion of the burned charge drawn out through the port d^3 into the air-tight vessel or tank. As the working piston moves rearwardly the piston C^2 within the pump or compressor cylinder will also move rearwardly and will strike the end of the valve-stem *e* and move the valve E′ till its port e^2 registers with the opening e^5 in the tubular extension E^3. The air or gas, when the latter is used, within the cylinder C^3 is compressed by reason of the movement of the piston C^2 and will pass out through the opening e^5 and pipe I into the mixing-chamber G′ and from thence through the nozzle G and channel a^2 into the combustion or explosion chamber *a′* and will carry with it a sufficient quantity of oil, which will be deposited in the mixing-chamber g^4 through the pipe G^2, the compressed air or gas within the chamber E^2 of the valve-casing E forcing the piston *h* rearwardly until the pressure is removed therefrom through the reverse movement of the said piston, when the spring *h′* will force the piston *h* toward the chamber E^2, which operation will create a vacuum in the valve-chamber F and thus draw oil through the pipe H, which will be forced through the pipe g^2 into the mixing-chamber by reason of the next movement of the pistons *h* and C^2, the latter being located in the compressing or pump cylinder. As the air or gas is discharged through the nozzle G into the channel a^3 it is apparent that it will there-

by be caused to circulate through the channels a^2 a^3 a^4 and the cylinder and cause it to be more thoroughly mixed. By providing the working piston, the extended hollow portion B′ of which is somewhat smaller than the interior of the cylinder and separated from the working piston by packing of non-heat-conducting material, it is evident that the working piston will be prevented from becoming overheated, and it is also apparent that by corrugating a portion of the cylinder, thereby affording greater radiating-surface and also separating said corrugated portion of the cylinder from the other part thereof by means of packing of non-heat-conducting material, the corrugated portion of the cylinder will be prevented from becoming overheated.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a gas or oil engine the combination with a working cylinder having ports for the discharge of burned gases, and an inlet for air, of a piston in said cylinder, an air-tight vessel having a communication with a secondary exhaust-port in the working cylinder, a pipe communicating at one of its ends with the primary exhaust-port in the working cylinder, another pipe communicating at one of its ends with the air-tight vessel and having in its other end a chamber and an exhaust-outlet, and a nozzle communicating with the primary exhaust-port and extending into said chamber, substantially as described.

2. The combination with a gas-engine, of a compressor or pump cylinder, a piston located in said cylinder and connected to the working piston of the engine, a spring-actuated hollow slide-valve communicating with the compressor-cylinder, and having its stem extending thereinto, an inlet-pipe communicating with said valve-chamber, an outlet-pipe communicating with the main cylinder and with said valve, a check-valve located in said pipe, substantially as described.

3. The combination with a gas-engine, of a compressor or pump cylinder, a piston located in said cylinder and connected to the working piston of the engine, a spring-actuated hollow slide-valve communicating with the compressor-cylinder, and having its stem extending thereinto, an inlet-pipe communicating with said valve-chamber, an outlet-pipe communicating with the main cylinder and with said valve, a check-valve located in said pipe, the valve-casing F communicating with the valve-chamber of the sliding valve, a spring-actuated piston located in the valve-casing F, a pipe communicating with the valve F, and with the main cylinder, an inlet-pipe communicating with the valve F, and valves in the said pipes to control the flow of oil, substantially as described.

4. The combination with a gas-engine, of a compressor or pump cylinder, a piston located in said cylinder and connected to the working piston of the engine, a spring-actuated hollow slide-valve communicating with the compressor-cylinder, and having its stem extending thereinto, an inlet-pipe communicating with said valve-chamber, an outlet-pipe communicating with the main cylinder and with said valve, a check-valve and a mixing-chamber located in said pipe, the valve-casing F communicating with the valve-chamber of the sliding valve, a spring-actuated piston located in the valve-casing F, a pipe communicating with the valve F, and with the main cylinder, an inlet-pipe communicating with the valve F, and valves in the said pipes to control the flow of oil, substantially as described.

Signed at Chicago, Illinois, this 22d day of April, A. D. 1898.

CHARLES A. ANDERSON.
ERICK A. ERICKSSON.

Witnesses:
CHAS. C. TILLMAN,
E. A. DUGGAN.