

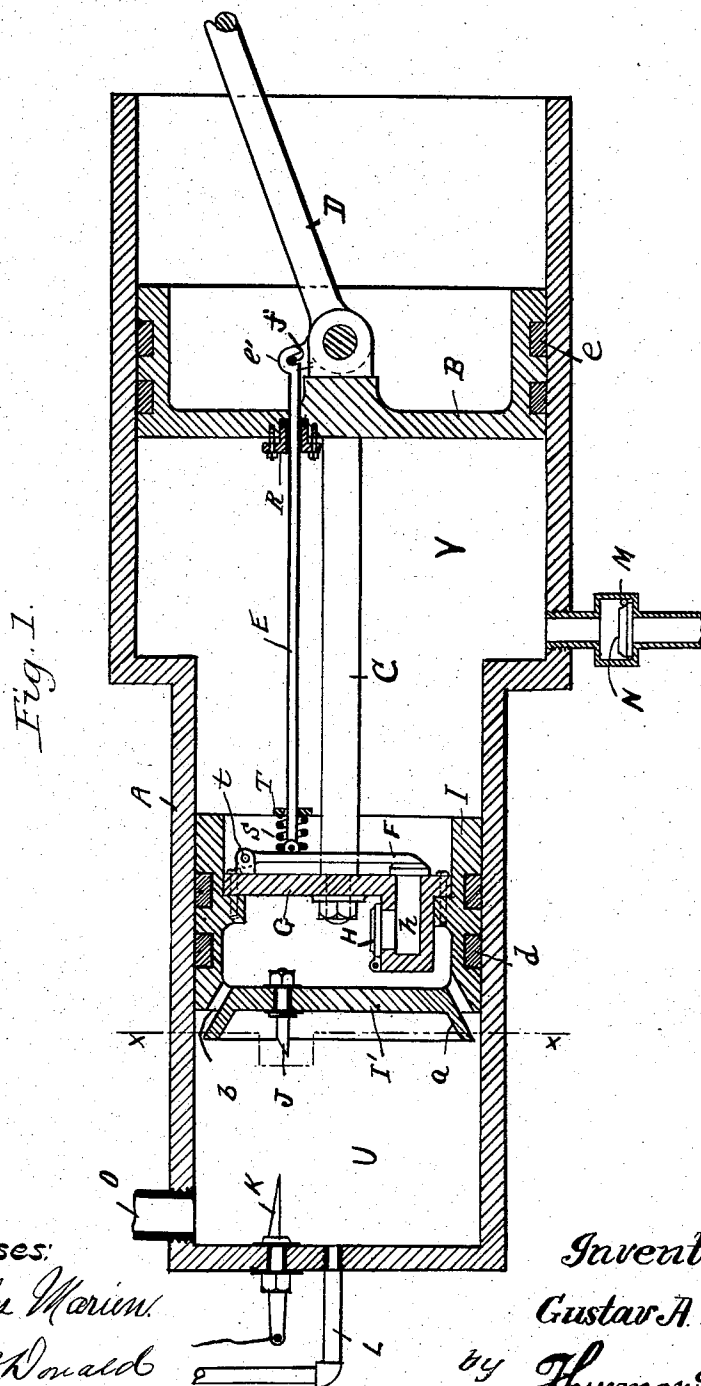
(No Model.)

2 Sheets—Sheet 1.

G. A. THODE.
GAS ENGINE.

No. 568,814.

Patented Oct. 6, 1896.



Witnesses:

Charles Morin.

M. McDonald

Inventor:

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by *Thurman & Stribling*
Attorneys.

(No Model.)

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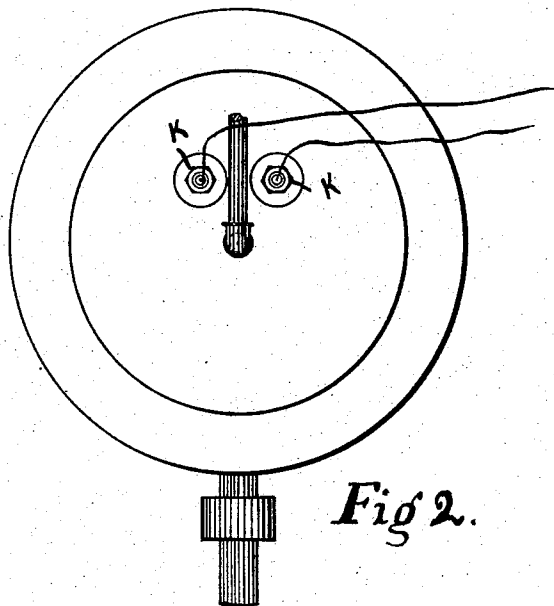


Fig 2.

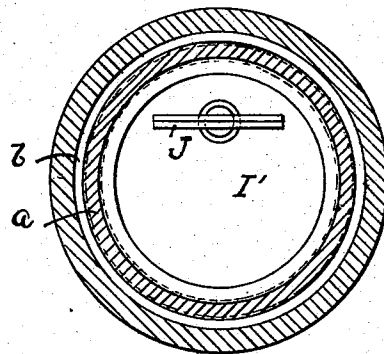


Fig 3.

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UNITED STATES PATENT OFFICE.

GUSTAV A. THODE, OF OSMOND, NEBRASKA.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 568,814, dated October 6, 1896.

Application filed January 29, 1896. Serial No. 577,238. (No model.)

To all whom it may concern:

Be it known that I, GUSTAV A. THODE, a citizen of the United States, residing at Osmond, in the county of Pierce and State of Nebraska, have invented certain new and useful Improvements in Gas-Engines; and I do 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 the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to that class of engines in which a mixture of gas or gasoline and air under compression is ignited by an electric spark and exploded in a cylinder, furnishing power to give momentum to a piston for transmitting power; and it consists of a new and useful combination of devices comprising cylinders and pistons movable therein, having peculiarly-arranged mechanism by which the power-cylinder may be prevented from becoming overheated by the use of atmospheric air automatically introduced to the inside of the cylinder, as will be more fully described hereinafter, and particularly pointed out in the claims.

My object is to provide a gas or gasoline engine, the cylinder of which shall be automatically kept sufficiently cool, and dispense with the use of a water-jacket, which is found to be impracticable to use in some types of engines where lightness and portability is a great consideration. This object I attain in a simple and inexpensive manner in the construction of my invention, which is of few parts, cheaply manufactured, and is durable and economical in use.

A clear comprehension of the merits and novel features of my invention is obtained by reference to the detailed description following and to the drawings, in which—

Figure 1 represents a longitudinal half-sectional view; Fig. 2, an end view of cylinders, and Fig. 3 a cross-sectional view on the line *xx* of Fig. 1.

In constructing my engine I use such metals as are found most desirable, and employ suitable mechanism in common application for actuating the inlet and exhaust valves for admitting the explosion mixture to the cylinder

and allowing the exhausted gases to escape, the essential features of my invention being in the use of two cylinders and two pistons of differing diameters, connected in tandem style, for an engine, any number of engines being connected to a single driving-shaft as may be desired.

In the drawings, A is the wall of the cylinder or cylinders, which is cast in one piece and comprises a power-cylinder U and larger air-cylinder V, there being a continuous opening between the two parts. To the head of the power-cylinder is connected a charge inlet-pipe L, leading from a suitably-operated inlet-valve, and an insulated electric connection passes through the head, terminating in an electrode K inside the cylinder. An exhaust-pipe O is provided, to which is connected a suitably-operated exhaust-valve. The larger cylinder V is provided with an air-inlet check-valve N, seated in a casing M. A suitable base or supporting-frame is attached to the cylinder-casting to correspond to the particular purpose to which my invention is applied.

I is a hollow piston having packing-rings *d*. The head I' is preferably made integral with the piston and has a series of apertures *b*, arranged in a circle near the periphery of the piston. These apertures incline at an angle, and the outside of the piston-head is provided with an annular flange *a*, having the peripheral face thereof coincident to the inside diameter of the circle of the apertures and inclined at the same angle, so that when air passes outward through the apertures from the piston it is deflected toward the walls of the cylinder. A suitable electrode J is attached to the head I' of the piston. The opposite head G of the piston is detachable. It is provided with a port *h*, at the inner end of which is seated a check-valve H. The outer opening of the port is covered by a valve F, hung at the lower end of an arm which is hinged at *i* to the piston and is operated at certain portions of each revolution by means of a connecting-rod E, which is so attached that when closing the valve it is slightly cushioned by a spring S, pressed by a collar T, and when opening the valve the movement is positive and direct. The opposite end of the rod E passes through a packing-gland R

and opening in the air-piston B, and has a hook *e'*, connecting with a wrist-pin *f*, secured to a short rocking arm attached to the end of the pitman or connecting rod D. The piston
5 B in the air-cylinder is provided with packing-rings *e*. This piston and the power-piston I are connected by means of a rod *C'*, so that they travel simultaneously each in its respective cylinder.

10 In practical operation the power-cylinder U receives a charge of gas mixture when the piston I is on the instroke and is thereby compressed, and when at the end of its travel, the charge being fired, the piston starts back
15 on the outstroke, the charging and explosion taking place at each alternate revolution. On the outstroke of the pistons the piston B draws in a quantity of air through the valve N into the cylinder V, which on the instroke
20 is slightly compressed, and is forced through the port *h* in the piston I into the opposite end of the cylinder U and out of the exhaust-valve, which, with the valve F, is opened automatically by positive connections with the
25 engine-shaft.

It is obvious that as the air-cylinder has a greater area than the power-cylinder the smaller cylinder offers a resistance when the piston B is on the instroke, so that the air is
30 somewhat compressed in the larger cylinder. Thus the cool atmospheric air comes in contact with the walls of the power-cylinder at both sides of the power-piston and tends to cool them, the air being exhausted together
35 with the heat it takes up from the cylinder-walls and piston at alternate revolutions, and cool air again admitted. This intermittent action also cleanses the cylinder of the burned gases and prevents fouling.

40 It will be understood that the air is forced through the power-cylinder during the instroke that is forcing out the burned gases, and on the alternate instroke the air forced through the piston is mixed in the power-cyl-
45 inder with the incoming charge of gas.

It is obvious that many minor variations may be made in the details of construction without departing from the intents and purposes of my invention.

I hereby disclaim invention of the igniting 50 arrangement; but

What I do claim as new and novel, and desire to secure by Letters Patent, is—

1. In a gas or oil engine, the combination of the cylinder A having the portions U and V; 55 the hollow piston I working in the part U and having the head *I'* provided with the flange *a* and the apertures *b* arranged as shown; the detachable head G secured to said piston and having the port *h*, the check-valve H and the operated valve F; the piston B having the packing-gland R and working in the part V; the rod C connecting said pistons; the rod E connecting said valve F at one end and hav-
60 ing at its opposite end the hook *e'* connecting with wrist-pin *f* secured to a vibrating arm at end of a pitman D connecting said piston B; the casing M having the check-valve N and connected to the part V as shown, substan-
70 tially as shown and described, for the purposes set forth.

2. In an engine of the kind described, the combination with the power-cylinder having suitable controlled supply and exhaust valves and means for igniting gas charges, of the 75 piston I having head *I'* and radial ports or apertures *a*, port *h*, check-valve H, valve F and means for controlling the latter valve by suitable connection with the vibrating rod connecting the piston with the crank of main
80 shaft, substantially as shown and described.

3. In a gas or gasolene engine having a larger and a smaller cylinder placed tandem and connected, the combination of the hollow 85 piston I, the air-piston B, the rod C connecting said pistons, the valve F attached to piston I, the rod E connecting said valve and having a connection at *e' f* with a vibrating arm on end of a pitman D and suitable packing
90 around rod E where it passes through head of piston B, substantially as shown and described.

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

GUSTAV A. THODE.

Witnesses:

B. M. SMITH,

C. B. WILLEY.