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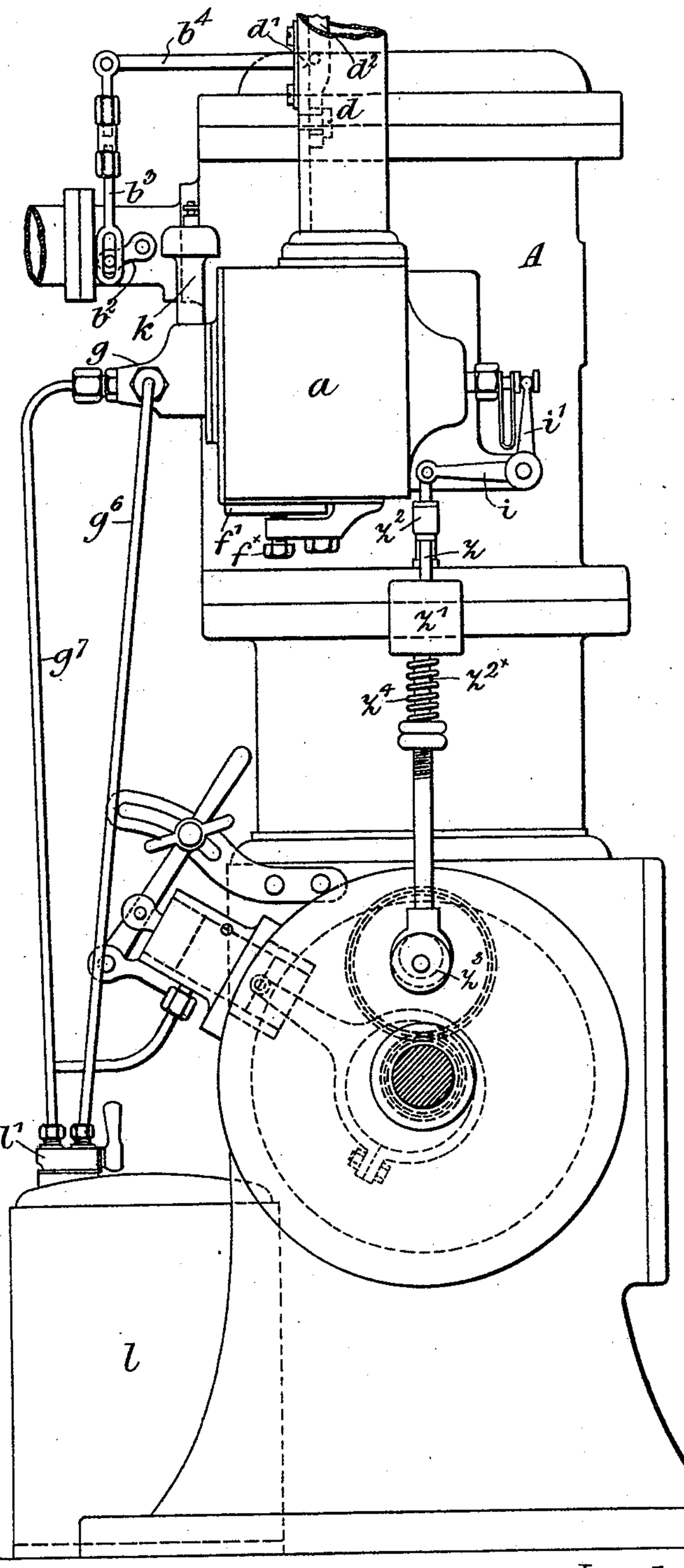
H. T. DAWSON.

OIL OR GAS ENGINE.

No. 582,271. Patented May 11, 1897.

Fig. 1.



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E. A. Bullock

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By his Attorneys
Baldwin Davidson & Wright

(No Model.) 5 Sheets—Sheet 2.

H. T. DAWSON.

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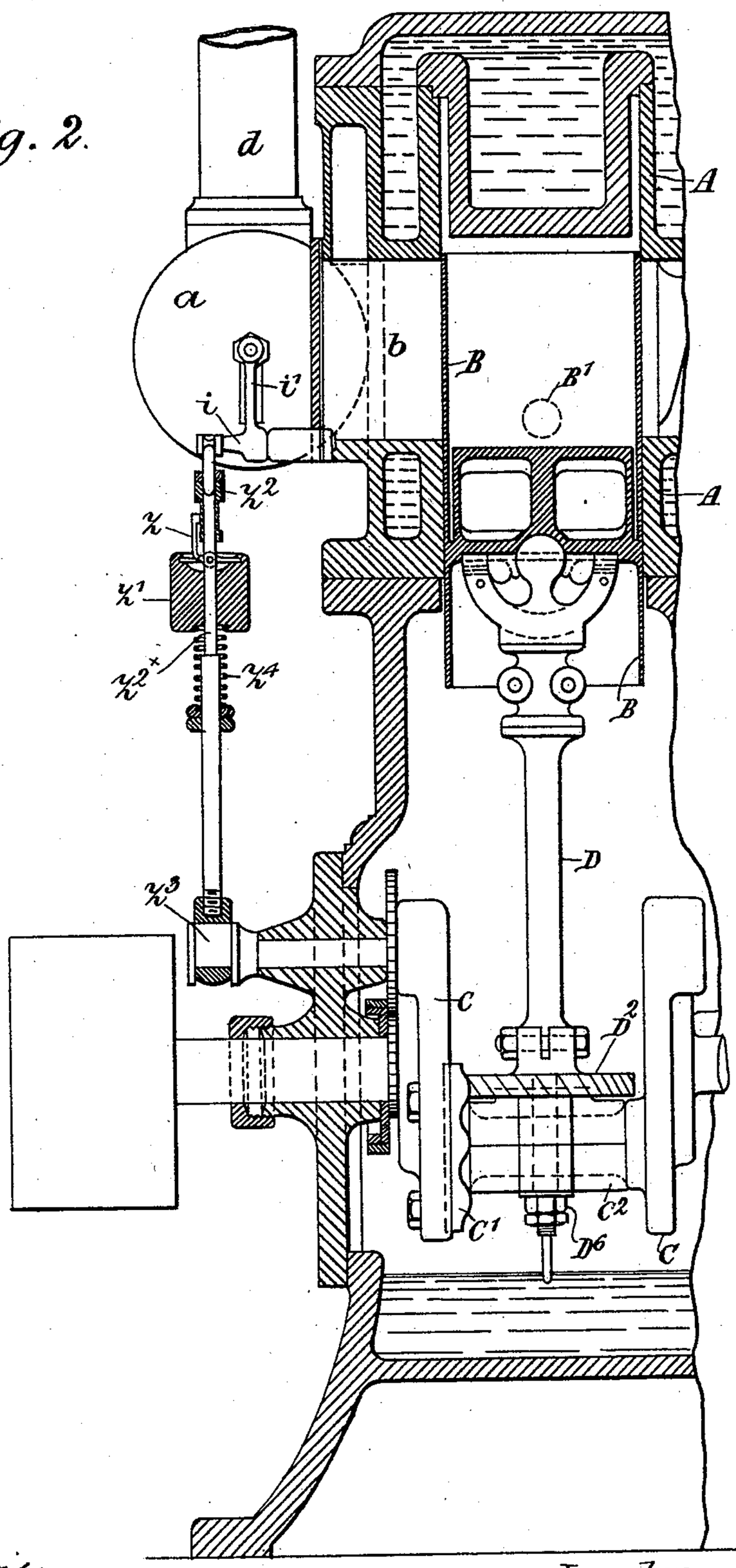
Fig. 2.



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(No Model.) 5 Sheets—Sheet 3.

H. T. DAWSON.

OIL OR GAS ENGINE.

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Fig. 9.

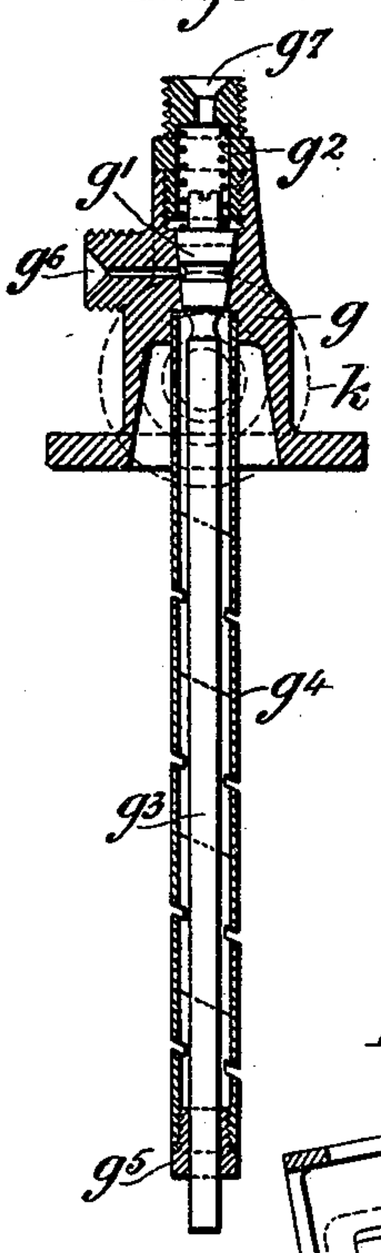


Fig. 10.

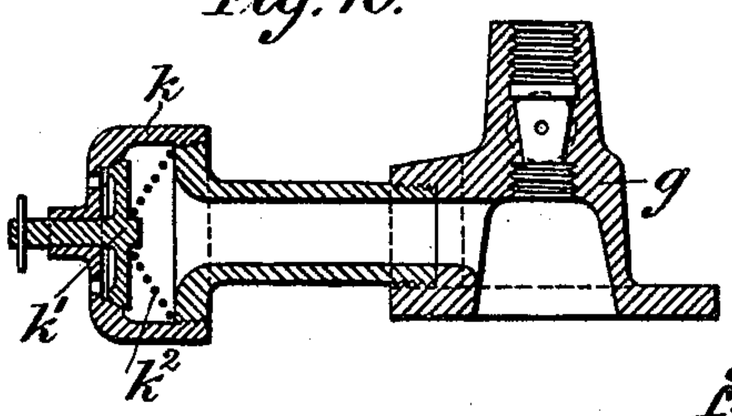


Fig. 6.

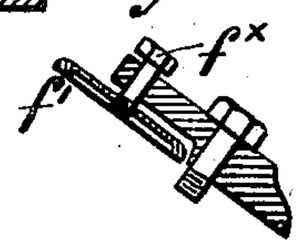


Fig. 4.

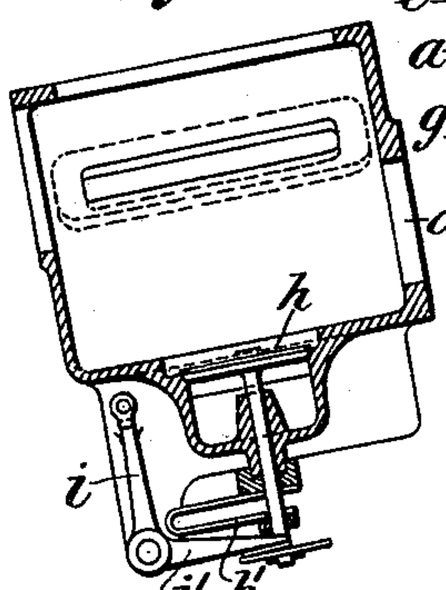


Fig. 3.

Fig. 8.

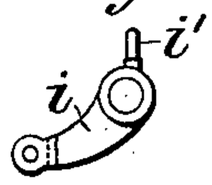


Fig. 5.

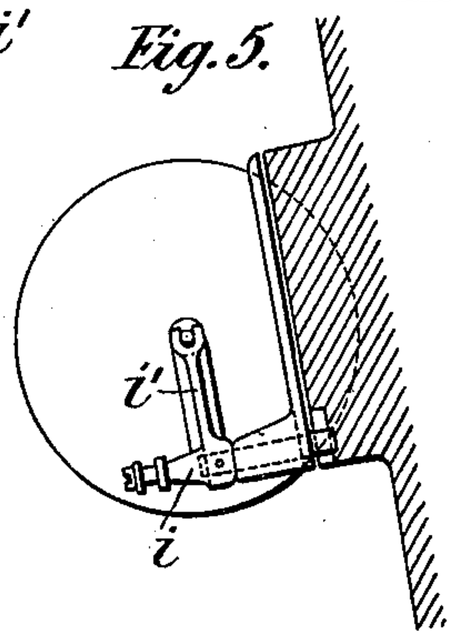
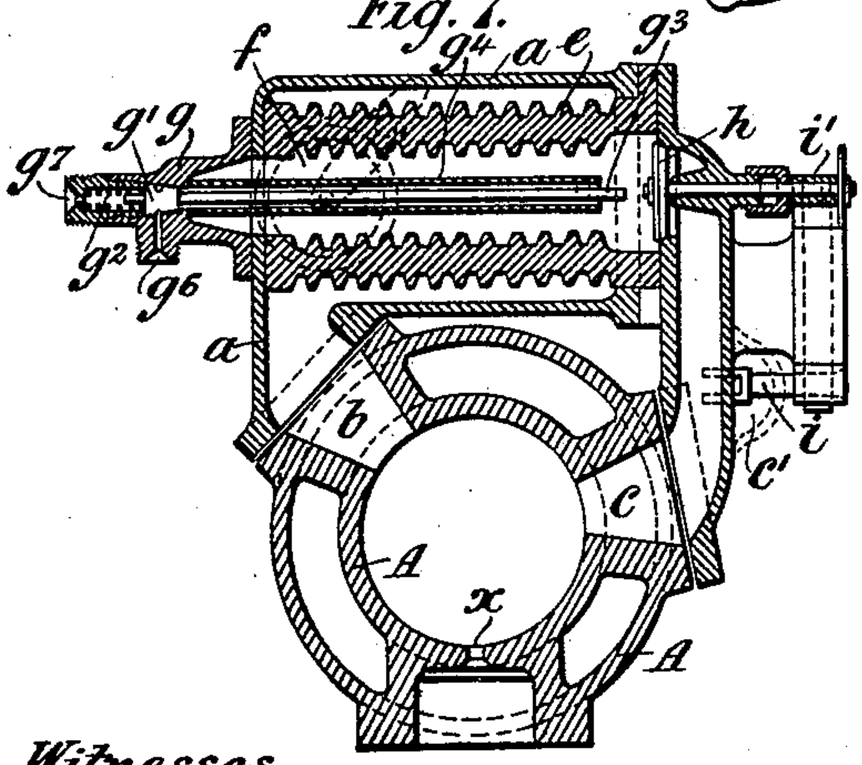


Fig. 7.



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H. T. DAWSON.

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Fig. 11.

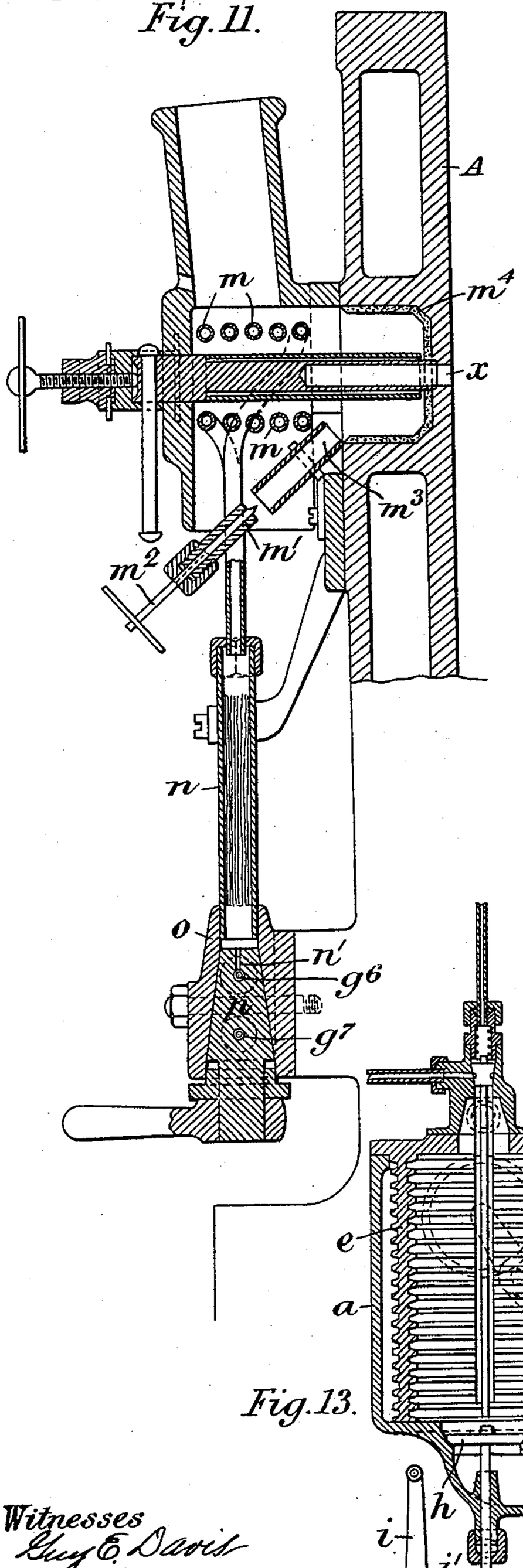

Fig. 12.

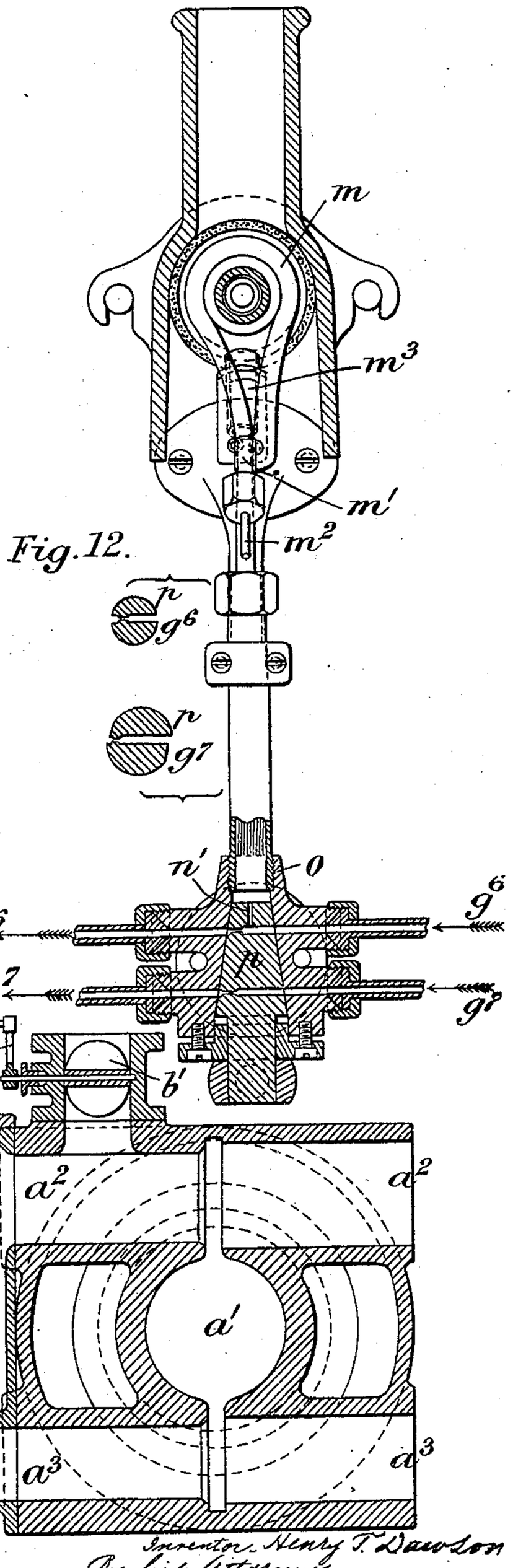

Fig. 13.

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OIL OR GAS ENGINE.

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Fig. 14.

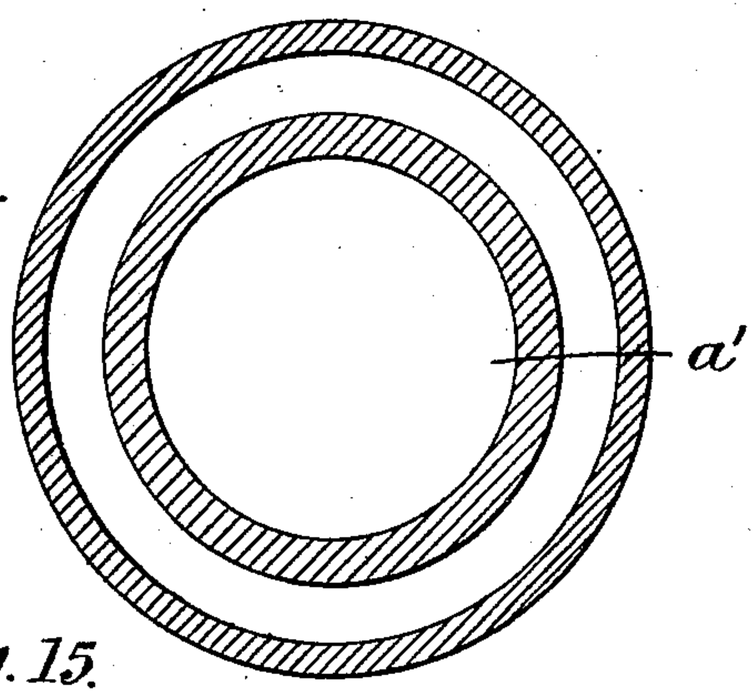


Fig. 15.

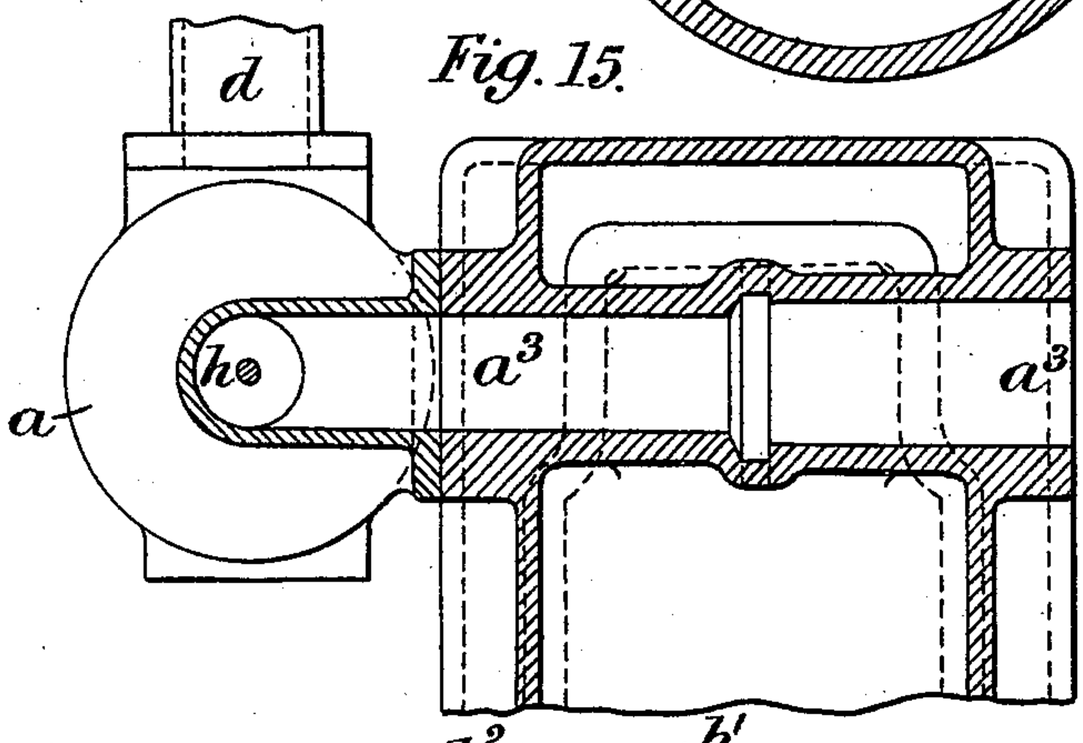


Fig. 17.

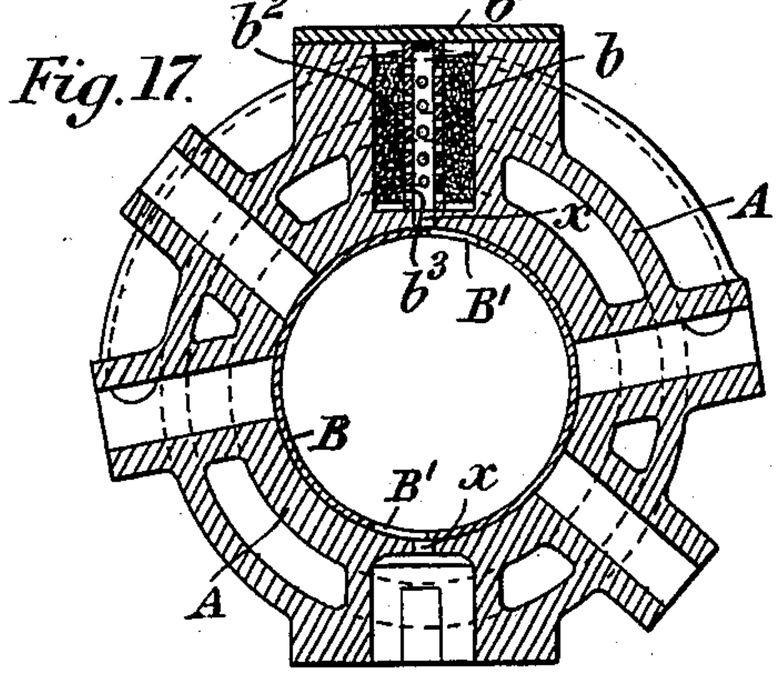
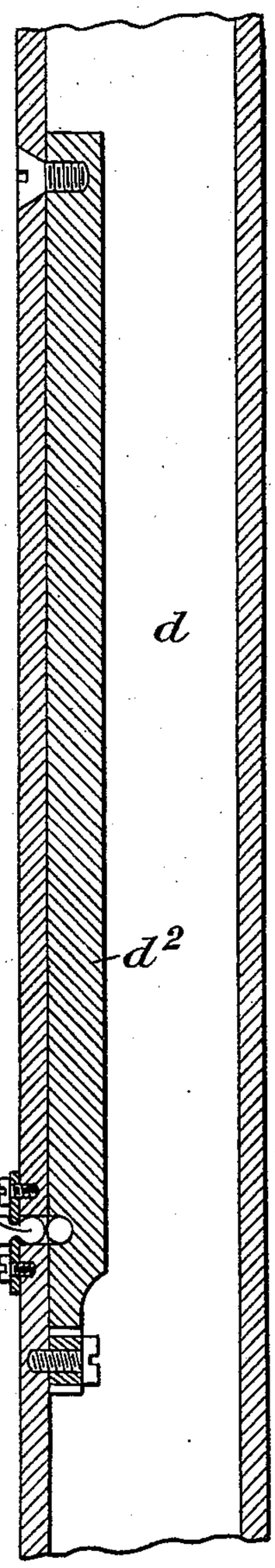


Fig. 16.



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UNITED STATES PATENT OFFICE.

HENRY T. DAWSON, OF LONDON, ENGLAND.

OIL OR GAS ENGINE.

SPECIFICATION forming part of Letters Patent No. 582,271, dated May 11, 1897.

Application filed March 9, 1896. Serial No. 582,424. (No model.)

To all whom it may concern:

Be it known that I, HENRY THOMAS DAWSON, gentleman, a subject of the Queen of Great Britain, residing at 157ª Manor Street, Clapham, London, in the county of Surrey, England, have invented certain new and useful Improvements in Oil or Gas Engines, of which the following is a specification.

One object of my invention is to enable engines which are constructed in such a manner that a revolving piston serves to control the opening and closing of the inlet and outlet ports of the cylinder, as described in the specification of my Patent No. 466,331, of January 5, 1892, to be worked with hydrocarbon oils, such as ordinary petroleum lamp-oils and similar fluids which require heating to produce a sufficiently combustible vapor for use, but the improvements are also partly applicable to other engines.

The drawings annexed show an engine having a revolving piston acting as inlet and outlet valves and adapted, as above described, for being worked with petroleum-oil vapor.

Figure 1 is a side elevation of the engine. Fig. 2 is a vertical section of parts of the same. Fig. 3 is a section in plan of the apparatus, taken through the center of the retort or oil-vaporizer, showing the method of its application to one of my double-ported revolving-piston gas-engines. Figs. 4, 5, and 6 are views and details taken at other angles. Fig. 7 shows the application of the vaporizing apparatus to a single-ported revolving-piston gas-engine. Fig. 8 is a view of the valve-lever of the vaporizing apparatus. Fig. 9 is the spray-valve in section to a larger scale, and Fig. 10 is the air-valve used in conjunction with the spray-valve. Fig. 11 is a section of the igniting apparatus, the igniting-tube being of the same construction as used in my revolving-piston gas-engines according to my Patent No. 466,331; and Fig. 12 is another view of the same. In Figs. 13, 14, and 15 some of my improvements are shown applied to an engine in which instead of the rotating piston other forms of valves for inlet and outlet of the working cylinder can be used. Fig. 13 is a horizontal section through the retort; Fig. 14, a horizontal section through the cylinder; Fig. 15, an elevation, partly in section, of the cylinder and retort. Fig. 16 shows to a larger scale the arrangement of the automatic outlet-valve b' for the exhaust with the apparatus for moving the same. Fig. 17 shows the arrangement of the supplementary igniter.

In Figs. 1 to 12 the same letters refer to the same parts.

A is the cylinder of the engine. *b* is an exhaust-port, and *c* an inlet-port, formed in its sides.

x are ignition-ports.

B is the piston, which moves to and fro in the cylinder, and is also rotated as described in the specification of my Patent No. 466,331. The piston is made as a long tube closed near the middle. It is made about twice the length of the stroke. The bore of the cylinder is in length about three times the length of the stroke. The ports in the sides of the cylinder are arranged about the middle of its length. There are also two ports B′, opposite to one another, formed through the tubular portion of the piston about the middle of its length. The ports in the piston are brought to coincide with the ports in the cylinder at the proper times by the piston being revolved as well as moved to and fro.

D is the connecting-rod. Its end revolves freely in bearings formed through the crank-brasses C^2 and is secured to them by the nuts D^6, which yet permit it to turn freely. The revolving movement of the piston is obtained by a worm or scroll C′, fixed upon the crank C, gearing into a wheel D^2, fixed upon the connecting-rod, which imparts its rotary motion to the piston, as fully described in the specification of my Patent No. 466,331.

I will now explain more fully the way in which a combustible mixture of heated air and oil-vapor is supplied to the cylinder of the engine.

a is a casing fixed upon exhaust-port *b* and extending toward admission-port *c*.

e is a retort contained within the vessel *a*. The retort is corrugated within and without, as shown. The hot gases from exhaust-port *b* flow around *e* and finally escape by the exhaust-pipe *d*, keeping the retort *e* at a proper heat during work. If the retort becomes too hot, some of the exhaust-gases are discharged

at the valve b', which is opened and closed automatically, as hereinafter described, so as to keep the retort at a proper heat.

f is an aperture underneath casing a.

f' is a cover by which the aperture can be closed. This cover is carried by a swing-bridge piece, as shown at Fig. 6, which allows of the cover being turned to one side and a lamp being placed below the retort to heat it when commencing.

g is a casing containing the spray-supply valve g', which is conical, of rather small taper, and fits well in its seat, being held thereto by spring g^2. The valve is furnished with a long pin or spindle g^3, which passes through and finally projects beyond a tube g^4, which tube itself passes through the center of the retort e. The tube g^4 is perforated by fine apertures or cuts, as shown, and where the rod g^3 emerges from the tube g^4 it passes through a closely-fitting bush g^5. The spray-valve g' has a groove around it, and into this groove opens the oil-passage g^6, while air under pressure enters at g^7 and bears against the outer end of the valve.

h is the outlet or delivery valve, through which the vapor passes to the admission-port of the engine. The valve h is held to its seat by the bent spring h', Fig. 4, and is opened at intervals by the engine through the medium of an inertia or other governor. The valve h is in such a position that its opening causes it to press upon the pin g^3, and thus open the spray-valve g' when valve h has opened to nearly its full extent.

The spindle of the valve h is coupled to one arm i' of a lever, the other arm i of which is acted upon by the governor.

In Figs. 1 and 2 I have shown an inertia-governor used for opening and closing the valve h. This governor is composed of a telescopic rod z^2 $z^{2\times}$, the upper half z^2 of which is jointed to the lever-arm i, while the lower half $z^{2\times}$ is reciprocated to and fro by the engine. In the drawings it is shown as being reciprocated to and fro by a crank or eccentric z^3, which is caused to make one revolution for every two revolutions of the crank-shaft of the engine. z is a lever-catch jointed to the rod $z^{2\times}$. One arm engages with the rod z^2 and when the rod $z^{2\times}$ is drawn downward draws down the rod z^2 with it so long as the speed of the engine is not excessive. The other arm of the lever-catch is coupled to a weight z', which can slide to and fro along the rod $z^{2\times}$ and is attached to a collar on this rod by a coiled spring z^4. So long as the speed is not excessive the weight is reciprocated to and fro, together with the rod $z^{2\times}$, the coiled spring maintaining it in such a position relatively to the rod that on each of the downstrokes of the rod $z^{2\times}$ the catch z engages with the rod z^2 and draws it also downward, and so causes the valve h to be opened. When the speed of the engine exceeds the speed desired, the reciprocating movements of the weight lag behind those of the rod $z^{2\times}$, and consequently the catch z is then held in such a position that on the downstroke of the rod $z^{2\times}$ the catch z does not engage with and draw down the rod z, and the valve h remains unopened.

The oil-valve casing g has standing out from it an air-valve casing k, which contains an air-inlet valve k', held to its seat by a light spring k^2.

l, Fig. 1, is a vessel containing oil maintained under pressure by an air-pump fitted to the engine, and when the engine is not at work the pressure is retained by the double stop-cock l', a pipe from which dips into the oil in the vessel.

The igniting apparatus, Figs. 11 and 12, is constructed, so far as the igniting-tube itself is concerned, according to my Patent No. 466,331, but to adapt it for heating by petroleum-oils the apparatus now to be described is used. m is a coil of tube loosely surrounding part of the igniting-tube and its spring plug-holder. The tube m terminates at one end in the fine jet m', furnished with the pricker or scavenger m^2, both for adjusting its delivery and keeping the jet free from slight deposit. The heat of the vapor is adjusted by the number of turns in the coil m. The tube m terminates at its other end in a larger tube n, which is filled with porous or fibrous material and acts as a filter, and the tube n is fitted upon a compound cock o. It should be noted that while the pipes leading from the cock l', Fig. 1, are shown for clearness directly entering the spray-valve casing g, before doing so in practice they pass through the compound cock o, fixed upon the engine, the oil entering and leaving by g^6 and the air under pressure by g^7. It will be noticed that the passages are contracted to very small diameters in the plug of the cock o, so that when the cock is full open the engine just gets the required amounts of oil and air. The passages in the cock-plug are furnished with small cuts or widenings, as shown at p, Fig. 12, so that the first movement of the cock from close shut lets oil under pressure into the passage n', but no farther, past the plug. The next movement of the handle lets air under pressure pass through g^7, and the final movement when full open, as shown, lets oil pass through all the upper passages g^6 and n' and air through the passages g^7.

m^3 is an injector-tube which causes more air to enter the furnace and intensifies the heat ensuing.

m^4 is non-conducting material lining the surface cavity.

At Fig. 17 is shown the supplementary igniter. This is constructed of a cavity b in the cylinder-walls situated exactly opposite to the externally-heated tube-igniter in order that this cavity may be opened to the cylinder just at the same time as the tube-igniter.

The cavity is covered by a gas-tight cover b' and contains broken refractory material b^2, such as fire-clay, through which passes an earthenware or metal tube b^3 well perforated, as shown. The heat of the explosions when the engine is working enters this igniter and heats it to a red heat without attention, and when it is thus heated it is unnecessary to continue to heat externally the other igniter-tube.

The action of the whole apparatus is as follows: The stop-cock l' on the oil vessel being first opened and a proper pressure existing therein the coil of the tube m and parts adjacent are then heated by a lamp or by burning a little cotton soaked in oil or spirit under it. When sufficiently heated, the cock o is moved about a twelfth of a turn to a mark upon its gland, and the vessel l being previously charged with oil under air-pressure the oil flows through n', through n, and into the coil m, where it is vaporized and issues in a jet at m', and rushing through the injector m^3 burns, when ignited, with a strong clear heat in the furnace-chamber, where it shortly heats the igniting-tube to the necessary degree, and if nothing else is done will maintain it so for a long period without attention. Next the aperture f under the casing a is opened and a flame from a lamp of usual construction allowed to play upon the retort e and adjacent parts until the vaporizing apparatus approaches a red heat. The aperture f is then closed and the cover fixed by the tightening-screw $f^{\times}$, Fig. 6. The cock o is then moved a further amount, as marked, which admits air under pressure to the spray-valve, and, as usually, a residue of oil remains in all the oil-passages and is enough to start with. A few turns of the fly-wheel will then start the engine, when the cock o may be gradually fully opened and the whole apparatus is then in action, and the engine runs until the oil is exhausted, the hot gases from the working cylinder keeping the retort and adjacent parts at the proper heat. If the proper speed is exceeded, the governor fails to open the admission-valve h, and therefore the spray-valve g', so that no oil enters the retort e and no vapor leaves it until the speed falls and the valves act again. The air and oil under pressure after passing through the spray-valve g' pass along the tube g^4 and out at the fine cuts and are thrown in fine spray directly upon the corrugated interior of the hot retort e. Air entering the valve k by the suction of the engine helps to carry the vapor forward to the admission-port, where more air is added, and the whole finally enters the cylinder in a well-mixed and proper condition for working. If the engine is of the double-port class, the last addition of air is made by the same air-passage entering the admission-ports as if used for a gas-engine, while if the engine is of the single-port kind the final air admission is made by an aperture at c', Fig. 7, and its amount is adjusted by partially covering the entrances or by other means.

In Figs. 13, 14, and 15, a' is the cylinder of the engine, a^2 is the passage leading from the exhaust-valve, and a^3 is the passage leading to the inlet-ports. The hot gases from the cylinder enter the casing a by the passage a^2, and the oil-vapor and heated air from the retort e, after passing through the valve h, enter the cylinder by the passage a^3. The cylinder-valves are not shown in this figure, but may be lift or other valves of any ordinary construction.

Fig. 16 shows to a larger scale the arrangement of the automatic outlet-valve b' for the exhaust with the apparatus for moving the same. The valve b' has a short lever b^2 upon its axis, and this is connected by an adjustable rod b^3 to the longer arm of the lever b^4, whose fulcrum is at d' in the metal of the exhaust-pipe. The shorter arm of b^4 engages with one end of a brass rod d^2, whose other end is firmly fixed to the exhaust-pipe. Other mechanical equivalents of this arrangement may be used.

Should more heat pass through the casing a and around the retort than is needful to keep the retort at a proper temperature, the brass rod d^2 in the exhaust-pipe d expands and, acting upon the shorter arm of the lever b^4, opens more or less the valve b', and thus allows some of the hot exhaust-gases to escape without passing around the retort, thereby checking its tendency to reach an undue temperature.

What I claim is—

1. The combination of the engine-cylinder, a retort in close proximity thereto, a casing surrounding the retort, through which the heated exhaust-gases from the cylinder pass, an inlet-valve at one end of the retort for admitting to it oil and air under pressure, an outlet-valve at the other end of the retort for allowing heated air and oil-vapor to pass therefrom to the cylinder, a governor controlling said valve, one of said valves at the opposite ends of the retort being formed with a long stem which extends nearly to the other valve so that when the governor allows the outlet-valve to be opened at the proper time, the inlet-valve is opened also, but if the outlet-valve remains closed the inlet-valve remains also closed.

2. The combination of the engine-cylinder having a reciprocating piston which is also rotated to open and close at the proper times inlet and outlet ports formed in the sides of the cylinder, a casing fixed at one side of and close to the cylinder, a retort passing through the casing, a communication between the exhaust-port of the engine and the chamber surrounding the retort, an inlet-valve at one end of the retort for the admission of oil and air to the interior of the retort, a valve at the other end of the retort for controlling the pas-

sage of the heated oil and air or vapor from the retort to the engine-cylinder and means for operating the valves to supply oil to the retort in separate quantities stroke by stroke, thus supplying a charge of oil to the retort each time that a charge of vapor is withdrawn therefrom.

3. A hydrocarbon or oil engine provided with a retort arranged in a chamber communicating with the exhaust port or ports of the engine, and having an outlet passage or chimney, an inlet-valve for the admission of the hydrocarbon to the interior of the retort, an outlet-valve controlling the passage of the heated vapor from the retort to the cylinder, and means for operating the valves to supply oil to the retort in separate quantities stroke by stroke, thus supplying a charge of oil to the retort each time that a charge of vapor is withdrawn therefrom.

4. The combination of the engine-cylinder, the retort, the valve-casing, the valve fitting into a corresponding seat formed in the casing, the annular groove or oil-passage around the sides of the valve or in its seat to which oil under pressure is supplied, and an air-port above the valve, substantially as described.

5. The combination of the retort, the perforated spraying-tube passing within it, the valve for admitting oil and air to the spraying-tube fitted into a corresponding seat, and the groove around the valve or its side into which oil under pressure is supplied while air under pressure is admitted to the outer end of the valve, substantially as described.

6. The combination of the retort or vaporizer corrugated or furnished with ridges both on its interior and its exterior, the inlet-valve and its seat at one end of the retort for admitting oil and air, and the perforated tube extending from the valve-seat into the retort for spraying oil upon its corrugated internal surface, substantially as described.

7. The combination of the heated retort fitted with an oil and air admission valve at one end, and an outlet-valve at the opposite end for the heated air and vapor, and a self-closing air-inlet valve for the admission of a further supply of air to the inlet end of the retort, substantially as described.

8. The combination of the retort, the inlet-valve for oil and air at one end, the outlet-valve at the other end, the perforated tube extending into the retort from the inlet-valve, the long valve-stem extending through the perforated tube from one valve nearly to the other so that the outlet-valve being opened also opens the inlet-valve, substantially as described.

9. The combination of the retort having its sides and ends closed, and its sides corrugated or furnished with ridges both on the exterior and interior, a valve for admitting oil and air at one end, an outlet-valve at the opposite end, and the long valve-stem extending from one valve nearly to the other, substantially as described.

10. The combination of the ignition-tube, the chamber containing it, the nozzle from which a flame is directed against the ignition-tube, the coil of tubes supplying oil-vapor from one end to the nozzle at the other end connected to a tube containing filtering material, and the reservoir containing oil and in which a pressure of air is also maintained from which oil is supplied to the tube containing the filtering material.

11. The combination of the engine-cylinder, the casing communicating with the exhaust-port thereof, a retort within the casing, a communication between the combustion-chamber of the engine and the interior of the retort, a valve controlling the communication between the combustion-chamber and the retort, a governor for regulating the valve, an inlet-valve and a tube extending from the valve into the retort perforated for the greater part of its length to discharge the hydrocarbon against the sides of the retort.

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