(No Model.)

2 Sheets—Sheet 1.

H. T. DAWSON.

GAS ENGINE.

No. 513,486. Patented Jan. 30, 1894.

Fig. 1.

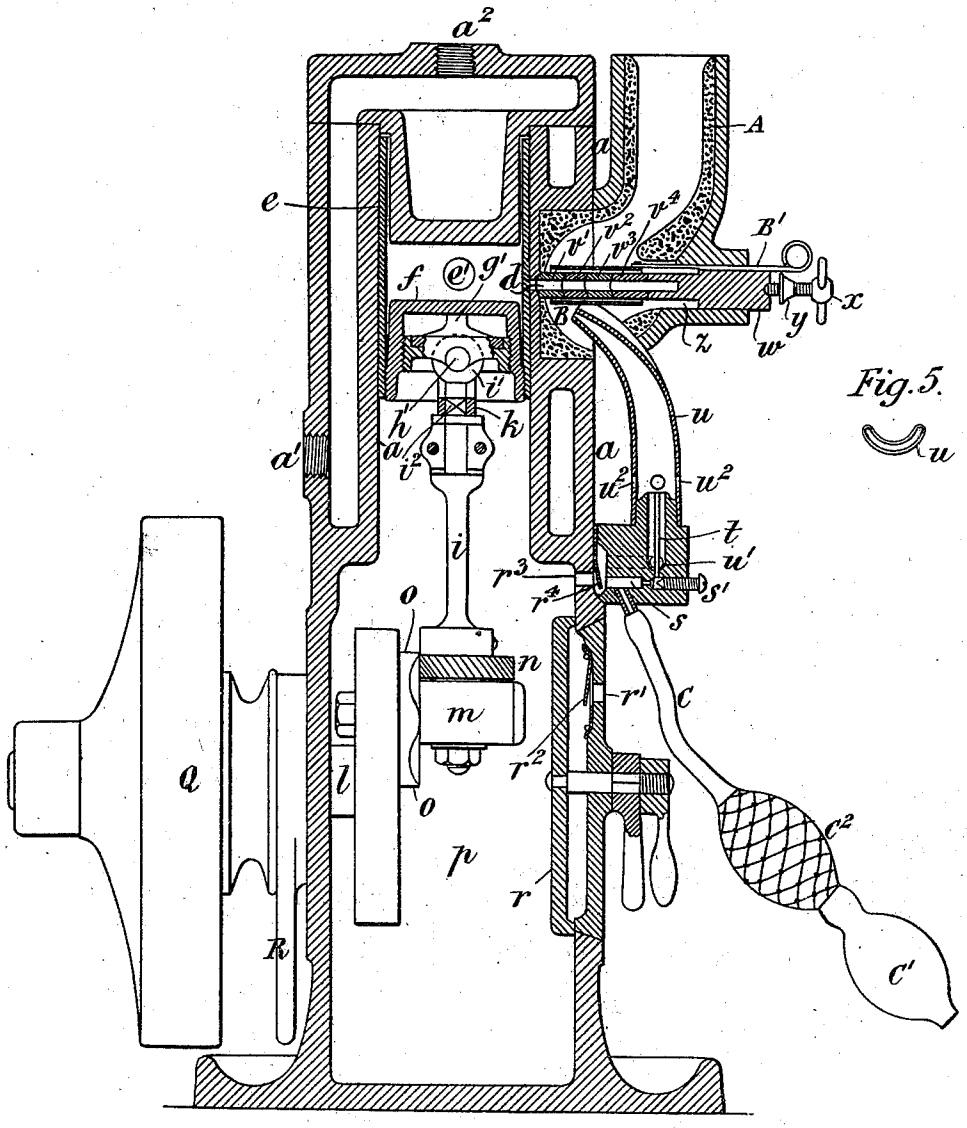

Fig. 5.

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(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

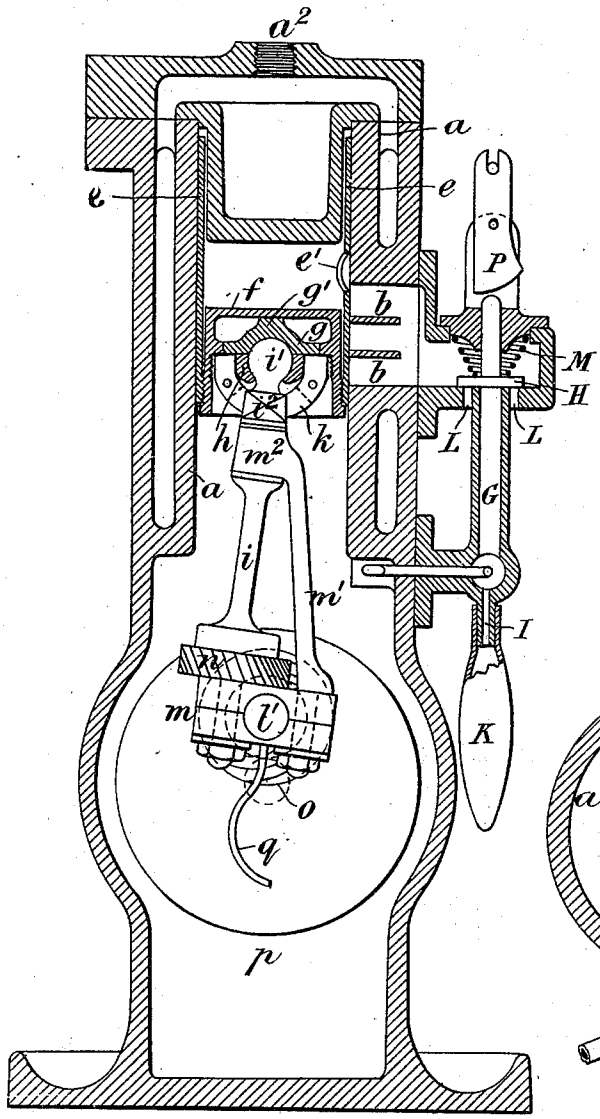


Fig. 3.

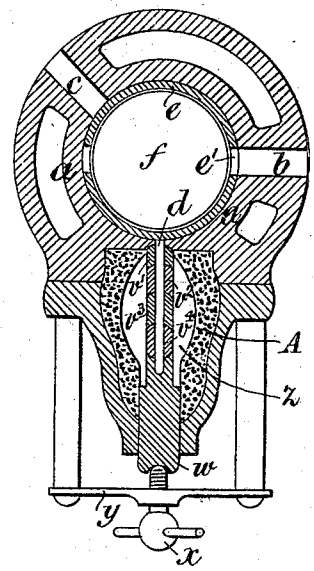
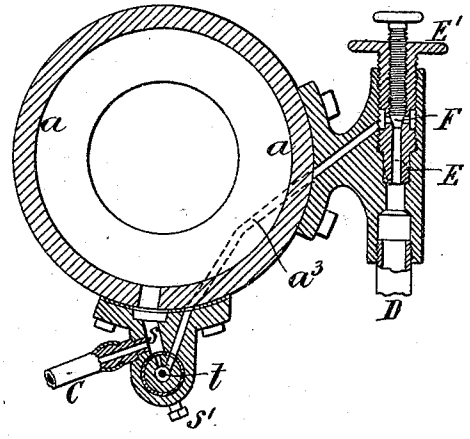


Fig. 4.



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UNITED STATES PATENT OFFICE.

HENRY THOMAS DAWSON, OF SALCOMBE, ENGLAND.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 513,486, dated January 30, 1894.

Application filed April 24, 1893. Serial No. 471,630. (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 Salcombe, in the county of Devon, England, have invented certain new and useful Improvements in Gas-Engines, of which the following is a specification.

This invention has for its object improvements in a gas engine such as is described in the specification of my former Patent No. 466,331, that is to say in an engine in which the piston rotates as well as reciprocates within the cylinder and by passing over passages in the walls of the cylinder controls the admission of the inflammable mixture of gas and air, the ignition of the same and the expulsion of the products of combustion. By my improvements the part of the piston which is exposed to the highest temperature is left free to expand and the heat generated by the combustion in the cylinder is more effectually prevented from reaching the lubricated parts. Also by my improvements the impulse given by the combustion of the gaseous charge in the cylinder is more directly transmitted to the connecting rod and crank.

My invention also comprises improvements in the ignition apparatus by which it is rendered more certain in its action and less liable to injury.

My improvements also relate to obtaining a blast of air to urge the flame by which the tube or capsule which fires the charge is maintained at a sufficiently elevated temperature.

In order that my invention may be fully understood I will proceed to describe the drawings annexed.

In the drawings, Figures 1 and 2 are vertical sections of an engine in accordance with my invention. Figs. 3 and 4 are horizontal sections. Fig. 5 shows a detail.

a is the cylinder which receives the charge of gas and air and within which the charge is ignited. This cylinder is water jacketed to prevent it from becoming over-heated; the water inlet is at a' and the exit at a^2. Through the walls of the cylinder there are passages as is described in full detail in my former specification, No. 466,331; the gas and air inlet is seen at *b*, the exit at *c* and the firing port at *d*.

e is the piston tube and *f* the piston. The piston tube has two ports in it at e' which in the working of the engine and in successive strokes pass first over the inlet *b*, the firing port *d*, and the exit *c*. The piston *f* is in the form of an inverted cup; it is secured to the lower end of the piston tube *e* and it extends upward within it just out of contact with the tube. By this arrangement the head of the piston which is exposed to high temperature is free to expand and is not confined by the walls of the cylinder while its lower end is so protected that it remains comparatively cool as also does the piston tube in consequence of the cooling influence of the water jacket. Within the piston *f* is inserted the upper part *g* of the ball bearing for the connecting rod; it has a projection g' which abuts centrally upon the under side of the head of the piston and conveys the impulse which the piston receives from the combustion of the charge, direct to the upper end of the connecting rod; nevertheless the projection being of comparatively small sectional area does not conduct so much heat from the piston to the ball bearing as to interfere with the effectual lubrication of the joint. The under part *h* of the ball bearing is in two parts joined together. It is screwed into the piston and suitably secured; it serves also to hold the part *g* in its place.

h' h' are trunnions in the part *h*.

i is a part of the connecting rod. *i* is the ball at its upper end concentric with the trunnions h'.

k is a semi-circular strap hung by the trunnions. It is made in parts to admit of its being conveniently fixed and it has two parallel side bars. The part of the connecting rod at i^2 is flat and fits between the bars of the strap *k* so that although it can swing to and fro between the bars it cannot rotate without carrying round with it the part *k* and also the piston and piston tube.

l is the crank axis and l' the crank pin; the latter is received into a bearing *m*.

m' is the part of the connecting rod which

is fast with the bearing m. At its upper end there is a collar m^2 in which the part i of the connecting rod is held and is able to turn. At the lower end of the part i it is stepped into a socket prepared for it in the bearing m and it has upon it a toothed wheel n which when adjusted in position is locked fast. The wheel n engages with a ring of teeth o fixed upon the cheek of the crank so that when the crank shaft revolves the part i rotates in the collar m^2. If I have but one port in the piston tube e, namely the port e', the gear is such that the crank shaft makes two rotations for one of the part i; but if as I prefer there be two ports in the piston tube e diametrically opposite to each other, it is necessary only to rotate the part i once in four rotations of the crank shaft, the two ports e' then acting alternately. The crank chamber p is partially filled with oil and as the crank revolves a bent tube q dips into the oil; thus the oil is scooped up and it is conveyed to the bearing m; it enters by a perforation in the lower brass and is distributed by grooves or channels in the brass in the usual way. The crank chamber is closed air tight by a cover r. When the piston descends it compresses the air in the chamber p and when the piston rises it rarefies the air. I avail myself of this circumstance to obtain a blast of air; I provide an inlet to the chamber at r' by a valve r^2 and an outlet at r^3 by a valve r^4. Air is consequently pumped through the passage s past the regulating screw s' and up the blow pipe t which is set in the base of a Bunsen burner u. This burner serves to heat the ignition tube which I form in several separate rings v' v^2 v^3 v^4; they are preferably of porcelain. The object in making the ignition tube in short rings is to lessen the risk of breakage on the application of heat. The innermost ring abuts on a seating formed in the side of the cylinder a around the ignition port and the other rings fit against the first, end to end. The series terminates in a block w which may be of cast-iron and the screw x presses this block forward. The screw passes through a tapped hole in the spring blade y which is held fast to the cylinder by its two ends. Thus by turning the screw x the pressure on the tube sections is readily adjusted so as to be sufficient to hold them in place but nevertheless allowing of expansion and contraction with variation of temperature. The ignition tube is contained within a small furnace chamber z fixed against the side of the cylinder a and lined with refractory material A. The burner u is curved so as to direct the flame especially upon the end of the ignition tube which is next the cylinder and the mouth of the burner tube is made semi-circular as is shown at Fig. 5 so that it partially embraces the ignition tube which thus becomes enveloped in the flame issuing from the mouth of the burner.

Around the ignition tube there is a tubular shield B which may be of metal or earthenware. It is intended to prevent breakage of the ignition tube by the too sudden and irregular application of heat when the flame is first applied. This precaution is very necessary if a porcelain ignition tube made in a single piece be employed. When the ignition tube is hot the shield may be drawn back as there is then little risk in exposing the tube to direct contact with the flame. As represented in the drawings the shield is provided with a stem B′ which carries it; the stem passes through a passage in the block w in which it can be slid endwise.

Gas is supplied to the burner u at u' and air is admitted at u^2 u^2. The blast of air through the blow pipe t causes a rapid indraft of gas and air into the burner and a vivid combustion is maintained. To start the engine the india rubber air pump C C′ C² of well known construction is provided; by alternately compressing with the hand and releasing the ball C′ of this air pump a current of air is propelled through the blow pipe t. The elastic ball C² serves as a regulator to render the blast more uniform and it operates to this end both when the hand pump is used and when the gas engine is running. The gas is admitted by the pipe D, which connects with the valves E and F. E is the main valve. When it is removed from its seat by turning the hand wheel E′ on the valve of which it forms a part, the gas passes by the passage G to the admission valve H. It also passes by the passage I into the elastic bag K which serves to render the pressure more uniform. The admission valve H lifts, when, in the working of the engine, a partial vacuum is formed in the cylinder a. Air at the same time enters by the passages L L. The spring M renders the closing of the valve sufficiently rapid. The supply of gas to the furnace of the ignition apparatus is regulated by the small screw valve F which has its seat in the main valve E. There is a passage bored in the main valve which allows gas to pass to the second valve F thence to a side passage and then into a duct a^3 formed in the walls of the cylinder a. In this way the gas to supply the Bunsen burner reaches the orifice u' and it passes up around the blow pipe t into the burner.

The driving pulley Q is not fast on the crank shaft but is connected by a friction clutch. The clutch is brought into operation when work is required by pulling a string attached to the clutch lever R overcoming a spring which draws it back.

The lift of the admission valve H is regulated by a cam lever P; a spring holds it in the position in which the drawings represent it, that is to say allowing very little lift of the valve, sufficient only to allow the engine to run when not loaded.

When work is required of the engine a string is pulled by the operator and the cam lever P is moved more or less as may be required. These are convenient arrangements

for putting the load on and off in the case of small engines such as drive sewing machines and the like, but they may be varied.

What I claim is—

1. In a gas engine in which the admission of the charge and the exit of the products of combustion are controlled by a piston and piston tube revolving as well as reciprocating within the cylinder; the combination of the piston tube, the cup like piston attached to the piston tube by the rim or outer end, the joint for the connecting rod within the cup like piston and a projection or stud on the upper part of the joint and abutting on the under side of the piston for the transmission of the impulse from the piston to the connecting rod.

2. In a gas engine, the combination of the cylinder, its piston, a crank shaft operatively connected with the piston, an inclosed crank chamber provided with inlet and outlet valves, a furnace chamber containing an ignition tube, a Bunsen burner projecting into the furnace chamber and having ports for drawing in air from the atmosphere, a gas pipe for supplying gas to the Bunsen burner, and a connecting passage between the Bunsen burner, and the inclosed crank chamber, the organization being such that the blast of air is supplied from the crank chamber to the Bunsen burner.

3. In a gas engine, the combination of the ignition tube, or capsule, the furnace chamber in which the ignition tube is inclosed, a Bunsen burner projecting into the furnace chamber outside the ignition tube, a blast pipe urging gas and air through the burner, a compressible ball connected to passages leading to the burner, and acting as a pump to force air through the blast pipe.

4. The combination of the ignition tube or capsule, the furnace chamber within which the ignition tube is inclosed, the Bunsen burner within the furnace chamber, and arranged to deliver a flame upon the outside of the ignition tube, means for supplying gas and air to the burner, and a compressible ball acting as an air pump connected with the burner for forcing air through the blast pipe.

5. The combination of the ignition tube or capsule abutting upon a seat around the ignition port in the side of the engine cylinder, the furnace chamber inclosing the ignition tube or capsule, the Bunsen burner within the furnace chamber, and acting upon the outside of the tube, and a blast pipe delivering a blast of air into the Bunsen burner and urging a current of gas and air through it.

6. The combination of the ignition tube or capsule, the furnace chamber within which it is arranged, the Bunsen burner having a semicircular mouth partially surrounding the end of the ignition tube.

7. The ignition tube or capsule herein described, comprising a series of rings abutting the one on the other end to end, and held in contact by spring pressure.

8. The combination with the ignition tube or capsule of a jacket around it protecting the ignition tube or capsule from contact with the flame by which the same is externally heated.

9. The combination with the ignition tube or capsule, of a movable jacket capable of being so placed as to protect the ignition tube or capsule from contact with flame and of being withdrawn to allow the flame to play directly upon the exterior of the igniting tube or capsule.

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