S. PERRY.

MANNER OF CONSTRUCTING AN INFLAMMABLE GAS OR VAPOR ENGINE.

No. 3,597. Patented May 25, 1844.

Fig: 3.

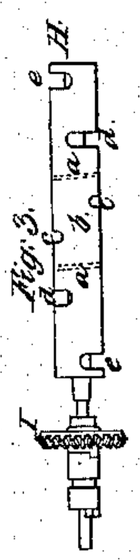


Fig: 2.

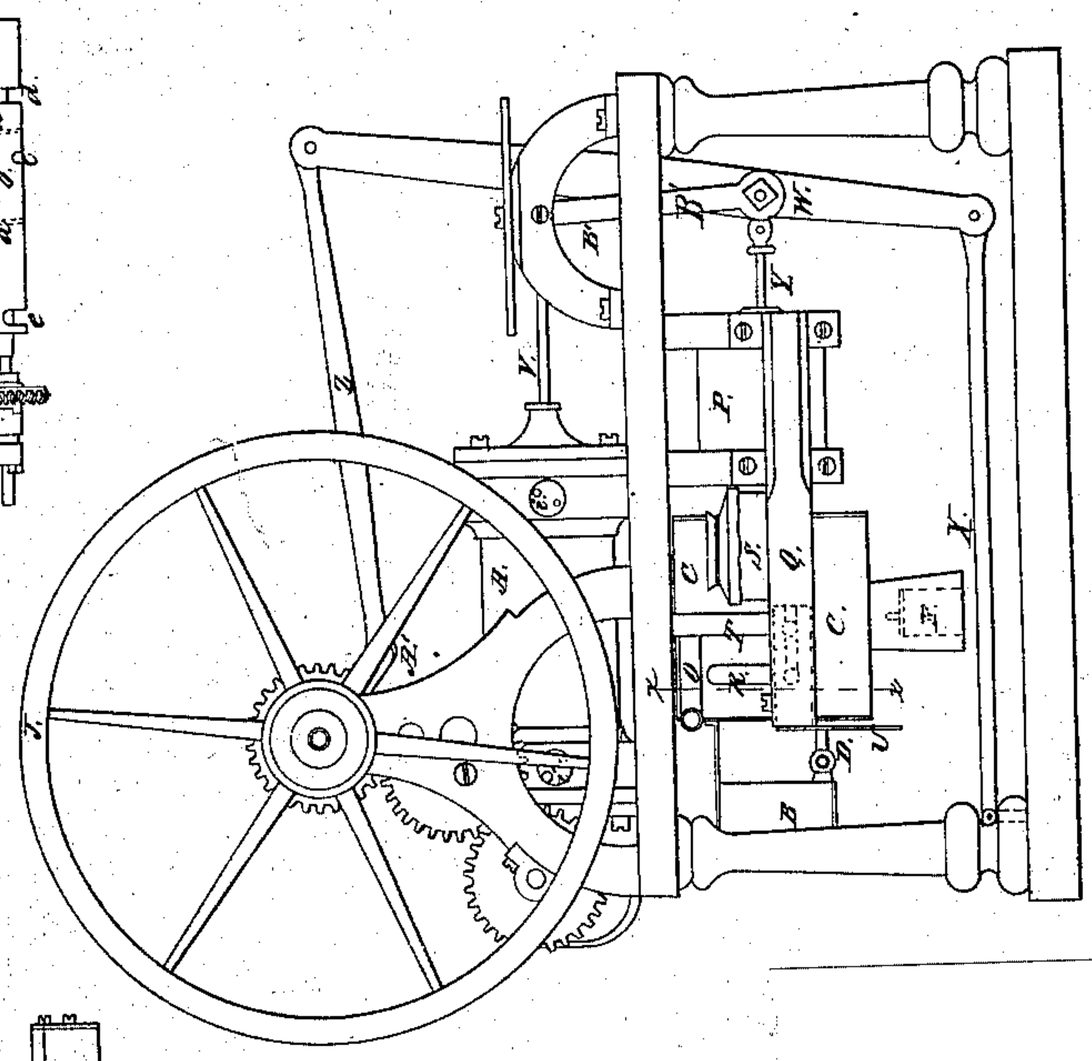


Fig: 5.

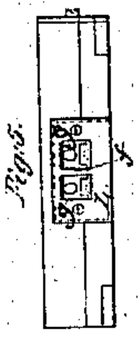


Fig: 4.

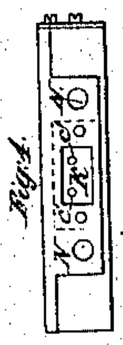
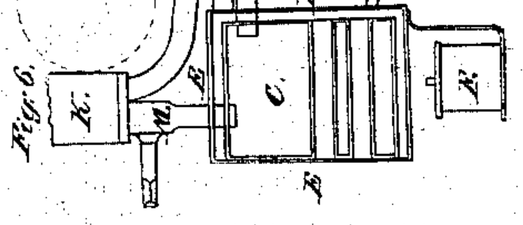


Fig: 1.

Fig: 6.



THE NORRIS PETERS CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

STUART PERRY, OF NEWPORT, NEW YORK.

IMPROVEMENT IN THE ENGINE TO BE OPERATED BY THE EXPLOSIVE MIXTURES OF INFLAMMABLE GASES OR VAPORS.

Specification forming part of Letters Patent No. **3,597**, dated May 25, 1844.

To all whom it may concern:

Be it known that I, STUART PERRY, of Newport, in the county of Herkimer and State of New York, have invented certain new and useful Improvements in the Manner of Constructing an Inflammable Gas or Vapor Engine; and I do hereby declare that the following is a full and exact description thereof.

In my inflammable gas or vapor engine the power which is to be obtained from it for the driving of machinery is to be produced by the expansion consequent upon the combustion of the vapor of spirits of turpentine or of other evaporable inflammable liquids, or of gas or vapor, or gas and vapor combined, obtained from undistilled turpentine, or from rosin or such other substances as will produce inflammable vapor, carbureted hydrogen, or other inflammable air by the aid of atmospheric air within a cylinder similar to that used in the steam-engine. It is well known to engineers that various attempts have been made to generate power by the combustion of explosive compounds within a cylinder, the expansive force of such compounds when ignited being in some cases allowed to act directly upon a piston, while in other cases the compounds have been exploded for the purpose of obtaining a vacuum into which the piston might be forced by pressure induced on the opposite side of it; but such attempts have not resulted in the production of a machine which could be practically used with advantage. In my engine, however, I have, as I verily believe, fully succeeded in obtaining a large amount of power more economically than in the ordinary steam-engine and under an arrangement of parts, which renders it readily manageable, employing, as above indicated, the expansive force of the ignited compound to operate upon the piston.

In the accompanying drawings, Figure 1 is a perspective representation of my machine, and Fig. 2 an elevation of that side of it not shown in Fig. 1. The other figures show in detail certain parts to be hereinafter fully explained.

In each of the figures where the same parts are represented they are designated by the same letters of reference.

A is the main cylinder, which is similar to that of the double-acting steam-engine.

B is a reservoir, which is to contain the spirits of turpentine, naphtha, or evaporable liquid the vapor of which is combustible; but this reservoir will not be used when the inflammable gases are employed, as the rosin or other substances from which this gas is obtained will require a vessel to which a higher degree of heat may be applied than is necessary for the simple evaporation of liquids, as is well understood. I will here remark, however, that it is my intention, in general, to use liquids of the above description instead of carbureted hydrogen, although this latter may be substituted by a slight change in the generating apparatus or wherever there are gas-works, in combination with my other improvements in the engine; but by the employment of the kind of liquids herein designated my engine may be applied to the purposes of locomotion and may be used, also, in other situations where the gaseous hydrocarburets are not readily obtainable. In describing my engine I shall therefore suppose the apparatus for generating the inflammable vapors to constitute a component part of it.

C is the vapor-generator, retort, or evaporating-vessel, into which a portion of the liquid contained in B is to be admitted through the connecting-tube D, which is governed by a cock. The retort C is shown as having tubular openings through it to increase its surface and as surrounded by a case E E, so as to leave a space between the two for the passage of heated air for warming the retort.

F is a small furnace, lamp, or other heating apparatus, which is placed under the center of the retort, where the outer case E is perforated to admit the heat directly to the bottom of the retort. This heating apparatus, although necessary in the commencement of the action of the machine, may be dispensed with afterward by allowing the heated air discharged from the cylinder to be brought into contact with the retort in a manner to be presently described, or the retort may be placed in contact with the main cylinder or so near to it as that the heat radiating therefrom will be communicated to the retort. This mode of heating it I have essayed and have found it efficient without using the heated air discharged from the interior of the cylinder.

G is a valve-box connected with the cylin-

der A, so as to give a supply of the combustible gas or vapor and of atmospheric air at each end of the cylinder alternately in the same manner in which steam is ordinarily applied in the steam-engine. Sliding or other valves constructed in known modes may be used in governing this supply, and as these are well known they do not require to be described; but as I have represented the revolving cylindrical valve in the drawings I will proceed to describe its particular construction.

The interior of the valve-box G, I make truly cylindrical, and into it I accurately fit a cylindrical tube H, Fig. 3, which is to revolve within the box. I is a bevel-wheel on its shaft, which is driven by gearing connected with the shaft of the fly-wheel J. The tube H is closed at its ends, and its interior is divided into three chambers by partitions. (Shown by the dotted line *a a*.) Into the middle chamber *b* there are two openings, (shown at *c c*,) and into each of the end chambers there are likewise two openings *d d* and *e e*. The tube H is represented in such a position as to show about one-half of each of these openings.

K is a chamber on the under side, and L one on the upper side, of the valve-box. M, Fig. 1, is a tube furnished with a cock and forming a communication between the retort and the lower chamber K for the passage of the vapor and air from the retort. From the chamber K there are two small openings *c' c'* corresponding with those marked *c c* in Fig. 3. The interior of this chamber is shown at K, Fig. 4. In the upper chamber L there is a partition dividing it into two parts, as shown at *f*, Fig. 5, and on each side of this partition there are two openings, one of which in each division is represented by dotted lines. These are covered by clapper-valves, which close them by their own gravity. These openings, like those in the lower chamber K, correspond with the openings *c c* in Fig. 1. The others (marked *g g*) lead into the air-passages opening into the two ends of the cylinder in the same manner with steamways. The openings *d d* and *e e* in Fig. 3 are exhaust-openings, *e e* admitting the residuary contents of the cylinder to pass alternately from the ends of the cylinder into the chambers between the partitions *a a* and the ends of the revolving tube H.

The tubes N N, Fig. 1, are exhaust-tubes leading from the exhaust-openings *d d* into the space which surrounds the retort. The air and vapor resulting from the combustion of the inflammable compound within the cylinder is highly heated, and as it passes through the above-named space it will communicate sufficient heat to the retort to evaporate the liquid admitted into it from the reservoir B, thus rendering the further use of the furnace or lamp F unnecessary. I have already mentioned that the heating of the retort after the engine is at work may be effected by placing the retort in contact with the cylinder. When this is done, its shape must be so altered as to adapt it to its situation. Its nature and operation will not be otherwise changed. The partition *f* in the upper valve-chamber and the clapper-valves, which close the openings in said chambers, serve to prevent the explosion or combustion of the inflammable compound in one end of the cylinder from extending beyond said partition, and immediately after such explosion has taken place the revolving valve-cylinder H will have passed around so far as to cut off all communication with the opposite end of the cylinder.

O, Fig. 2, is an escape-tube leading from the upper part of the space which surrounds the retort into a flue or elsewhere for conducting off the heated air and vapor after they have performed their office.

I have spoken above of the production of the ignitible vapor which is, in conjunction with the atmospheric air, to supply the combustible mixture in the cylinder, and I will now proceed to describe the manner of supplying the atmospheric air, which must be made to commingle with the gas or vapor.

P is the cylinder of a pump, which is intended to force atmospheric air into the retort. This pump is double-acting, having a valve in each end for the admission of air, and being in other respects constructed in a manner resembling that of many blowing-machines. The air from this pump passes through a trunk Q, Fig. 2.

R is an air-tube leading from the trunk Q into the retort. Within said retort there may be an agitator made to revolve by motion communicated to it from the current of air entering the retort and acting upon its wings in a manner well known for the purpose of intimately mixing the air and vapor, or the air may be made to enter the retort through numerous small openings for the same purpose. As the pressure of the air is to be nicely regulated, I place an air-regulator S upon the air-trunk, its sides being formed of leather or other elastic material, or it may be otherwise constructed in any of the well-known modes of forming such regulators. In the top of it there is a valve, through which the air escapes when the pressure becomes too great.

T is an air-tube leading from the air-trunk directly into the lower chamber K of the valve-box. The air from the pump P may be made to pass through either or in part through both of the tubes R and T, the openings into which tubes I have sometimes regulated by means of a revolving valve or conical key, like that of a cock within the trunk Q, of which valve U at the outer end of said trunk represents the handle, and by the turning of this handle one or other of the tubes may be closed, or they may both be left partially open. The quantity of atmospheric air entering the retort may thus be governed, or a portion of it may be carried immediately into the valve-box should it be desired to mix a

larger quantity thereof than usual with the vapor.

Fig. 6 is a vertical section from front to back through a part of the machine in the line *x x* of Fig. 2, showing the manner in which the air-tubes R and T enter the retort and the valve-box and convey the air from the trunk Q into them.

The piston of the main cylinder may be made solid and of metal. I prefer, however, to make it expanding in any of the modes used for that purpose. The drawings represent the manner in which I communicate motion from it to the fly-wheel and to the air-pump, which is as follows: The piston-rod V is jointed to a vibrating rod or bar W, which rod is at its lower end jointed to the vibrating rod X. To the rod W is also jointed the piston-rod Y of the air-pump, and from the upper end of the rod W the connecting rod or shackle Z extends to the crank A′ on the fly-wheel shaft. Jointed rods B′ serve to sustain the rod W in place and to preserve the parallelism of the piston-rods V and Y. The direction of the engine may be reversed by means of a clutch throwing either of the wheels I or I′ into gear with the wheel *h*.

In the various explosive or gas engines which have been constructed one of the greatest difficulties experienced in their management has been to obtain absolute certainty in igniting the explosive mixture, and without this such engines must be valueless. It has been usually attempted to effect this by drawing a portion of the flame into openings leading into the cylinder; but the result is in this case extremely uncertain, and that more especially when the inflammable vapors are used, the quantity of air drawn in with the flame appearing, manifestly, to interfere with the production of the intended combustion. The mode that I have adopted has completely obviated all difficulty in this particular, and is as follows:

By the combined use of the air-pump and air-regulator, and of the cocks which govern the admission of atmospheric air into the retort or into the valve-box, and of those which govern the admission of the inflammable liquid into the retort and the admission of the mixed air and vapor into the valve-box, I am enabled to adjust the quantity of each and the pressure within the cylinder with great precision. This pressure is but slightly to transcend that of the atmosphere. At each end of the cylinder there are openings governed by valves, through which openings the ignition is to be effected, and opposite to and nearly in contact with them is the flame of a burning lamp. The valves which close these openings are removed at a time a little after the crank has passed its dead-center—say when the piston has made about one-eighth of its stroke—and the cylinder has therefore about one-eighth of its capacity filled with the aeriform gaseous compound, there being then a slight excess of pressure above that of the external air. There will be a momentary jet of the ignitible mixture outward, and as the supply is at that instant cut off and the piston is traveling onward, there will be an immediate draft inward. As this is taking place the ignition will be effected with certainty, and the valve will then be closed. The ignition-openings are seen at *i i*, Fig. 2. The circular boxes, in which they are shown as being made, lead immediately into the cylinder, and as the piston passes back and forth it touches a projecting piece or pin, which opens the valve at the proper time, or the valve may be opened by its own gravity or by a slight spring and closed by the expansion consequent on the firing, the firing not taking place until the change of action is produced by cutting off the supply.

When in the construction of this engine the retort is placed in contact with or close to the cylinder, the cylinder is warmed thereby sufficiently to prevent a condensation of the vapor in setting the engine at work. If the retort is not thus placed, the cylinder must be warmed by other means.

I have found that the main cylinder by the continued operation of the machine is liable to become too highly heated. It is proper, therefore, to adopt means to prevent this, which may be effected in various ways. That which I prefer is to inclose the cylinder and its immediate appendages in a case, through which cold air may be blown by means of a rotary fan or other blowing apparatus, which may be operated by the engine in any convenient manner.

Having thus fully set forth the nature and operation of my improved inflammable gas or vapor engine, what I claim therein as new, and desire to secure by Letters Patent, is—

1. The manner in which I have combined and arranged the air-pump, the reservoir, the retort, the air-regulator, and the cocks which govern the admission of atmospheric air into the valve-box, and their immediate appendages, as above described, by which arrangement I am enabled to supply the inflammable vapor or gas in regulated proportions and to produce a pressure within the cylinder slightly exceeding that of the atmosphere at the moment of opening one of the ignition-orifices, which outward pressure is to be immediately succeeded by a draft inward, this being effected in the manner and for the purpose above described.

2. The manner set forth of heating the retort by employing the heated air, which escapes through the eduction-tubes, so as to render such air effective in converting the combustible fluid employed into vapor.

STUART PERRY.

Witnesses:
ROSWELL PLUMMER,
WM. H. DAVENPORT.