S. PERRY.

GAS ENGINE.

No. 4,800. Patented Oct. 7, 1846.

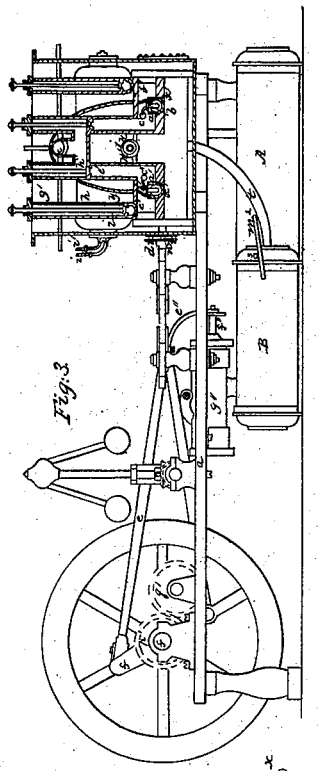

Fig. 3

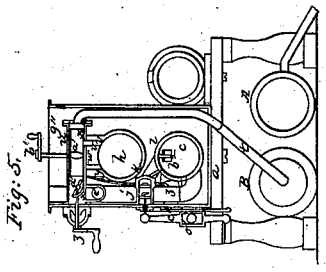

Fig. 5

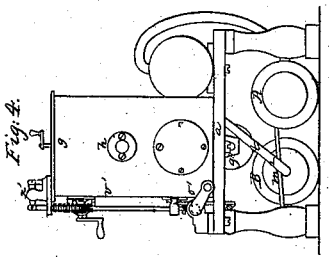

Fig. 4

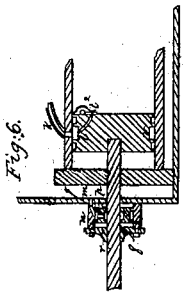

Fig. 6

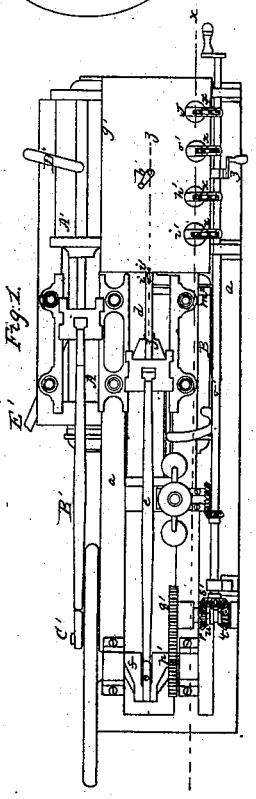

Fig. 7

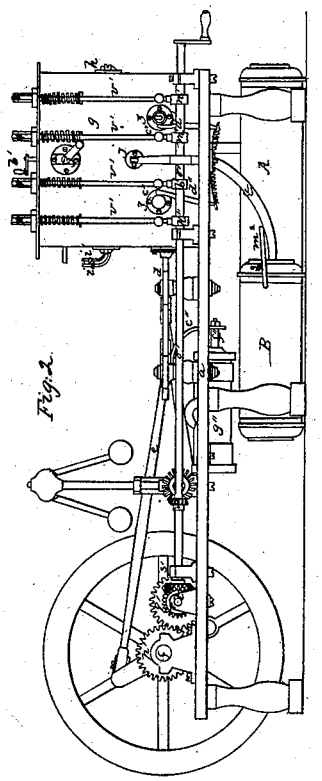

Fig. 2

UNITED STATES PATENT OFFICE.

STUART PERRY, OF NEW YORK, N. Y.

IMPROVEMENT IN GAS-ENGINES.

Specification forming part of Letters Patent No. **4,800**, dated October 7, 1846.

To all whom it may concern:

Be it known that I, STUART PERRY, of the city, county, and State of New York, have invented new and useful Improvements in the Engines Operated by the Explosion of Gases; and I do hereby declare that the following is a full, clear, and exact description of the principle or character which distinguishes them from all other things before known, and of the manner of making, constructing, and using the same, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a plan of the engine; Fig. 2, a longitudinal elevation; Fig. 3, a longitudinal vertical section taken at the line X X of Fig. 1; Fig. 4, an end elevation, and Fig. 5 a cross vertical section.

The same letters indicate like parts in all the figures.

On the 5th day of May, 1844, Letters Patent were granted to me by the United States for an "engine to be operated by the explosive mixtures of inflammable gases or vapors." In this engine the piston is impelled by means of inflammable gas or gases generated from liquids or solids, and, together with atmospheric air exploded within the cylinder, the expansive force of the gases thus exploded being the impelling agent. It has been found, however, that the heat thus generated and communicated to the cylinder and to the other parts of the engine is a serious practical difficulty, and the leading object of my present improvements is to remedy this and other serious defects.

My first improvement consists in surrounding the cylinder of the engine with water to carry off the heat generated by the explosion of the gases and keep it at a sufficiently low temperature for the efficient action of the engine, and at the same time, in certain cases, to employ this surrounding water as a water-bath for the retort which generates the inflammable gas when the gas is generated from a liquid or liquids, the heat generated by the combustion of the gases being sufficient to keep the water at the temperature required for generating the gas, while the water carries off the heat from the cylinder to prevent it from being overheated.

My second improvement consists in lubricating the piston and the inside of the cylinder with water, which not only prevents the wear of the parts, but at the same time aids in preventing these parts from being overheated.

My third improvement consists in lubricating the piston-rod and preventing it from being overheated by surrounding it with water at or near the stuffing-box.

My fourth improvement consists of a new method of inflaming the gases by platina heated by the heat of inflamed jets of gas and air from the retort acting thereon, the platina being so situated as to communicate by a valve or valves directly with either end of the cylinder or with the passages through which the mixed gas and atmospheric air pass to either end of the cylinder; and my fifth improvement consists in the employment of a receiver containing condensed atmospheric air for starting the engine, in combination with another receiver and with an air-pump, by means of which atmospheric air is forced for the continued working of the engine, the said air-pump being operated by the engine.

In the accompanying drawings, *a* represents a frame properly adapted to the various parts of the engine, and *b* a cylinder, to which is adapted a piston *c* in the usual manner of steam-engines, and connected by means of a piston-rod *d* and connecting-rod *e* with the crank-shaft *f*. The cylinder is surrounded by a metallic vessel *g*, sufficiently large to contain water and permit it to circulate around the cylinder, and above the cylinder and within this vessel *g* there is a metallic retort *h* to contain any liquid from which inflammable gas may be generated, which is to be supplied to it regularly from a reservoir by means of two balancing-tubes *i i'*, the one *i* for conducting the liquid, and the other *i'* to conduct gas from the retort to the upper part of the reservoir to force the liquid from the reservoir into the retort until the liquid rises above its aperture in the retort, which cuts off the supply of gas, and hence the supply of liquid, until the liquid again sinks below the said gas-tube. As this mode of supplying liquids is well known and has been frequently employed to supply steam-boilers, it is deemed unnecessary to represent it in the drawings and model. The water in the vessel *g* keeps down the temperature of the cylinder, and for the purpose of lubri-

cating the piston and the inside of the cylinder, and at the same time to keep down the temperature of these surfaces, a small double-acting force-pump j, operated by the cam-shaft, to be hereinafter described, is employed, which communicates with the two ends of the cylinder c by pipes k k, which pass through the cylinder, so as to correspond with a groove l in the periphery of the piston (see Fig. 6) at each end of its stroke, where, by the dead points of the crank, the piston is at rest for an instant of time, the strokes of the pump being so regulated as to discharge a small stream of water alternately at either end of the cylinder when the piston reaches the end of its strokes. The piston is packed on either side of this groove to prevent the escape of the water from the groove except through an aperture in the face of the piston, which connects with the groove and which is furnished with a spring-valve l^2. By this supply of water the piston and inside surface of the cylinder are effectually lubricated. The piston-rod is also lubricated and kept cool by a supply of water from the vessel g by the pressure of the head by a tube m, (see Fig 6, longitudinal section of Fig. 1 at Z Z on an enlarged scale,) which communicates with the stuffing-box n, that is constructed in the following manner: o is a ring of packing, and p a metallic ring grooved inside and outside, and q is another ring of packing, against which fits the gasket r. The water-tube m communicates with the outside groove in the metal ring, and by a hole therein with the inside groove to lubricate the piston-rod. In this way all the parts of the cylinder, the piston, and piston-rod are kept down to the required temperature.

I will now describe the engine as being worked by the explosion of atmospheric air and gas generated from spirits of turpentine. For the purpose of starting the engine a metallic receiver A contains condensed atmospheric air forced in by a hand-pump, or by any other auxiliary means, and this communicates with another receiver B by means of a pipe m^2, governed by a stop-cock s, and this latter communicates by a pipe t with the retort through a valve-box u, provided with two apertures v w leading to the retort and governed by a sliding valve x, operated by a screw and crank-handle z, and this valve is a hollow cylinder, which may be closed and opened by a valve a', the stem of which is provided with a crank-handle b'. The valve-box is also provided with a throttle-valve d', which regulates the charge of mixed gas and atmospheric air to be admitted to the cylinder, and this may be worked by hand or by a regulator, as in the steam-engine. From the valve-box there are two pipes or passages e' f', communicating with the opposite ends of the cylinder and governed by induction-valves g' h', and beyond these are also two exhaust-valves i' j', and these four valves are operated in one direction by appropriate cams k' l' m' n' on a rod o' receiving motion from the crank-shaft by a train of wheels p' q' r' s' t', the three wheels r' s' t' being bevel-wheels, and the two r' t' turning freely on their shaft, that either may be clutched by the sliding clutch u' to admit of reversing the rotation of the cam-shaft when it is desired to reverse the action of the engine. The cams operate lifters v' connected with the valve-rods h' i' j' g' by levers x. There are two small pipes y' y' that extend from the valve-box to a vessel z' z' on either side and placed in the pipes or passages e' f' to supply small jets of the inflammable mixture, which is inflamed and kept burning within the vessels z' z' to heat platina cups a'' a'' that project within these vessels, and the upper part of these platina cups (which open into the passages through which the inflammable mixture passes to the cylinder) are governed by valves b'' b'', the stems c'' c'' of which are operated by cams d'' d'' on the faces of the cams that operate the induction-valves. The inside of these vessels is lined with earthen luting made of some bad conductor to prevent the vessel from being too much heated. The piston-rod of the engine is provided with an arm e'', which takes hold of and operates the piston-rod f'' of an air-pump g'', by means of which atmospheric air is forced into the air-receiver B, the capacity of this air-pump being such as to force into the receiver a quantity of air at each stroke equal to the supply required for the working of the engine. When the engine is first started, the water which surrounds the cylinder and the retort must be heated to the temperature required for generating inflammable gas or vapor from spirits of turpentine or other suitable substance, and this may be done by any of the known means of applying heat to liquids, and when sufficient gas has been generated for starting the engine this source of heat is dispensed with. The stop-cock s in the pipe, which forms the connection between the two air-receivers A B, is opened, which permits the atmospheric air by its elastic force to pass into the receiver B, and thence through the pipe t into the valve-box u. The slide-valve x is then opened, which permits a portion of this air to pass through the aperture v into the retort to mingle with the gas therein, and the mixed air and gas then passes out through the aperture w to the induction pipes or passages e' f'. At the same time a portion of the air, without entering the retort, passes through the hollow slide-valve to the induction and eduction passages, there to mingle with the compound of gas and air from the retort preparatory to being inflamed. A small quantity of this mixture passes from the valve-box through the small pipes y' y', and these two jets are inflamed in the vessels z' z' to heat the platina cups a'' a''; and if by the inflammation of these jets it is found that the mixture does not contain a sufficient proportion of inflammable gas, the valve a', which governs the air-pas-

sage in the slide-valve, and which is situated between the apertures *v w*, is partly closed, which forces a greater quantity of the air to pass through the retort and to take up the required quantity of gas, and vice versa. So soon as the mixture is found to be in a proper condition the cam-shaft is rotated by hand to open one of the induction and one of the eduction valves and one of the small valves *b''*, so that as the gas passes through this induction-passage to one end of the cylinder it passes over the uncovered platina cup, which, having been heated by the small jet, inflames the mixture, the expansion of which forces the piston to the opposite end of the cylinder, when these valves are closed and the others opened by the operation of the cam-shaft to produce the reversed action of the piston, which discharges through the eduction-passage the products of the previous explosion. In this way the engine continues to act, the heat generated by each explosion being sufficient to keep the surrounding water at the requisite temperature for generating the gas in the retort. The eduction-passages communicate with the lower part of the cylinder, and the valves when open permit not only the products of the previous explosion to escape out into the atmosphere, but at the same time any water which may have accumulated from the lubrication of the piston.

It will be obvious that the throttle-valve, which regulates the supply of the explosive mixture to the cylinder, must be placed beyond the valves and apertures which regulate the admixture of gas and atmospheric air, and that the induction-valves are opened for a short time only, (sufficiently long to admit the required supply of the mixture,) and that these must be closed or closing before the valves which form the connection between the induction-passages and the heated platina are opened, for otherwise the mixture in the other parts of the apparatus would also be exploded; but one of the eduction-valves is kept open during the greater part of the stroke of the piston.

From the foregoing it will be evident that, instead of generating the inflammable gas from spirits of turpentine or other liquid in the retort, it may be generated from any other material in a separate apparatus and carried by a pipe to the retort, which in that case will answer the purpose of a conducting-pipe, and under these circumstances the water surrounding the cylinder and the retort may be dispensed with, and the cylinder kept cool by the injection of water; but under all circumstances it will be found advisable to surround the cylinder, valves, and induction-passages with water.

Instead of using the platina in the cup form for inflaming the mixture, it may be used in any other form, as the object is to use the heated surface of platina to inflame the mixture, instead of jets of flame, as a means of safety.

The valves may be operated by any desired mechanical arrangement which will produce the intended and requisite movements, as I make no claim to the arrangement pointed out above.

I contemplate using this engine for the purpose of compressing air to operate by its expansion another engine. This is effected by a double-acting air-pump A′, operated by a connecting-rod B′ and crank C′ on the crank-shaft *f* of the gas-engine. The air is forced from the pump through a pipe D′ into the receiver A, which is connected with the cylinder of the engine to be operated by the expansive force of the air by means of the pipe E′.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. Surrounding the cylinder and induction-passages of an engine operated by the explosion of gases with water for the purpose of keeping it at the requisite temperature, as described.

2. Cooling and lubricating the inside of the cylinder and piston of an engine operated by the explosion of gases by injecting water within the cylinder, whether this be effected in the manner as herein described or in any other manner producing the same effects, as described.

3. Cooling and lubricating the piston-rod and stuffing-box of an engine operated by the explosion of gases by injecting water around the piston-rod and within the stuffing-box, substantially as described.

4. The method of inflaming the explosive mixture in the cylinder or in the induction-passages by means of heated platina or other metal having like properties, and provided with a valve or valves by which the heated surface can be separated from the explosive mixture, substantially as described.

5. The combination of a receiver of condensed air filled by an auxiliary force, with the receiver, into which air is forced during the action of the engine, as described, for the purpose of starting the engine, as described.

STUART PERRY.

Witnesses:
HENRY CARTER,
JAMES S. BUTLER.