P. D. JOHNSTON.

PROCESS OF OBTAINING POWER FROM HYDROCARBONS.

APPLICATION FILED JULY 7, 1906.

905,433. Patented Dec. 1, 1908.

Fig. 1

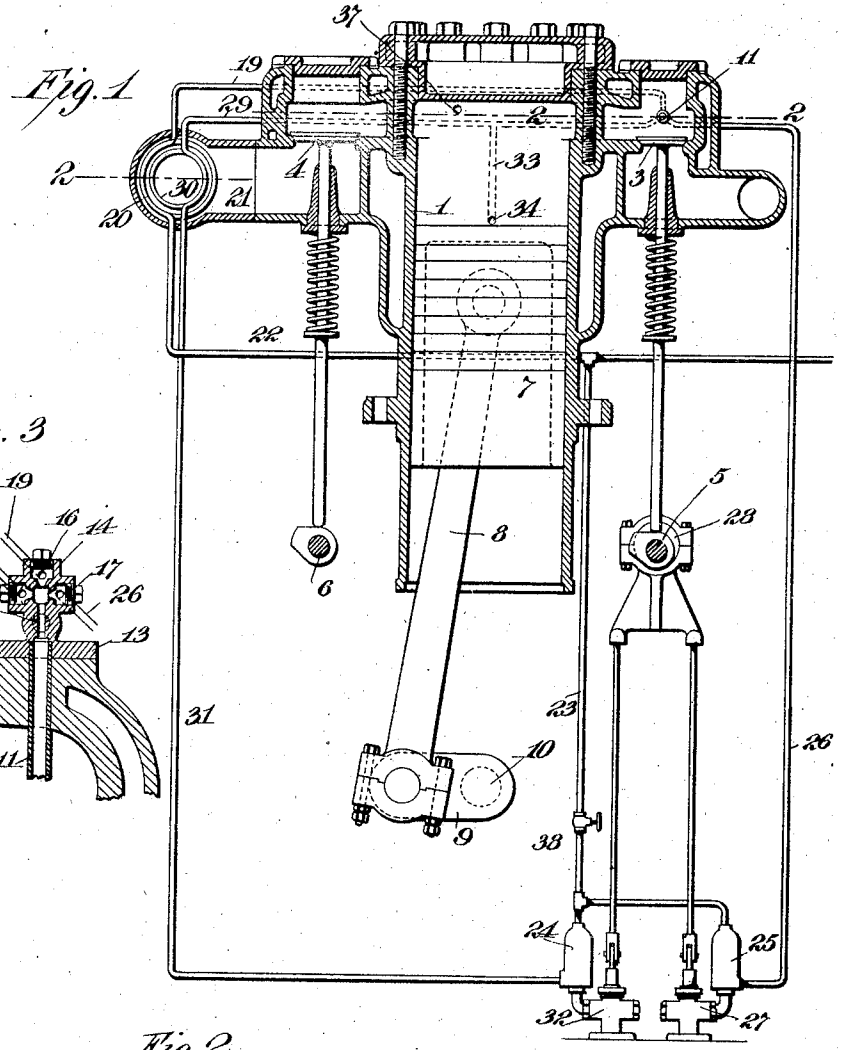
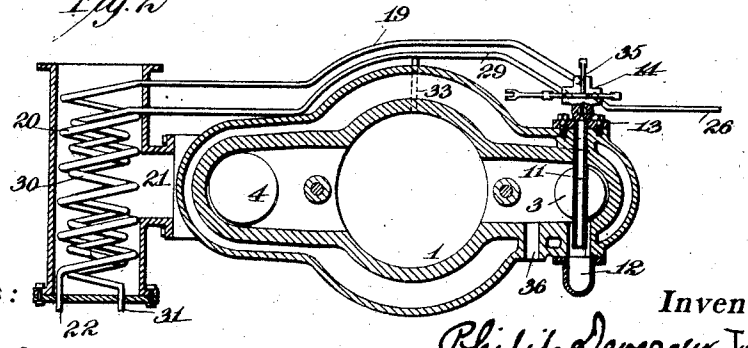


Fig. 3

Fig. 2



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PROCESS OF OBTAINING POWER FROM HYDROCARBONS.

No. 905,433. Specification of Letters Patent. Patented Dec. 1, 1908.

Application filed July 7, 1906. Serial No. 325,110.

To all whom it may concern:

Be it known that I, PHILIP DEVEREUX JOHNSTON, a citizen of the United States, residing in the village of Cold Spring, Putnam county, State of New York, have invented a new and useful Process of Obtaining Power from Hydrocarbons, of which the following is a specification.

The object I have in view is the obtaining of power from hydrocarbons, particularly heavy hydrocarbons, including the natural crude mineral oils of paraffin or asphalt base, as well as kerosene and other manufactured or modified products of the same general class.

The invention is particularly useful in obtaining power in connection with an engine of the internal combustion type, although the invention can be used with engines of other types, in which power is obtained by the production of heat.

By my invention I seek to reduce the cost of obtaining power, make it possible to carry out the process with an apparatus of small bulk and cheap construction, and one which will run with certainty and may be readily governed.

Further objects will appear from the following specification:

One means of carrying out my process is illustrated in the accompanying drawings which represent a portion of a hydrocarbon internal combustion engine.

Figure 1 is a sectional view of the operative parts of such an engine, Fig. 2 is a horizontal sectional view taken on the line 2—2, of Fig. 1, across the combustion chamber, and Fig. 3 is an enlarged detail of a portion of the mechanism shown in Fig. 2.

In all the views, like parts are designated by the same reference characters.

The engine illustrated is an oil engine of the four-cycle or four-stroke type, although it is obvious that the process may be carried out with engines using other forms of hydrocarbon, or of the two-cycle or two-stroke type.

The apparatus, by means of which the process may be carried out, is constructed as follows: 1 is the cylinder, which is shown as water-jacketed, and has at the top a combustion chamber 2; 3 is the inlet valve and 4 the outlet valve, each valve being shown as operated by a cam, carried by the valve shafts 5 and 6 respectively.

7 is the piston of the ordinary type, to which is attached the connecting rod 8. This connecting rod is attached to the crank 9, which is carried by the shaft 10. All of this is of the ordinary and usual construction.

Above the inlet valve 3 is a retort 11. This retort is shown as extending through one of the walls of the combustion chamber, and passes part-way through an opening in the opposite wall. The retort is in the form of a metal tube open at both ends. The free end of the tube is covered by a hood 12, which is not water-jacketed, but has sufficiently thin walls to be readily heated by the combustion of the contents of the combustion chamber. The other end of the retort is connected to a mixing valve 13. This mixing valve is provided with an internal mixing chamber 14. Between the mixing chamber and the retort is a cut-off valve 15. This cut-off valve is operated by suitable mechanism at the proper time so as to close communication between the mixing chamber and the retort.

Three nozzles discharge into the mixing chamber 14. Of these nozzles, the nozzle 16 is arranged to deliver air into the mixing chamber, the nozzle 17, oil, and the nozzle 18, water. The nozzles 17 and 18 are shown with their orifices opposed to each other, while the nozzle 16, for the introduction of air into the mixing chamber, has its orifice at right angles to the other two nozzles. The air nozzle 16 communicates, by means of a pipe 19, with a coil 20, arranged within a chamber 21, which communicates with the exhaust port 4. The coil is in such a position that it will be constantly swept by the hot products of combustion. Connecting the coil 20 and a source of air supply under pressure, not shown, is a pipe 22. A suitable means of supplying air under pressure may be an air pump or a tank containing compressed air. A pipe 23 communicates with the pipe 22, so as to be subjected to the same pressure as contained in the pipe 22, and this pipe 23 communicates in turn with the equilibrium chambers 24, 25. The oil is admitted to the nozzle 17 by means of a pipe 26, which is connected to a pump 27 from a source of oil supply. This pump 27 is actuated from a cross-head carried by an eccentric 28 on the shaft 5. The pump 27 and pipe 26 communicate with the equilibrium chamber 25. The air supply pipe 23 may be provided with a valve 38 for the purpose of cutting off or

limiting the flow of air to the two equilibrium chambers. This is for the purpose of reducing the force of outflow of the oil and water into the mixing chamber, so that the engine will not be compelled to always pump against high pressures. It may be desirable, after the engine has started, to reduce the pressure under which the oil and water are forced into the mixing chamber, and to permit this to be done, the valve 38 may be partially closed.

The water nozzle 18 communicates through a pipe 29, with a coil 30, which passes through the chamber 21 so as to be subjected to the heat therein. This coil 30 is connected through the agency of a pipe 31, to a pump 32, which is operated from the same crosshead as is the pump 27. The equilibrium chamber 24 communicates with the pump 32 and pipe 31. A branch pipe 33 connects the pipe 29 with the interior of the cylinder, by means of a port 34. This port is shown in such a position as to be closed by the piston when the latter reaches about one-half of its inward stroke. The amount of opening of the nozzles 16, 17, 18 may be controlled by suitable valves, not shown, whereby the richness of the mixture and the speed of the engine will be regulated. These valves may be simultaneously actuated by a system of linkage shown generally by the character 35. This linkage connects with the governor by means of which the extent of opening of the nozzles within the mixing chamber is controlled. A port 36 communicates with the combustion chamber and is for the purpose of permitting the entrance of a starting valve by means of which a supply of air, under pressure, and a volatile hydrocarbon, will be admitted to start the engine. The usual igniting system is provided.

In carrying out the process, after the engine is started and the retort 11 has become heated by the combustion of the volatile hydrocarbon within the combustion chamber, a supply of liquid hydrocarbon is injected into the mixing chamber, through the nozzle 17. At the same time a supply of water is injected into same chamber through the nozzle 18. The discharge from the orifices of the two nozzles meets within the combustion chamber and the hydrocarbon is very finely divided therein and becomes thoroughly mixed with the water. At the same time a supply of air, under pressure, is admitted into the mixing chamber through the nozzle 16, and this air mixes with the previously atomized hydrocarbon and water, and thoroughly volatilizes the two. The valve 15, being at this time open, the mixture of oil, air and water passes into the retort 11, where, coming in contact with the hot walls thereof, it is converted completely into vapor. This vapor will issue from the open end of the retort, and coming in contact with the heating hood 12, the mixture will become further heated and will be in condition to be consumed without leaving objectionable deposits of soot or graphite upon the inside of the combustion chamber, the cylinder or upon the piston. After leaving the retort, the mixture of oil, water and compressed air will come in contact with air which is being drawn in through the inlet valve 3. The complete mixture will then be drawn into the cylinder and will be there compressed by the ascending piston. The amount of compression can be great, so that the gas will be in condition to be completely consumed. The efficiency of the process is increased by heating the air and water by means of the coils 20 and 30 which are subjected to the hot discharged products of combustion. A certain amount of water will enter the cylinder through the port 34, the amount being determined by the size of the port, and its location within the cylinder. The equilibrium chambers 24 and 25, communicating as they do, with the source of air supply, and subjected to the pressure of such air, will keep the contents of the mixing chamber in equilibrium. During the suction stroke, or while the piston 7 is descending, the complete mixture of air, oil and water will be discharged through the retort into the combustion chamber. This will continue during a portion of the compression stroke, or until the pressure within the combustion chamber equalizes that within the mixing chamber, or until the cut-off valve 13 is closed, should that occur before the pressures are equalized. As soon as this happens, no more air will be admitted into the equilibrium chamber, and as the pressure through the nozzles of oil and water is the same as that of the air, no more liquid will be admitted into the mixing chamber. Should the port 34 not at this time be covered by the piston, no more water will enter the cylinder during this stroke. After the mixture has been compressed it is ignited in the usual manner and the combustion of the mixture produces the working impulse upon the piston, as is well understood.

The process may be carried out by other mechanism than that shown. If desired, the compressed mixture may be drawn off through the port 37, and utilized in producing heat or power in other mechanism.

By the process described, it is possible to employ the heavier and cheaper hydrocarbons which heretofore have been found extremely difficult to be used in an internal combustion engine, for the reason that they tend to cause deposits of carbon or graphite within the cylinder and upon the piston, and to choke the valves, such deposits probably being caused by the fractional distillation of the more volatile constituents of the hydrocarbon due necessarily to the great pressure

and high temperature required to effect the combustion of the less volatile constituents of the fuel. By mixing the oil with water, in the presence of air, in a mixing chamber, the subdivision of the hydrocarbon is made more minute than has heretofore been possible and the combustion more perfect.

The apparatus illustrated and described is not claimed herein but forms the subject matter of applications for patent filed by me May 17, 1907, Serial Nos. 374,266, 374,267 and 374,269.

Having now described my invention, what I claim as new and desire to secure by Letters-Patent is:

1. The step in the process of obtaining power from heavy liquid hydrocarbon, which consists in opposing jets of liquid hydrocarbon and water, both being under pressure, whereby they will be broken up and mixed, and further subjecting this mixture to the action of a jet of air at high velocity.

2. The step in the process of obtaining power from heavy liquid hydrocarbon, which consists in opposing jets of liquid hydrocarbon and water, both being under pressure, whereby they will be broken up and mixed, and further subjecting this mixture to the action of a jet of air at high velocity, the said air being previously heated.

3. The step in the process of obtaining power from heavy liquid hydrocarbon, which consists in opposing jets of liquid hydrocarbon and water, both being under pressure, whereby they will be broken up and mixed, and further subjecting this mixture to the action of a jet of air at high velocity, and timing the moment of mixture.

4. The step in the process of obtaining power from heavy liquid hydrocarbon, which consists in opposing jets of liquid hydrocarbon and water, both being under pressure, whereby they will be broken up and mixed, and further subjecting this mixture to the action of a jet of air at high velocity, the entire mixture being subjected to high compression.

This specification signed and witnessed this 3rd day of July, 1906.

PHILIP DEVEREUX JOHNSTON.

Witnesses:
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