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METHOD FOR PRODUCING WORKING FLUIDS FOR MOTORS.

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1,068,348. Patented July 22, 1913.

Fig. 2.

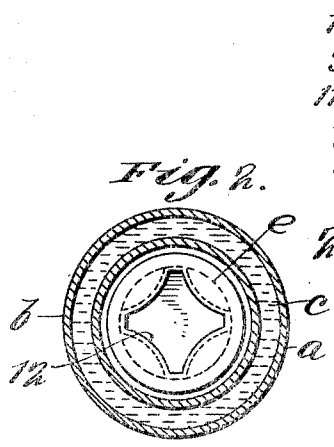


Fig. 1.

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METHOD FOR PRODUCING WORKING FLUIDS FOR MOTORS.

1,068,348. Specification of Letters Patent. Patented July 22, 1913.

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To all whom it may concern:

Be it known that I, OTTO KRAUS, a citizen of the United States, residing in the borough of Manhattan, in the city, county, and State of New York, have invented certain new and useful Improvements in Methods for Producing Working Fluids for Motors, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to improvements in methods of producing working fluids for motors; and an object of this invention is to provide a method of the character just mentioned which will be simple and efficient in practice.

In the drawings illustrating the principle of this invention and the best mode now known to me of applying that principle, Figure 1 is a central longitudinal section through my new apparatus; and Fig. 2 is a section on the line 2—2 of Fig. 1.

The wall *a* of the casing *b* is almost entirely hollow and the annular space *c* between the inside and the outside of this hollow wall is connected by the water-supply pipe *d* with a source of water supply of any suitable character, the water being forced in under pressure. The wall *a* incloses or surrounds the combustion chamber *e* within which is contained refractory material, such as pieces of fire-brick *f*. Near the inlet end of the combustion chamber *e* there is mounted in the wall *a* an igniter *g* of any suitable description. To the wall *a* of the casing *b* near the inlet end of the combustion chamber *e* there is fastened, by the screw ring *h*, the casing *i* of a fuel-feeding device *j*. To the chamber *k* within the casing *i* air is led under pressure by the pipe *m*. Within the chamber *k* there is mounted a chambered spraying device or atomizer nozzle *n*; and within the latter there is mounted a fuel-nozzle *o*, in which is a needle valve *p*. In the lower part of the casing *i* there is formed a chamber *q* into which liquid fuel is forced by the pump plunger *r'* of the pump *r*. Between the head *s* of the plunger *r'* and the pump cylinder *r''* there is mounted a coil spring *t*. The liquid fuel is drawn by the pump *r* from the oil-tank (not shown) through the fuel-inlet pipe *u* and past the ball check-valve *w* and is forced by the pump past the ball check-valve *w'* into the oil-reservoir *q*. In the latter there is fitted the upper end of an overflow pipe *y* in which is mounted a ball check-valve *w''* and which communicates at its lower end with the interior of the pump-cylinder *x''* within which reciprocates the pump plunger *x'*, which is similar in all respects to the pump plunger *r'* and is, like the latter, controlled by a coil spring *t*. The outlet *z* from the pump *x* is controlled by the ball check-valve 3, which is normally held on its seat by the coil spring 4. Compressed air entering through pipe *m* will normally flow through the opening *n'* into the atomizer *n* and from the latter through the L-shaped air passage *n''* to the fuel reservoir *q*, wherein it will exert a pressure upon the surface of the liquid fuel. When the air rushes out of the atomizer-nozzle *n*, this air-pressure will, due to the suction therein produced, force the liquid fuel through the fuel passage 5 into the fuel-nozzle *o* and past the needle valve *p* out into the atomizer *n*, where it will mix with the air from the pipe *m*. This mixture of liquid fuel and air will be sprayed from the atomizer *n* into the inlet end of the combustion chamber *e*, where it will be ignited by the igniter *g*. By manipulating the screw-plug *o'*, the flow of air through the annular passage *n^x* and through the atomizer-nozzle *n* may be controlled so as to vary the volume of air which is fed direct to the combustion chamber *e* through the annular passage *n^x* and the volume of which passes through the opening *n'* to atomize the fuel.

On the upper end of the casing *b* there is mounted the casing 6 of the steam generating-and-superheating chamber 7. The top of the casing *b* is closed by a grating or foraminated plate 8 which forms part of the bottom of the casing 6 and, therefore, of the generating chamber 7. The casing 6 is formed with an opening 9 which is normally closed by the handhole cover 10. The chamber 7 contains small pieces 11 of any suitable material and these pieces are of such size as to offer a large heating surface and are at the same time not so small as to impede unduly the passage of the fluid through the chamber. I have found that a metal chain having small links 11 is well adapted for the purpose. The outlet end of

the chamber 7 is provided with a foraminated diaphragm 8′, which closes that end of the chamber against any danger of the chain's being drawn therefrom. As will be understood from an inspection of Fig. 1, the diaphragm 8 prevents the chain's falling out of the casing 6 at that point.

The length of the combustion chamber *e* is sufficiently great to insure the complete combustion of the liquid fuel, and the products of combustion on leaving the combustion chamber are at a high temperature. These highly-heated products flow past the cup-like valve 12 which closes the outlet end of the combustion chamber and, as a result, the valve 12 tends to become very highly heated. To keep the valve 12 comparatively cool, the following arrangement of parts is provided and is an important feature of this invention: The annular water-jacket *c* is open at its top, which lies above the valve 12. That portion 8″ of the diaphragm 8 which lies directly above the water-jacket *c* is imperforate. The flow of water in the water-supply pipe *d* is so regulated that there will be a constant overflow of water from the open upper end of the water-jacket *c*. Some of the water which overflows from the latter will fall into the cup-like valve and will maintain the same in a cool condition, despite the extremely high temperature of the gases issuing from the combustion chamber *e*. Part of the water which splashes upwardly from the open top of the water-jacket *c* will strike against the imperforate portion of the diaphragm 8 and will be deflected downwardly into the cup-like valve. The upward movement of the latter is limited by a finger 13 which extends downwardly from the diaphragm 8.

The highly-heated products of combustion flowing past the valve 12 from the combustion chamber *e* will mix with the steam and water flowing from the open top of the water-jacket *c*; and this mixture of gas, steam and water will pass through the foraminated part of the diaphragm 8 into the steam generating and superheating chamber 7. The dimensions and arrangement of the latter are such that the water and steam will be transformed into steam gas, while the products of combustion will be cooled, so that the mixture of these products and the steam gas which flows from the chamber 7 through the pipe 14 to the motor and which is designed to serve as a working fluid for the same will be at a temperature so low that no injury will be done to the working parts of the motor with which the mixture comes into contact and the use of water-jackets may be dispensed with. The working fluid will, nevertheless, be of a sufficiently high temperature to insure the motor's working at high efficiency. The chain-links 11 break up and retard the stream of water, steam and highly-heated gases flowing into the chamber 7 through the diaphragm 8. These chain links 11, moreover, absorb heat from the highly-heated gases and then give it up again to the water and steam, transforming the same into steam gas and bringing the whole mixture to the proper temperature for efficient working in the motor to which it is supplied through the pipe 14.

The pressure of the spring 4 on the ball valve 3 is of such degree that the ball valve 3 will not be raised by the pressure of the compressed air. However, should any liquid fuel overflow from the oil-reservoir *q*, it will be drawn past the ball check-valve *w*″, and after a sufficient quantity has accumulated in the pump cylinder *x*″, it will, since it is practically incompressible, be forced past the spring-pressed ball-valve 3 and will flow back to the oil-tank (not shown). The pump plungers *r*′, *x*′ are driven by the beam 15 in any suitable manner. If desired, the water-supply pipe *d* may, in the case of a condensing engine, be connected with the latter and an increase of efficiency obtained by the preheating of the water supplied to the water-jacket *c*. A suitable drain-pipe *c*′ is provided for the combustion chamber *e*.

The mode in which my new process is carried out may be briefly described as follows: Liquid fuel, such as crude oil, is drawn by the pump plunger *r*′ through the fuel-inlet pipe *u* past the ball-valve or check-valve *w* and is forced into the oil reservoir *q*. From the latter the liquid fuel is forced by air-pressure through the fuel-passage 5 into the fuel-nozzle *o* and past the needle-valve *p* out from the nozzle into the atomizer *n*. The mixture of air and fuel is sprayed from the atomizer into the combustion chamber *e*, where it is ignited by the igniter *g*. The combustion heats the pieces of refractory material *f* to an intense heat. After the refractory material has become incandescent, the fuel will ignite immediately on contact therewith and will burn completely, whereby perfect combustion will be attained. The electric igniter *g* may then be cut out and the apparatus will continue its operation. The heat generated by the combustion also raises the water in the water-jacket *c* to a high temperature. The cup-like valve 12 is kept comparatively cool by the water which splashes over from the water-jacket *c* and which is caught in the cup-like valve 12. The products of combustion from the combustion chamber *e* mix with the water and steam from the water-jacket *c* and this mixture flows through the foraminated diaphragm 8 into the steam generating-and-superheating chamber 7. The chain links 11 in the chamber 7 serve to break up and

impede the passage of the mixture of water, steam and products of combustion. As hereinbefore stated, the hot gases give up some of their heat to the chain links 11 and are, therefore, cooled. The heat absorbed by the chain-links is given up by them to the water and steam, which are thus transformed into steam gas; and the products of combustion and the steam gas flow through the grating 8′ and the pipe 14 to the motor, which may be a single-cylinder or a multi-cylinder motor.

It is to be observed that the cup-like valve 12 will act as a check-valve to prevent the back flow of water and steam from the generating-and-superheating chamber 7 into the combustion chamber *e*. It will be understood that as, the air compressor supplying compressed air through the pipe *m*, reciprocates, there may be caused fluctuations in the pressure in the combustion chamber *e*: and, when the pressure in the latter falls below that in the generating-and-superheating chamber 7, the valve 12 will close and will thereby prevent this back flow of water and steam which would cool the combustion chamber and interfere with the combustion of the fuel.

This application is filed as a divisional application under my pending application Serial No. 615,406, filed March 18th, 1911.

I claim:

1. A process for the production of a working fluid consisting of a mixture of steam and the products of combustion of a hydrocarbon, comprising impregnating the combustion products with water; and leading the water-impregnated combustion products into contact with the extensive surface of small bits of a suitable material which is maintained out of contact with the water-supply and takes up heat from the combustion products and transfers heat to the entrained particles of water, whereby the latter are transformed into steam.

2. A process for the production of a working fluid consisting of a mixture of steam and the products of combustion of a hydrocarbon, comprising preheating water by heat from the combustion products; impregnating the combustion products with preheated water; and leading the water-impregnated combustion products into contact with the extensive surface of small bits of a suitable material which is maintained out of contact with the water-supply and takes up heat from the combustion products and transfers heat to the entrained particles of water, whereby the latter are transformed into steam.

3. A process for the production of a working fluid consisting of a mixture of steam and the products of combustion of a hydrocarbon, comprising impregnating the combustion products with water; and dividing into numerous fine streams the stream of water-impregnated combustion products by passing the same through the interstices between small bits of a suitable material which is maintained out of contact with the water-supply.

Signed at the borough of Manhattan, in the city, county and State of New York, this seventeenth day of June, A. D., 1912, in the presence of the two undersigned witnesses.

OTTO KRAUS.

Witnesses:
JAMES HAMILTON,
EMMA I. MCCARTHY.