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PROCESS FOR UTILIZING HYDROCARBONS IN INTERNAL COMBUSTION  
ENGINES AND APPARATUS THEREFOR  
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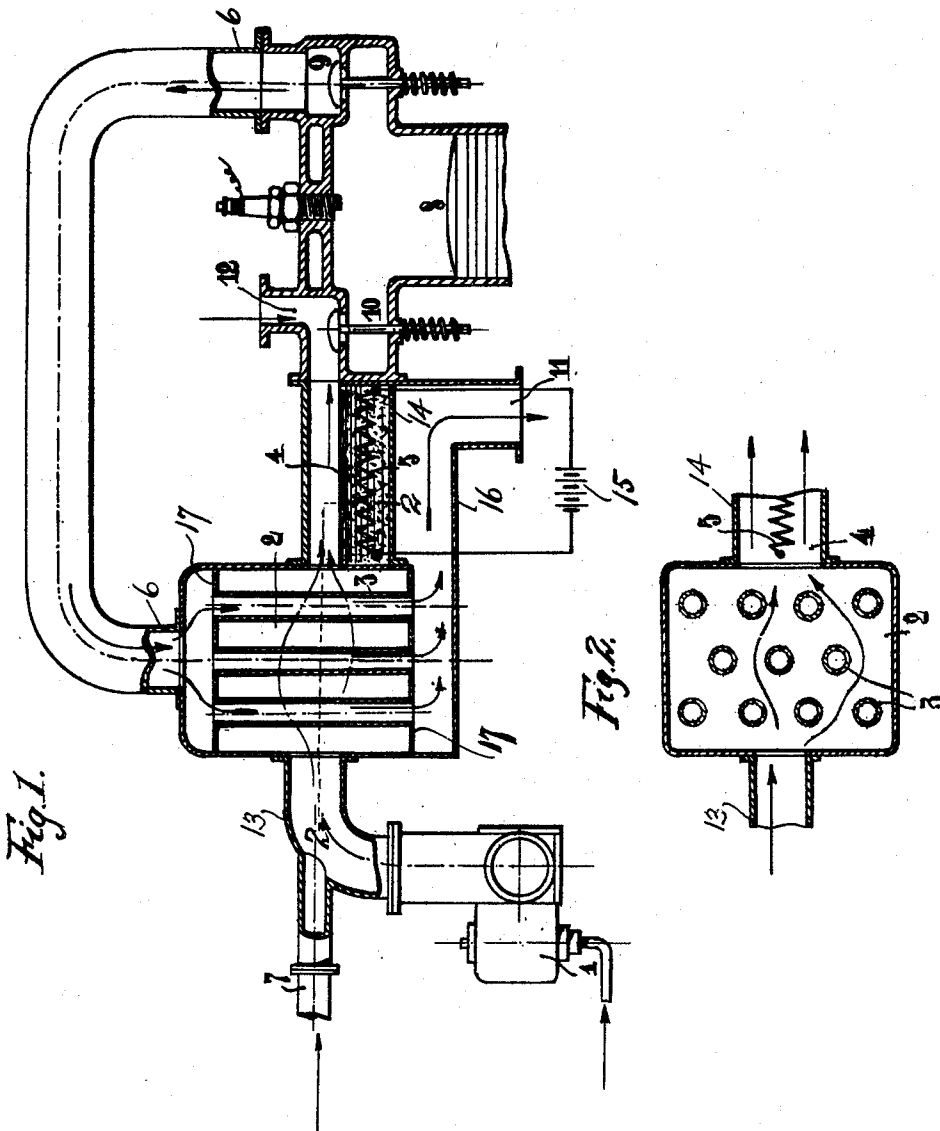


Fig. 1.

Fig. 2.

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## UNITED STATES PATENT OFFICE.

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PROCESS FOR UTILIZING HYDROCARBONS IN INTERNAL-COMBUSTION ENGINES AND APPARATUS THEREFOR.

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The difficulties inherent in the use of heavy hydrocarbons as fuel for internal combustion engines are common knowledge and are overcome by subjecting the said hydrocarbons to a particular treatment in an apparatus designed for the purpose.

The process according to the present invention affords the possibility of using heavy hydrocarbons as fuel for any kind of internal combustion engine, whatever the type of carbureter fitted to such engine.

The process is essentially characterized in that the carbureter is combined with a device for continuously cracking the hydrocarbon either by heat or by catalysis. The catalyzer may be of any kind (metal, oxide, salt etc. for example red copper or nickel) and is placed in the path followed by the heavy hydrocarbon on its way to the engine. The said catalyzer is heated to a suitable temperature either by externally produced heat (for instance a paraffin burner or an electric current) or by heat derived from the exhaust gases of the engine, or by both. The heavy hydrocarbon thus decomposed by cracking reaches the engine as a mixture of very light and very heavy hydrocarbons. The light and therefore easily inflammable hydrocarbons are fired first by the ignition means provided on the engine and thus provide the heat required for igniting the heavy hydrocarbons contained in the mixture.

The catalyzing device may comprise tubes, plates, wires or the like made of suitable metal and arranged in a chamber for the purpose of finely dividing the mixture of decomposed hydrocarbons or of nondecomposed hydrocarbons and their vapours, and for the purpose of assisting the catalytic action and the heating of the said hydrocarbons to a temperature at which they may be used as fuel.

The engine is started with petrol, as is the case with engines fitted with carbureters fed with heavy hydrocarbons; or it may be started with hydrocarbons previously subjected to the cracking process hereinbefore set forth and stored in a suitable container.

The present process when carried into effect does not entail polymerization of the treated substances owing to the cracking being continuous and owing to the decomposed material being instantly utilized.

The accompanying drawing shows, by way of example, one form of apparatus

which may be used in carrying out the invention, and wherein Figure 1 is a diagrammatic view of such apparatus, partly in side elevation and partly in vertical section; and Fig. 2 is a horizontal section on line 2-2, Fig. 1.

Referring more particularly to said drawing, 1 indicates a heavy-oil carbureter of any preferred type which is connected with the catalyzing chamber 2. Within said chamber, there are arranged the catalyzing devices 3, which may consist of plates or wires of suitable metal, but which are here shown as open-ended tubes. The pipe 13 which connects the heavy-oil carbureter with the chamber has fastened to it a pipe 7 for supplying the steam or water vapor, so that the latter and the heavy-oil vapors are delivered into the catalyzing chamber, where they flow around the tubes 3 and then pass into a tubular vessel or pipe 14 containing the catalyzing material 4. This material is heated to the required temperature, according to the present showing, by means of a resistance element 5 which is included in a suitable electric circuit containing a battery 15.

The catalyzed vapors pass from tube 14 to the internal combustion engine 8 which may be of any desired type and which is equipped with suitable inlet and outlet valves 10 and 9 as usual. The exhaust gases from the engine may be utilized to heat the tubes 3 in the catalyzing chamber 2; and to that end, the exhaust pipe 6 may be connected to the top of said chamber to open thereinto, as shown, and a separate or additional pipe 11 may be connected to the bottom of the chamber to discharge the said gases after they have given up their heat. The tubes 3 have their opposite ends fitted in openings in a pair of tube plates 17 which are disposed within the chamber at a suitable distance from the top and bottom walls thereof.

Finally, a pipe 12 is connected to the top of the engine cylinder adjacent the inlet valve 10, this pipe leading from a second carbureter (not shown) which is supplied with gasolene, benzol or other liquid fuel and which is utilized, as usual, for starting the engine.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A process of utilizing heavy oils as fuel for internal combustion engines, comprising the steps of feeding a mixture of heavy oil and air to a catalyzing chamber, and simultaneously passing the exhaust gases from an engine through a multitude of hollow metallic catalyzing elements in said chamber, so that the current of exhaust gas will be split up into a multitude of separate, relatively-fine streams which will heat the catalyzing elements during their passage therethrough, while the mixture of oil and air will be split into small streams by said elements during its passage through the catalyzing chamber and will be decomposed catalytically by direct contact with the bare, heated metal surfaces of said elements; and then delivering the decomposed mixture into the cylinder of the engine for ignition therein.

2. Apparatus for catalytically decomposing heavy oils to enable their use as fuel for internal combustion engines, comprising a heavy oil carbureter; a catalyzing chamber; a pipe connecting said chamber with said carbureter to deliver the mixture of heavy oil and air from the latter to the former; a multitude of hollow catalyzing elements having bare metal surfaces disposed in said

chamber but devoid of communication with the interior thereof, said elements communicating at one end with the exhaust pipe of an engine so that the current of exhaust gas on entering said chamber will enter said elements and thus be split into a multitude of relatively-fine streams which will heat the catalyzing elements during their passage therethrough, the other end of said elements communicating with a common discharge pipe, said elements being disposed in the path of the mixture of heavy oil and air entering said chamber so as to break up the same into a multitude of small streams which are decomposed catalytically by direct contact with the bare, heated metal surfaces of said elements; and means for supplying the decomposed mixture to the cylinder of the engine.

3. Apparatus according to claim 2, in which a pipe communicates with the connecting pipe between the heavy oil carbureter and the catalyzing chamber for supplying moisture to the mixture admitted to said chamber.

In testimony whereof we affix our signatures.

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