

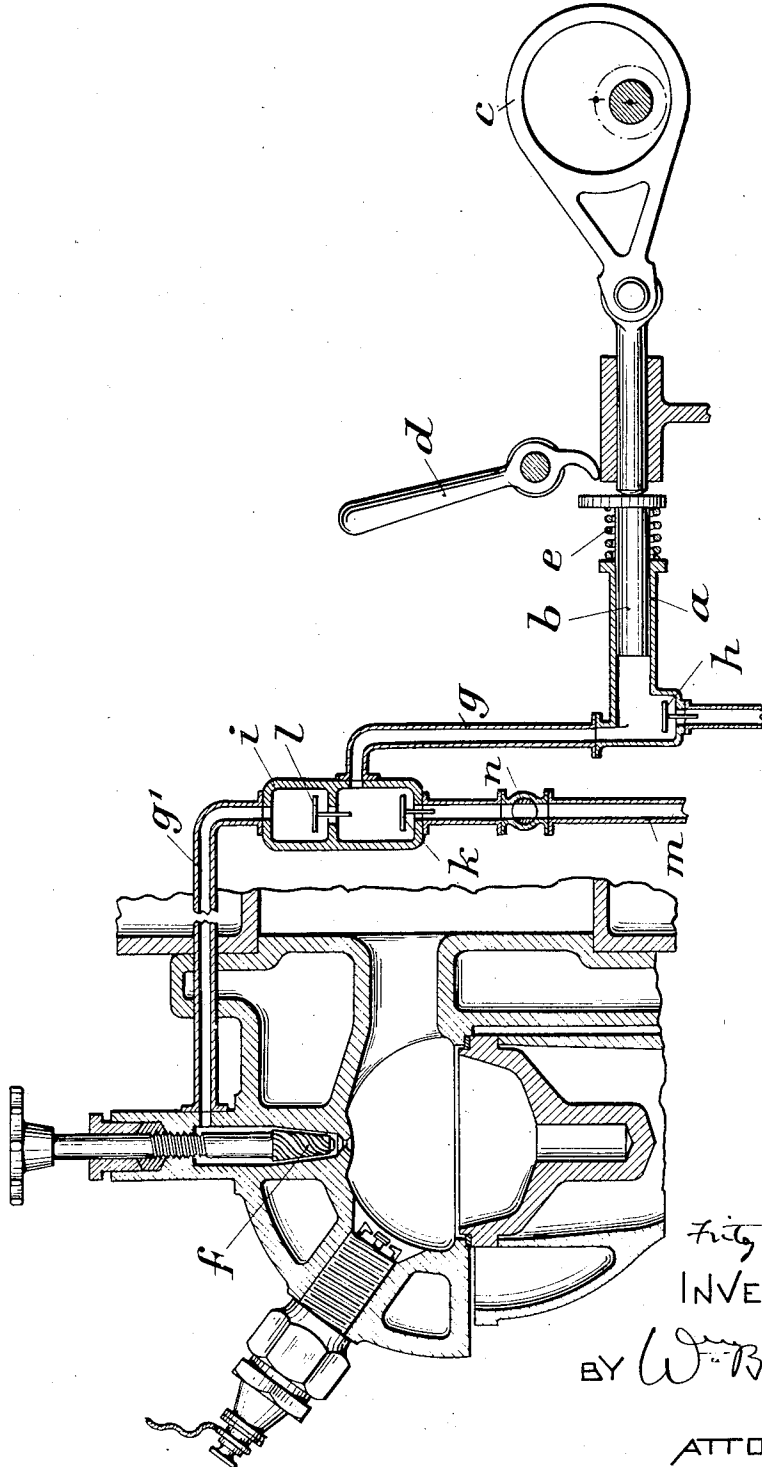
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FUEL DELIVERING DEVICE

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# UNITED STATES PATENT OFFICE

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## FUEL DELIVERING DEVICE

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The present invention relates to a device for delivering different liquids by means of a single pump and pressure piping with only one pressure valve, the device being particularly adapted to serve as fuel injecting appliance for heavy oil engines.

Devices for supplying internal combustion engines with two or more liquid fuels or other liquids in mixed condition are known already, and the usual kinds of such devices comprise as a rule one pump piston, a pressure valve, a pressure piping, and a nozzle, while the suction pipings for the various liquids open directly into the suction space of the pump. These devices suffer from the drawback that, if the pump has been working for instance with heavy oil, the entire pump chamber is filled with heavy oil up to the injection valve and, if during starting a change is to be made to light oil, considerable time is required until the heavy oil has been removed from the pump chamber. Furthermore, if benzine is used as light oil, the pump piston will work without lubrication while delivering the benzine, and similar difficulties arise when one of the liquids is water which is often added to the heavy fuel.

The invention eliminates these drawbacks by providing means which reduce the amount of heavy oil reaching the nozzle during the alternate delivery of heavy and light oils and the change from heavy to light oil to a minimum and which prevent benzine, if used as light oil, from entering the pump cylinder which thus remains filled with the well lubricating heavy oil even if benzine is delivered.

According to the invention, these aims are attained by disposing one of the suction valves for the different liquids more closely to the stroke space than the other and both in spaced relation to one another.

Another feature of the invention is that the farther removed suction valve is arranged in a casing containing also the pressure valve, an arrangement which, for instance in starting devices for heavy oil engines, affords the advantage that the connection for the light oil piping and the pressure valve may be positioned in the immedi-

ate neighborhood of the nozzle so that only a minimum of heavy oil is injected when changing from heavy to light oil.

Still another feature of the invention is that the suction valve opens more easily for one liquid than for the other, owing to variations in the spring load of the suction valves or to different arrangement of the tanks for the liquid as to height. Something similar has been proposed already, but these proposals refer to devices, in which just as many pressure pipings as suction pipings are required.

Devices for supplying different kinds of fuels to internal combustion engines, in which at a change from heavy to light oil the former presses the latter in front of it and into the nozzle, are known which have only one fuel pump. However, the suction pipings for the various fuels open directly into the pump cylinder so that, if benzine is employed, the piston will come in touch with it. Moreover, the known devices of this class require double pressure pipings and double nozzles.

By way of example the invention is illustrated in the accompanying drawing in connection with the cylinder head of a hot bulb engine.

Referring to the drawing, *a* is the fuel pump with the piston *b* driven by the eccentric *c*. When the engine stops, the piston *b* may be advanced by the lever *d* and returned in the known manner by a spring *e*. From the pump *a* fuel is supplied to the nozzle *f* by means of the pipes *g* and *g*<sup>1</sup>. In the immediate neighborhood of the stroke space of the pump the suction valve *h* for heavy fuel is provided. Between the pipes *g* and *g*<sup>1</sup> a valve casing *i* is disposed for the reception of the suction valve *k* for light fuel and of the pressure valve *l* for light and heavy oils. *m* is the suction piping for the light fuel and can be shut off by the cock *n*. In order to cause the valve *k* to open more easily than the valve *h*, either the spring closing the valve *k* has less tension than the spring closing the valve *h* or the light oil tank is positioned on a higher level than the heavy oil tank.

The device functions as follows:

During normal operation with heavy oil the cock *n* is closed, and the pump sucks up fuel from the heavy oil piping through the valve *h* and presses the oil through the pipe *g*<sup>1</sup> towards the nozzle. When the engine is stopped, the pump *a*, the pipings *g*, *g*<sup>1</sup> and the casing *i* will be filled with heavy oil. If the engine is to be started with light oil, the cock *n* is opened, and the pump *a* will then suck up fuel from the pipe *m*. As the pump as well as the piping *g* are filled with heavy oil, the aspirated light oil will not reach the stroke space of the pump *a* and the heavy oil in the stroke space of the pump *a* and in the piping *g* will not be pressed into the nozzle. The casing *i* may be made very small and the cross sections of the piping *g*<sup>1</sup> and the nozzle body kept quite narrow so that a few motions of the lever *d* will suffice to remove the heavy oil from the nozzle *f* and supply the latter with light oil. The piston *b* does not come into contact with the light oil but merely with the heavy oil which is superior to light oil in lubricating quality.

Instead of placing the light oil tank on a higher level than the heavy oil tank or loading the suction valve *k* with a lighter spring than the heavy oil valve *h*, the heavy oil piping may be provided with a cock adapted to be closed during light oil operation, though the construction described is preferred for the reason that it effectively prevents irregularities due to negligence of the attendants who might forget to close the cock in the heavy oil piping.

The casing *i* may be structurally united with the nozzle body or with the body of the pump, in which case provision should be made to retain the pipe *g* between the stroke space of the pump and the pressure valve, the pipe ascending preferably from *h* to *l*.

I claim:—

1. A device of the type described comprising a pump, two inlet ports thereto controlled by suction valves and located in spaced relationship one to the other and at different distances from the pump, a single outlet port therefrom controlled by a pressure valve, and means for selectively causing the pump to pump a fluid from either one of the two inlet ports and discharge the same through the single outlet port.

2. A device according to claim 1 in which the inlet port nearest to the pump is connected with a source of supply of a heavy fuel oil and the more remotely located inlet port is connected with a source of supply of a light fuel oil.

3. A device according to claim 1 in which the two inlet ports are separated from each other by a vertically disposed pipe serving both to connect one inlet port with the outlet port and the other inlet port with the pump.

4. A device according to claim 1 in which the suction valve controlling the more remotely located of the two inlet valves is more easily responsive to the action of the pump than the suction valve controlling the inlet port located closer thereto.

5. A device according to claim 1 in which the inlet port nearest to the pump is connected with a source of supply of a heavy fuel oil and the more remotely located inlet port is connected by a valve-controlled pipe with a source of supply of a light fuel oil.

6. A device according to claim 1 in which the two inlet ports are separated from each other by a vertically disposed pipe which is connected at its upper end with a casing containing the outlet port and one of the inlet ports and serves both to connect said inlet port to the pump and the other inlet port with the outlet port.

In testimony whereof I have affixed my signature.

FRITZ HUBER.