

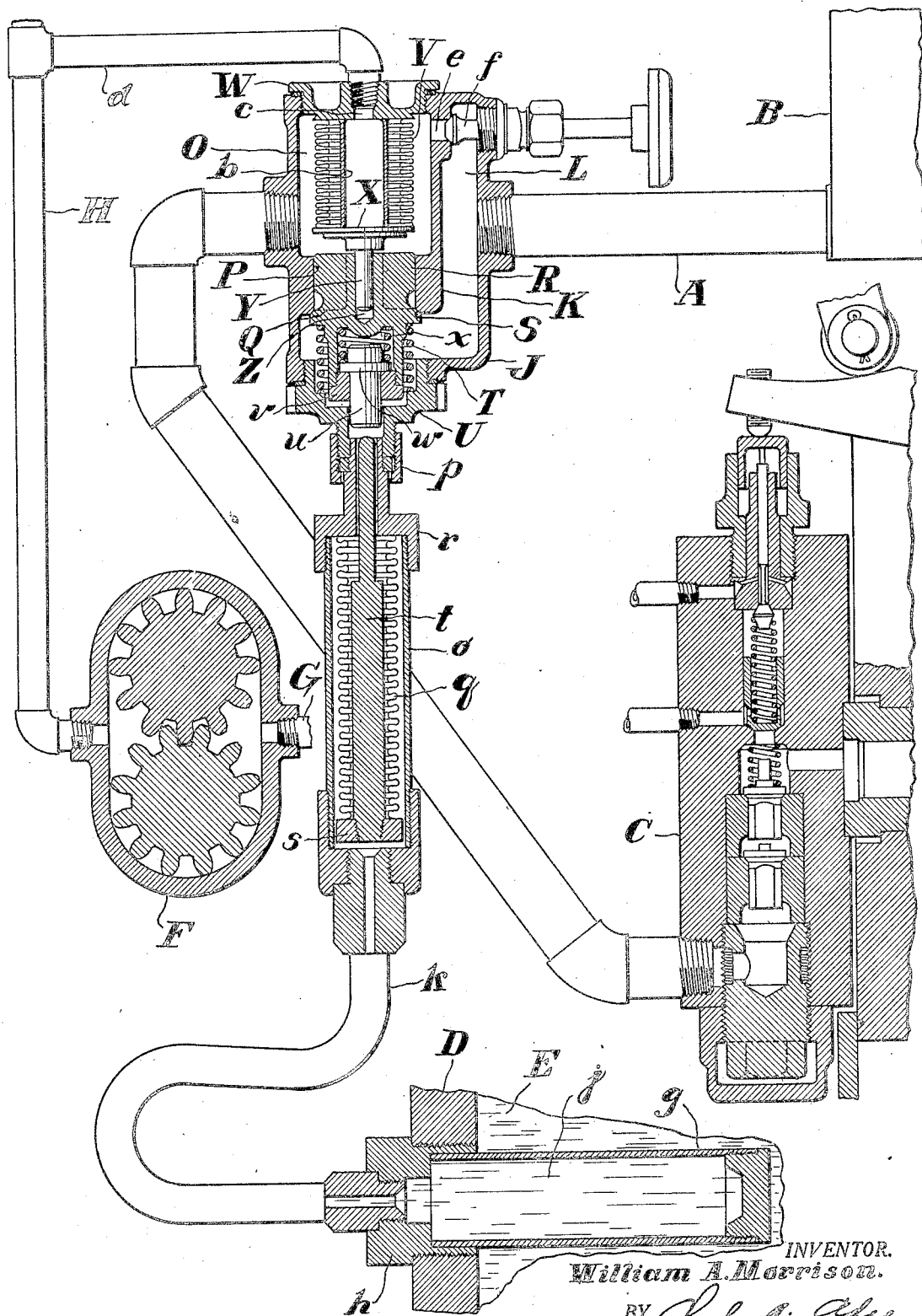
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SAFETY DEVICE FOR OIL INJECTION ENGINES

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SAFETY DEVICE FOR OIL-INJECTION ENGINES

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This invention relates to fuel injection engines, but more particularly to a safety device adapted to be interposed in the fuel line of the engine and actuated by means responsive to the temperature of the liquid used for cooling the engine.

One object of the invention is to cut off the fuel supply to the engine whenever, due to various causes, the temperature of the cooling water reaches a critical point.

Other objects will be in part obvious and in part pointed out hereinafter.

The invention consists of the combination of elements and arrangement of parts substantially as hereinafter described and claimed and illustrated in the accompanying drawing, the figure of which is a diagrammatic sectional elevation of the device connected to an oil injection engine and its lubricating system.

Referring more particularly to the drawing, A designates a fuel line leading from a fuel storage tank B to a fuel pump designated by C. The fuel pump C may be of a well known type and is shown merely for illustrative purposes. Its function is to inject the fuel under pressure into the cylinders of an internal combustion engine, such as an engine D, only a portion of the water jacket E of which is shown.

F designates a lubricating pump of the gear type adapted to force oil under pressure to the various relatively movable surfaces of the engine D. The oil is drawn into the pump F through a pipe G which may lead from a suitable source of supply and is discharged from the pump through a pipe H.

In accordance with the present invention, means are provided for automatically cutting off the supply of fuel to the engine D whenever the cooling liquid in the water jacket E reaches a temperature beyond which it is unsafe to continue the operation of the engine. To this end means comprising a valve casing J is interposed in the fuel line A. Within the casing J is a wall K which divides said casing into a passageway L and a chamber O. The oil from the fuel storage tank B is discharged into the passageway L and, during the normal operation of the en-

gine, flows through a bore P in the wall K into the chamber O from whence it continues through the pipe A to the fuel pump C.

Communication between the chamber O and the passageway L is controlled by a fuel valve Q having in this instance wings R slidable in the bore P whereby the valve Q is guided. At the lowermost end of the bore P is formed a seat S for the valve Q. Preferably a spring T is disposed about the valve to act with one end against the valve and with its other end against a cover U threaded into the lowermost end of the casing J. The spring T may be of a tension to maintain the valve Q closed in the absence of pressure on the valve tending to open it.

Means are provided for automatically opening the valve Q upon starting of the engine in order to permit the flow of fuel from the storage tank B to the engine. This means in the present instance comprises a flexible corrugated diaphragm V disposed in the chamber O and connected at its uppermost end to a head W forming a closure for the chamber. The opposite end of the diaphragm V may be suitably connected to a head X having a stem Y which extends slidably into an aperture Z in the valve Q. A spacer *b* in the form of a sleeve may be attached to the head W to limit the contractile movement of the diaphragm. Preferably, the spacer *b* is of such length that the head X will be spaced a slight distance from the valve Q when the valve Q is closed.

In the head W is formed a passage *c*, a portion of which is threaded for connection to a pipe *d* leading from the discharge pipe H of the lubricating pump F. In order to insure an adequate supply of fuel to the engine D for the purpose of starting the engine, a port *e* is formed in the wall K. The port *e* is controlled by a valve *f* of the globe type which is threaded into the casing J. The function of the valve *f* is merely to admit fuel from the passageway L into the chamber O during the starting period of the engine D, and after the engine and the fuel pump F are set in operation, the valve *f* may again be closed. The valve Q will thereafter be maintained open by pressure from the lu-

bricating pump acting against the head X of the diaphragm V which in turn is pressed against the valve Q to open the said valve. With the valve Q in this position fuel will flow directly from the passageway L through the bore P into the chamber O.

Means are provided for automatically closing the valve Q whenever the cooling liquid in the water jacket E reaches a certain predetermined temperature. To this end an immersion thermometer *g* is inserted in the water jacket E and held in position by a gland *h* threaded into the wall of the water jacket. The thermometer *g* may be filled with any suitable volatile liquid *j* as may also be a tube *k* leading from the thermometer *g* to a cylinder *o* connected at its uppermost end to the cover U by means of a sleeve *p*.

Within the cylinder *o* is disposed a flexible diaphragm *q* connected to a cover *r* of the cylinder *o* and to a head *s* against which the liquid *j* may act for contracting the diaphragm *q*. A stem *t* is threaded to the head *s* and in the extended position of the diaphragm *q* extends through the cover *r* to a point near the uppermost end of said cover. This is the position of the stem *t* during the normal operation of the engine when the cooling liquid in the water jacket E remains below the temperature at which the liquid *j* in the thermometer *g* volatilizes.

The transmission of the movement of the stem *t* is effected through a plunger *u* slidable in a plate *v* threaded in the valve Q. The plunger *u* has a collar *w* on which is seated a spring *x* interposed between the valve and the plunger to cushion the plunger whenever the stem *t* presses thereagainst.

The operation of the device briefly described is as follows: Let it be assumed that the valve Q is in the closed position which it will occupy while the engine D is idle and that there is no pressure in the diaphragm V to act against the valve Q. If then it be desired to start the engine, the valve *f* may be opened to admit fuel, such as oil from the passageway L into the chamber O from whence it will flow through the pipe A to the fuel pump to be injected thereby into the engine in a well known manner.

The valve *f* may remain open until the engine attains sufficient speed to create a pressure in the lubricating system into which the lubricating pump F discharges after which the valve *f* may be closed. When this speed has been reached, lubricant discharged from the lubricating pump F into the pipe H passes through the pipe *d* into the diaphragm V to expand the diaphragm V against the valve Q, thus unseating the valve to admit the fuel from the passageway L through the bore P into the chamber O. This is the course of the fuel from the storage tank B to the engine during the normal operation of the engine. If, however, due to any one of vari-

ous causes the cooling liquid in the water jacket E reaches a critical temperature, the liquid *j* in the immersion thermometer *g* will volatilize and exert a pressure against the head *s* of the diaphragm *q* and press the stem *t* against the plunger *u*.

As the pressure in the immersion thermometer *g* increases due to the temperature increase of the cooling liquid, the stem *t* together with the plunger *u* will continue to rise until a tension is set up in the spring *x* sufficient to close the valve Q against the pressure in the diaphragm V. In this way the supply of fuel to the engine will be automatically cut-off and will remain cut-off until the manually controlled valve *f* is again opened which, of course, will not be done until the condition which caused the high temperature of the cooling liquid has been corrected.

I claim:

1. In combination with an oil injection engine having a fuel supply pipe and a pressure lubricating system, a water jacket on the engine, a valve casing interposed in the supply pipe, a valve in the casing controlling the flow of fuel through the casing, flexible means in the casing actuated by pressure from the lubricating system for actuating the valve in one direction, and temperature responsive means in the water jacket connected to the casing to exert a pressure on the valve for actuating the valve in the opposite direction.

2. In combination with an oil injection engine having a fuel supply pipe and a pressure lubricating system, a water jacket on the engine, a valve casing interposed in the supply pipe, a valve in the casing controlling the flow of fuel through the casing, flexible means in the casing actuated by pressure from the lubricating system for opening the valve, and temperature responsive means in the water jacket connected to the casing to act on the valve for closing said valve whenever the temperature in the water jacket reaches a certain predetermined degree.

3. In combination with an oil injection engine having a fuel supply pipe and a pressure lubricating system, a water jacket on the engine, a valve casing interposed in the supply pipe, a valve in the casing controlling the flow of fluid through the casing, a spring tending to close the valve, flexible means in the casing pressed against the valve by pressure from the lubricating system for opening the valve, and means connected to the water jacket and the casing and responsive to a predetermined temperature in the water jacket to augment the spring for closing the valve.

4. In combination with an oil injection engine having a fuel supply pipe and a pressure lubricating system, a water jacket on the engine, a valve casing interposed in the supply pipe, a valve in the casing controlling

the flow of fluid through the casing, a spring
tending to close the valve, flexible means in
the casing pressed against the valve by pres-
sure from the lubricating system for opening
5 the valve, means connected to the water jacket
and the casing and responsive to a predeter-
mined temperature in the water jacket to aug-
ment the spring for closing the valve, and a
spring pressed plunger in the casing for trans-
10 mitting the movement of said means to the
valve.

5. In combination with an oil injection en-
gine having a fuel supply pipe and a pressure
lubricating system, a water jacket on the en-
15 gine, a valve casing interposed in the supply
pipe, a wall in the casing dividing the cas-
ing into a passageway and a chamber, a bore
in the wall affording communication between
the passageway and the chamber, a valve
20 controlling the bore, a spring in the casing
tending to close the valve, flexible means
in the chamber actuated by pressure from
the lubricating system for opening the valve,
temperature responsive means in the water
25 jacket connected to the casing for closing the
valve whenever the pressure within said
means exceeds the pressure in the lubricating
system, a port in the wall, and a manually
operable valve controlling the port for selec-
30 tively affording communication between the
passageway and the chamber.

In testimony whereof I have signed this
specification.

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