

UNITED STATES PATENT OFFICE.

MORRIS F. STEIN, OF PHILADELPHIA, PENNSYLVANIA.

SWITCH.

Application filed January 9, 1922. Serial No. 527,853.

To all whom it may concern:

Be it known that I, MORRIS F. STEIN, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented new and useful Switches, of which the following is a specification.

The object of my invention is to provide a novel switch or detector for the purpose of testing the ignition system in any cylinder of an internal combustion engine of conventional type, such as are commonly used in automobiles, trucks or other self-propelled vehicles.

Another object of this invention is to provide novel means for testing the coils or spark plugs or grounded or disconnected wires on any ignition or wiring system.

It further consists of other novel features of construction, all as will be hereinafter fully set forth.

For the purpose of illustrating my invention, I have shown in the accompanying drawings a form thereof which is at present preferred by me, since it will give in practice satisfactory and reliable results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my invention is not limited to the precise arrangement and organization of these instrumentalities as herein shown and described.

Figure 1 represents a fragmentary perspective view of an instrument board of a motor vehicle, showing my invention attached to the dash thereof.

Figure 2 represents a section on line 2—2 Figure 1.

Figure 3 represents a section on line 3—3 Figure 2.

Figure 4 represents a section on line 4—4 Figure 3.

Figure 5 represents a side view of my invention.

Figure 6 represents a fragmentary view showing one of the knife blades in a neutral position.

Figure 7 represents a wiring diagram.

Similar numerals of reference indicate corresponding parts.

1 designates my novel switch or detector, which is applicable to the gas engine or ignition system of a motor vehicle, aeroplane or the like.

In Figure 1 my invention is shown as

attached to the instrument board of a motor vehicle, the detector 1 comprising a casing or shell 2, having the lugs 3 thereon, through which suitable fastening devices pass.

4 designates an insulated disc which is fastened to the inner periphery of the casing 2 in any conventional manner, said disc being adapted to support the bolt 5 on which are rotatably mounted the knife blades 6, 7, 8 and 9, said blades being held in assembled position by a nut or the like.

10, 11, 12 and 13 designate the switch contacts, which receive said knife blades 6, 7, 8 and 9, said contacts, being electrically connected to the lead wires of the spark plug circuit.

14, 15, 16 and 17 are sockets or contacts of the same type, but are connected to the coil box, which may be seen more clearly from Figures 1, 3 and 7.

Each knife blade has the oppositely located contact lugs 18 and 19, and projects through the slots 20 of the casing 2 and terminates in the insulated knobs or handles 21, whose lower portion 22 fits tightly against the both sides of the offset portions of the slots 20, thus frictionally maintaining the same in any position desired.

Both the spark plug and coil contacts are fastened to the disc 4 by the binding posts composed of the screws or bolts 23 and nuts 24.

25 designates radially arranged insulated separators adapted to separate and insulate the coil and spark plug sockets to prevent any possible short circuiting.

26 represents an inner cylindrical insulated lining, used to insulate the casing from the circuits.

The recess 27 in the insulation 4 is adapted to receive the member 28, the spring 29 and the plunger 30, said members comprising a ground circuit, grounded by way of the casing 2 and the screws 31 to the instrument board, as shown in Figure 2.

When the instrument board is of some insulating material, a wire 33 is used to ground to the cylinder.

34 designates a rear insulating disc used to insulate all wires, from the instrument board.

The casing 1 is constructed in a novel manner, having a flanged annulus 35 in engagement with its front, said annulus holding the glass, mica or any other transparent material 36 therein.

June 17, 1924.

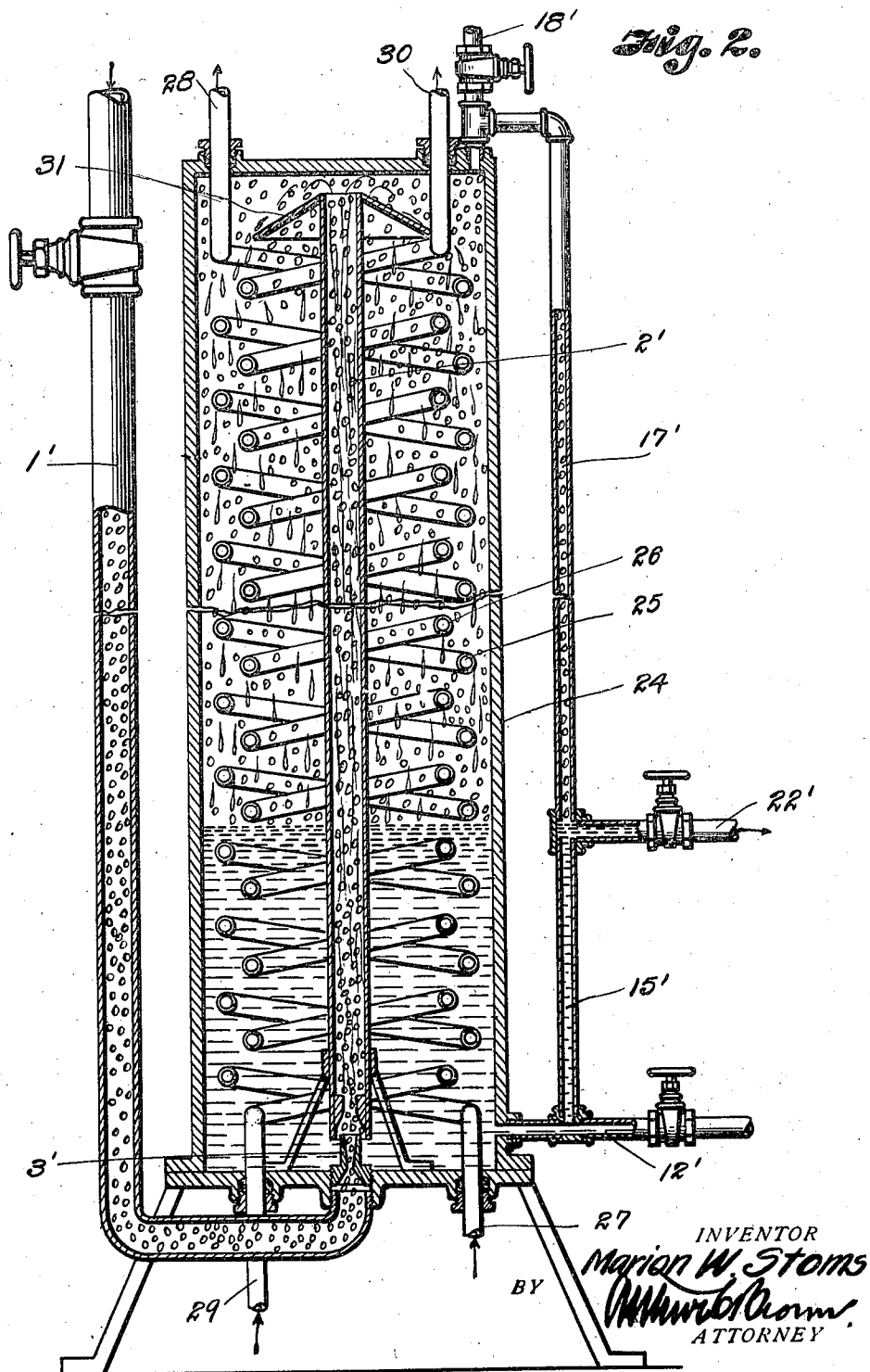
1,498,408

M. W. STOMS

FLOODED SHELL TYPE CONDENSER

Filed Aug. 12, 1922

2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE.

MARION W. STOMS, OF OMAHA, NEBRASKA, ASSIGNOR OF ONE-HALF TO LEIGH W. MORRIS, OF KANSAS CITY, MISSOURI.

FLOODED SHELL-TYPE CONDENSER.

Application filed August 12, 1922. Serial No. 581,442.

To all whom it may concern:

Be it known that I, MARION W. STOMS, a citizen of the United States, residing at Omaha, in the county of Douglas and State of Nebraska, have invented certain new and useful Improvements in Flooded Shell-Type Condensers; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

This invention relates to flooded shell type condensers for refrigerating systems; that is, the invention has to do with a condenser in which the refrigerant is converted from the gaseous or vapor phase to a liquid phase.

The refrigerant comes from a compressor or generator in the vapor or gaseous phase and it is condensed by the condenser into a liquid phase before it is passed to the evaporating coils.

My invention particularly contemplates a construction wherein an economical and efficient conversion can take place and it particularly contemplates the provision of means for showering the refrigerant over the cooling surface of the condenser to obtain a baudelot effect so that the finely divided refrigerant as it showers or rains over the cooling surface may have its heat absorbed by the cooling surface, the refrigerant being not only condensed but cooled below its critical temperature so it will be in prime condition to be discharged into the evaporating coil, the bottom of the condenser serving as an accumulator or receiver; the level of the refrigerant in the liquid phase being controlled by the discharge pipe which leads from the condenser to the evaporating coils.

The novel features of the invention will be more particularly understood by reference to the following description in connection with the accompanying drawings, in which:

Fig. 1 is a vertical, longitudinal, sectional view of the preferred form of the condenser, and

Fig. 2 is a similar view of a slightly modified form of condenser.

The refrigerant, for example, ammonia in the gaseous or vapor phase is discharged

from the compressor (not shown) into a gas supply pipe or lead 1, which discharges directly into a stand pipe 2 through the injector nozzle 3. The stand pipe 2 is located within the condenser shell or casing 4 and it is shown as having its lower end spaced from the bottom of the shell, being supported by legs 5 and 5' although any other suitable means may be utilized for supporting the stand pipe.

The stand pipe extends nearly to the top of the casing where the refrigerant is discharged against a directional wall 6, shown as concave with a centrally located cone 7 pointed in the direction of the discharge end of the stand pipe. The directional wall or baffle bends the stream lines of the fluid discharged from the stand pipe 2 over a coil of pipe 8 in a shower or spray, the coil of pipe 8 constituting a conduit for the cooling water supplied to the condenser.

The bottom portion of the shell 4 constitutes a liquid chamber 9 and I prefer to maintain the level of the liquid at about one-fifth the height of the shell 4. The injector nozzle will inject the gas into the stand pipe 2 at a considerable velocity, sucking in the liquid to combine with the gas to assist in the condensation of the gas to convert it from the gaseous phase to the liquid phase.

It is well known that the ammonia has a characteristic that when, if in the vapor phase, it comes into contact with a body of its own liquid, it will have a tendency to condense or combine with it; therefore, some of the vapor will be condensed by the liquid in the pipe 2 but whatever the resultant of combining the contents of the pipe 1 with the liquid in the bottom of the shell 4, it will be finally liquid after it has been showered over the cooling coil 8. It will be observed that the cooling coil is fed with cooling liquid from the pipe 10 and that after the liquid passes through the pipe 10, it discharges through the pipe 11.

There is an outlet for the condenser consisting of the pipe 12 whereby the condenser may be drained. The valve 13, however, in the pipe 12, will normally be closed. The pipe 15 is connected to the pipe 12 and rises to about the point at which the level 16 of the liquid is to be maintained and it is connected to a vapor pipe 17, communicating with the top of the condenser at 18, there

also being a purge pipe 19 provided with a valve 20, as will be well understood. The pipes 15 and 17 are connected by a T-fitting 21 and to the T-fitting is connected a pipe 22 leading to the evaporating coil. In the pipe 22 is a valve 23.

The gas passing from the compressor is conducted through pipe 1, through the injector nozzle 3 directly into the stand pipe 2. The injector nozzle will induce liquid under pressure into the stand pipe 2 to combine with the ammonia in the vapor phase. Therefore, the intermixed ammonia, vapor and liquid will be forced through the top of the stand pipe 2 which terminates short of the top of the shell 4, the resultant issuing from the stand pipe being sprayed against the reflector wall or baffle 6, the stream being divided in all directions by the point 7. Therefore, the combined vapor and liquid will shower down over the coils, producing a baudelot effect so that the refrigerant will be cooled considerably below its critical temperature by the time it enters the chamber 9.

Since the height of the shell is sufficient to allow a certain time element to enter into the condensation of the gas issuing from the stand pipe 2 and since liquid will be sprayed down over a considerable area, it will be apparent that by the time the refrigerant reaches the bottom of the shell 4, it will be thoroughly condensed below its critical temperature. The purge pipe is well understood as is also the pipe 17.

Since the outlet pipe 22 is above the bottom of the casing 4, it is apparent that the liquid in the casing or shell 4 will be maintained at about the height of the T-fitting, which I prefer to be about one-fifth the height of the shell tower or casing 4. Therefore, a constant supply of liquid in the chamber 9 will be assured because it cannot escape from the casing unless the valve 13 is opened to permit the liquid to discharge through the pipe 12. The condenser is quite simple in construction and efficient in operation.

A slightly modified form of the device is shown in Fig. 2 in which 24 designates a shell in which there is a double coil consisting of the pipes 25 and 26, the pipe 25 having an inlet 27 and an outlet 28 and the pipe 26 having an inlet 29 and an outlet 30. The cooling water passes through these coils after the manner described with respect to the coils 8 in the preferred form.

The refrigerant in the gaseous phase is fed into the pipe 1' from the compressor and enters a stand pipe 2' through an injector nozzle 3'. The stand pipe receives its supply of liquid from the bottom of the shell or casing. The stand pipe discharges into the top of the shell tower or casing and distributes the combined vapor and liquid

over a showering dome or baffle 31 so that the resultant issuing from the stand pipe 2' will shower over the coils 25 and 26. The liquid refrigerant can pass from pipe 12' at the bottom of the shell to pipe 15' to discharge pipe 22' and to the evaporating coils. The pipe 17' corresponds to the pipe 17 in Fig. 1 and the purge pipe 18' corresponds to 18 in Fig. 1.

In the form shown in Fig. 2, the gas traveling through pipe 1' will go through the injector nozzle 3' with sufficient velocity to draw in the liquid from the bottom of the shell so that the liquid will be forced under pressure through the top of the stand pipe into the condenser, as will be clearly seen by reference to Fig. 2.

The important feature of the constructions shown in Figs. 1 and 2 is that the liquid is showered over the cooling coils or cooling surfaces and that there is sufficient time due to the space above the liquid to allow a complete conversion from the vapor or gaseous phase to the liquid phase within the condenser shell.

Attention is called to the fact that a very intimate and thorough mixture is secured between the gas and liquid due, first, to both passing through the injector nozzle; second, to the pulsating effect caused by the reciprocating compressor pistons now commonly used, and third, by the sudden contraction of the gas globules due to the instantaneous cooling when brought into contact with the cold liquid ammonia as well as by the condensation of part of the gas which produces a tremendous drop in pressure at that immediate point for an instant, causing a rush of gas and liquid to produce equalization.

The incoming gas follows the natural tendency of any gas injected into liquid and breaks into a great number of small globules which expose the largest possible cooling surface as the entire surface of the globules is in direct contact with the cold liquid during its passage through the injector and stand pipe.

I do not accomplish a complete condensation of the incoming gas between the ejector and the discharge end of the stand pipe. There is a mixture of saturated gas and liquid ammonia flowing upward from the stand pipe which is forced against the deflector surfaces of the shell in either form shown in Figs. 1 and 2. The mixture is deflected by the deflector and gravitates through a saturated gas which fills the top of the condenser shell. Part of this mixture impinges against the cooling coil and drops downward from coil to coil to the liquid below.

This is the most important feature of the condenser—the downward spray or rain of liquid ammonia through a saturated gas and over a series of cooling pipes. The sat-

urated gas is in the final stage before changing to liquid and is very susceptible to the cooling effect produced by the rain or shower of liquid ammonia about the dripping coils. At this point a maximum cooling surface is provided for the liquid discharged from the stand pipe as it returns to the bottom of the condenser after having been introduced into the top thereof from the stand pipe. Each drop is exposed to a considerable surface and a considerable cooling effect during its downward passage.

I recommend that the tower or condenser shell be of sufficient height that it will measure about five times the height of the liquid in it because, in actual practice, I have found this proportion to insure a minimum condensing pressure or a maximum in capacity. If the condenser is too short, there is not sufficient time for the exchange of heat between the liquid and the gas. In order to obtain the best results, the condenser must be high enough to bring about a complete transfer of heat from the gas to the liquid in passing through the stand pipe and falling down through the condenser to the liquid contained in the bottom of the condenser shell. The stand pipe outlet should be just close enough to the condenser head to secure a slight impact of the liquid being expelled therefrom. The liquid must be carried as low as possible in the shell and still be sufficient to give an abundant supply of cold liquid for the injector.

I have found that where the gas pressure before the injector exceeded the pressure within the condenser by approximately one and one-half to two pounds gauge very satisfactory results were obtained. By increasing the liquid height slightly, the difference in pressure became quite marked and the condenser pressure increased considerably, or if the level of the liquid was reduced very much, a like result was obtained.

It has been customary in flooded type condensers to fill them from two-thirds to three-fourths full. I have found this is not as good practice as maintaining the level of the liquid in the condenser about one-fifth to one-fourth the height of the condenser. In other words, I have found in my own condenser that by filling the shell approximately three-fourths full I secured an increase of about twenty-five pounds in condenser pressure over the pressure existing with the shell one-fifth full and performing the same amount of work.

As an example of the increased efficiency of my condenser over those ordinarily used, I will state that it has commonly been accepted as good practice to figure a transmission of sixty B. t. u. per square foot of exchange surface per hour for one degree mean difference. I have actually secured a transmission of three hundred and sixty B.

t. u. per square foot per hour for one degree mean difference and this I attribute largely to proportioning the condenser shell so that the condensing chamber area above the liquid is considerably greater than the capacity of the liquid chamber or space at the bottom of the shell. Therefore, I recommend that a relatively low liquid level be maintained in the condenser shell.

What I claim and desire to secure by Letters Patent is:

1. In a flooded shell type condenser for refrigerating systems, a shell, a cooling coil in the shell, a stand pipe communicating with the bottom of the shell and discharging into the top thereof, means for injecting a refrigerant into the stand pipe in a gaseous phase under pressure to co-mingle with liquid refrigerant passing from the bottom of the shell into the stand pipe, and means in the top of the shell to shower the combined liquid and gaseous refrigerant over the cooling coil so that the gaseous and liquid refrigerant discharged from the stand pipe will be distributed over the cooling coil in a film or spray to cause a drop in temperature of the refrigerant before it is received into the bottom of the shell.

2. In a flooded shell type condenser for refrigerating systems, a liquid-containing shell, a cooling coil in the shell, a stand pipe communicating with the bottom of the shell below the liquid level and discharging into the top thereof, means for injecting a refrigerant into the stand pipe in a gaseous phase under pressure, means in the top of the shell to shower the combined liquid and gaseous refrigerant over the cooling coil so that the gaseous and liquid refrigerant discharged from the stand pipe will be distributed over the cooling coil in a film or spray to cause a drop in the temperature of the refrigerant before it is received into the bottom of the shell, and a discharge pipe connected to the condenser shell to communicate with the evaporator coil, the discharge pipe maintaining a constant level of liquid in the bottom of the shell.

3. In a flooded shell type condenser for refrigerating systems, a liquid-containing shell, a cooling coil in the shell, a stand pipe communicating with the bottom of the shell below the liquid level and discharging into the top thereof, means for injecting a refrigerant into the stand pipe in a gaseous phase under pressure, means in the top of the shell to shower the combined liquid and gaseous refrigerant over the cooling coil so that the gaseous and liquid refrigerant discharged from the stand pipe will be distributed over the cooling coil in a film or spray to cause a drop in temperature of the refrigerant before it is received into the bottom of the shell, and means for maintaining

a relatively shallow liquid level in the shell, the liquid level in the shell being maintained at a point above that at which the refrigerant in the liquid phase passes into the stand
5 pipe.

4. In a flooded shell type condenser for refrigerating systems, a liquid-containing shell, a cooling coil in the shell, a stand pipe communicating with the bottom of the shell
10 and discharging into the top thereof, means for injecting a refrigerant into the stand pipe in a gaseous phase under pressure to co-mingle with liquid refrigerant discharged from the bottom of the shell into the stand
15 pipe, means in the top of the shell to shower the combined liquid and gaseous refrigerant over the cooling coil so that the gaseous and liquid refrigerant discharged from the stand pipe will be distributed over the cooling
20 coil in a film or spray to cause a drop in temperature of the refrigerant before it is received into the bottom of the shell, and means for maintaining a constant liquid level in the shell not to exceed one-fourth
25 the capacity of the condenser shell.

5. In a flooded shell type condenser for refrigerating systems, a shell, a cooling coil in the shell, a stand pipe communicating with the bottom of the shell and discharg-
30 ing into the top thereof, means for introducing a refrigerant in the gaseous phase into the stand pipe under pressure to co-mingle with the liquid refrigerant received from

the bottom of the shell, a baffle in the top of the shell against which the resultant from
35 the stand pipe discharges so that the resultant will be showered over the cooling coil in the shell, and means for maintaining a constant liquid level in the bottom of the shell.

6. In a flooded shell type condenser for refrigerating systems, a shell, a cooling coil in the shell, means for injecting a refrigerant in the pipe in a gaseous phase under
40 pressure to contact with the cooling coil and means for maintaining a constant liquid level in the shell, the liquid level in the shell being maintained at a point above that at which the refrigerant in the gaseous phase enters the shell so that the refrigerant in
45 the gaseous phase will co-mingle with the refrigerant in the liquid phase within the shell and then contact with the cooling coil.

7. In a flooded shell type condenser for refrigerating systems, a liquid containing
50 shell, a cooling coil in the shell, a stand pipe in the shell surrounding an opening in the bottom thereof, means for introducing a refrigerant in the stand pipe in a gaseous phase under pressure to co-mingle with
55 liquid refrigerant discharged from the bottom of the shell into the stand pipe and means for maintaining a constant level of liquid refrigerant in the shell.

In testimony whereof I affix my signature.
MARION W. STOMS.