INSTRUCTIONS

for operating the

Stanley

STEAM CAR

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Stanley Steam Car

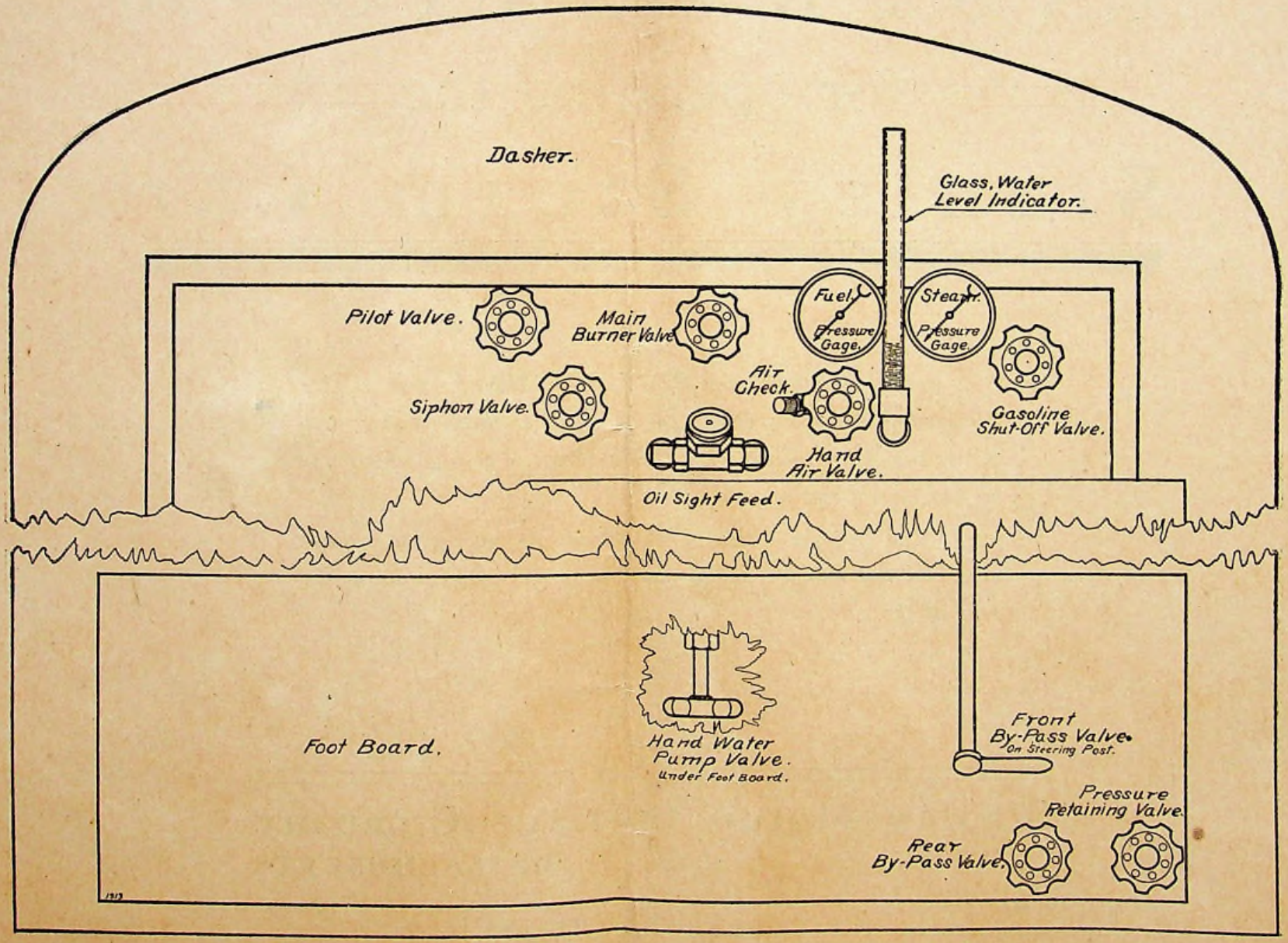
In ordering parts for STANLEY CARS, be sure to give the number and name of the part wanted, as these numbers and names are listed in our Price List of Parts, a copy of which may be had on application.

Also, give the name of the model, the year of manufacture, and the number of the car as on the name plate at the rear of the car.

1913

Stanley Motor Carriage Company

NEWTON : : : : : MASSACHUSETTS


Dasher.
Glass, Water Level Indicator.
Pilot Valve.
Main Burner Valve
Fuel Pressure Gage.
Steam Pressure Gage.
Air Check.
Siphon Valve.
Gasoline Shut-Off Valve.
Hand Air Valve.
Oil Sight Feed.
Foot Board.
Hand Water Pump Valve.
Under Foot Board.
Front By-Pass Valve.
On Steering Post.
Pressure Retaining Valve.
Rear By-Pass Valve.

To Steam Up

FIRST be sure that there is plenty of *water* in the *boiler,* and see that there is about 120 pounds pressure on the fuel pressure gauge; and that the Prest-O-Lite tank is connected to the acetylene torch line by the rubber tube connection.

Lift the hood lid and smoke bonnet lid, open the Prest-O-Lite tank valve, and light the acetylene torch with a match, placing the torch so the flame strikes the pilot vaporizer.

After from 15 to 30 seconds, or when the pilot vaporizer is sizzling hot, open pilot valve, light pilot by moving the torch so the flame will enter the peek hole; then move the torch back so the flame will strike the upper part of the vaporizer for 15 to 30 seconds longer, or until the main burner nozzles are sizzling hot.

Then close Prest-O-Lite tank valve, open the main burner valve and close it immediately, repeating this until the gas from the main nozzles is dry, then leave the valve open:

Connect the tire pump to the air check valve, and pump about fifty strokes of air into the pressure tank, leaving the pressure retaining valve closed.

If the boiler is too full of water, open the blow-off valve and draw out some, opening the throttle valve at the same time so as to give vent to the boiler.

It is good practice to open the steam chest drip valve and open the throttle a little with the emergency brake set, while raising steam, and when the pressure reaches 50 pounds, to run the car back and forth on the floor a few times, and thus warm the engine and free the steam pipe, steam chest, and cylinders from water; and to start as soon as there is sufficient steam pressure to drive the car.

When starting out on the road, open the main burner valve wide, that is, give it one or two complete turns, also the pressure retaining valve.

It is easily possible to fire up in from 5 to 15 minutes, depending on the size of boiler and expertness of the operator, and this time may be utilized in doing things that should be done, such as oiling, filling oil tank, water tank, etc.

There should be no fire burning while filling the gasolene tank.

While running, the operator should control the supply of water to the boiler by operating the by-pass valves.

To force the water from one pump to the boiler, close the front by-pass valve.

To force the water from both pumps to the boiler, close both by-pass valves.

If the front by-pass valve is open, no water is forced to the boiler, whether the rear one is closed or open.

The by-pass valves should be so operated as to maintain a medium height of water in the glass level indicator.

Remember that when the water is low in the boiler it is high in the glass, and *vice versa,* when it is high in the boiler it is low in the glass.

When stopping the car for any length of time, close the main burner and pressure retaining valves, in fact it is well to close the main burner valve just before stopping, and when through with the car for the day, close also the pilot valve. This will leave the car in normal condition for steaming up the next time.

The Burner

In a steam car the source of all power is the heat produced in the burner. Therefore, a good burner in perfect condition is the first essential, and to give good results it must have a supply of gasolene flowing freely to it under the proper pressure.

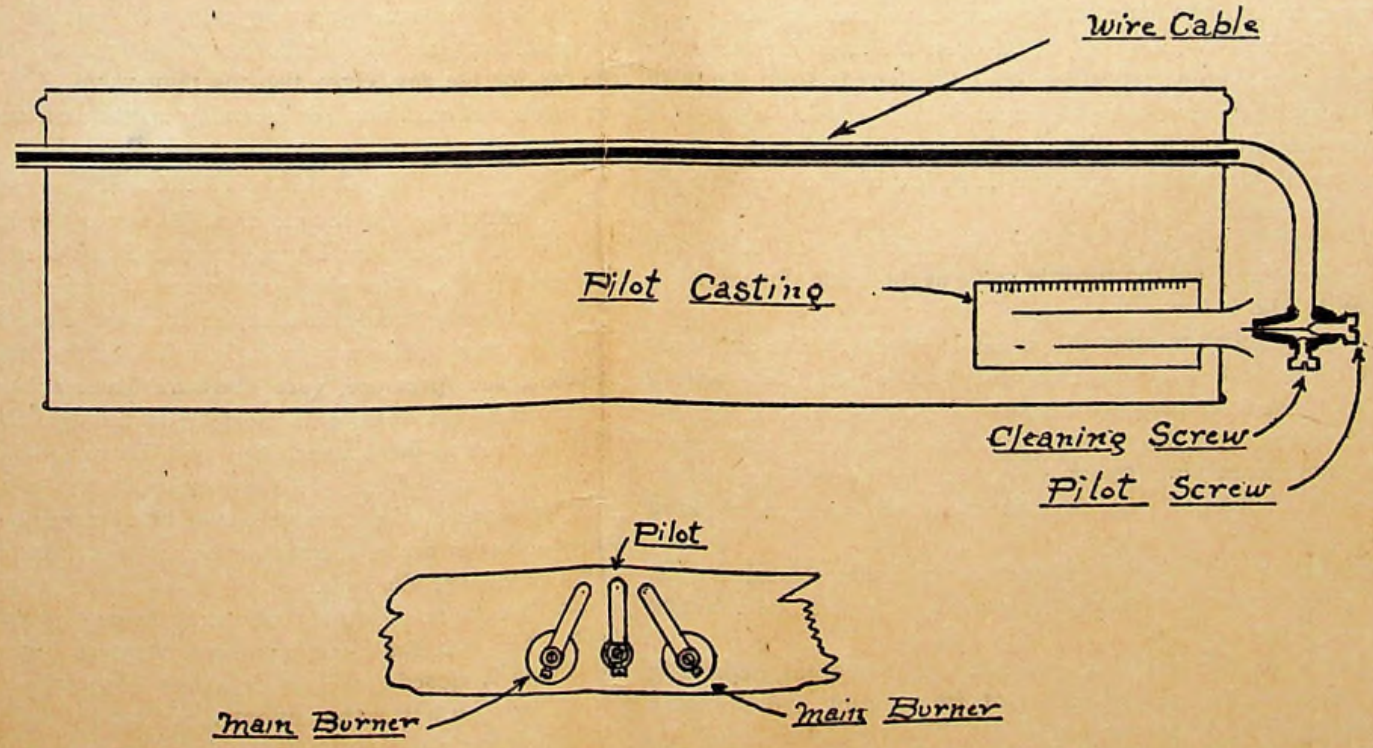
If the main fire is not good, it indicates that either there is insufficient fuel pressure, (see Pressure Tank article), some valve or automatic not open, or a clogging in the gasolene line from the pressure tank to the burner. See that the small holes in the vaporizer nozzles are clean. If they are not, they can be cleaned by running a small wire through them, after taking out the vaporizer screw. Never use a reamer or broach for this purpose, as it is likely to enlarge the hole.

See that the main burner valve and the gasolene shutoff valve are open. See that the steam pressure is not so high that the steam automatic is closed, (see Boiler article Hydraulic Pressure.)

See that the low water automatic is not hot. (See Low Water Automatic article.)

If there is a clogging in the gasolene line, it should be easily located as follows. With all the fire out, take out the vaporizer

Section of Burner
showing
Plan of Pilot Light



The Burner (*Continued*)

screws, open the main burner valve, and see if there is a good flow of gasolene. If there is not, it indicates that the clogging is farther back. Then disconnect the copper tube from the vaporizer at the back of the burner, and try it there. And so on, disconnecting at each union, back in the line, to the main burner valve. When necessary to go back further, use the gasolene shutoff valve.

To clean the vaporizer, after disconnecting the copper tubes at the back of the burner, take off the stub ends and with pliers draw out the wire cables and clean them. Take out the vaporizer screw, and use the air pump to blow out any loose particles in the tubes. If the vaporizing coil clogs, it may be necessary to replace it.

To clean the gasolene filter, do not attempt to take it apart on the car, but disconnect the copper tube unions and screw it off from the gasolene shutoff valve. Put one square in a vise, and with a wrench on the other square, screw it apart. Clean the wire screen and replace the absorbent cotton with new.

If, when starting to fire up, the main burner valve is opened too quickly, the rush of gasolene may flood the burner, or if there is a slight leak in the main burner valve or in the vaporizer, the burner chamber may become filled with a mixture of air and gasolene so rich that it will not burn inside, but only where it oozes out to the air. The remedy in this case is to get some air into the burner. This can be done by using the air pump to force air in through the mixing tubes.

Sometimes, after stopping a car or while coasting down a hill and the automatic valve closes, the pressure of the gas at the nozzles of the burner will be gradually reduced, so that the gas will ooze out at a very low velocity. Under these conditions, the burner may light back with a slight explosion; that is, the gas will light at the nozzles; then when the automatic valve opens, the fire may continue to burn inside the burner and mixing tubes, with a roaring sound. If this is allowed to continue, it will ruin the burner, burning or melting the iron. To prevent this, when the roaring sound is heard, the main burner valve should be closed for a few minutes, and then when it is re-opened the fire should light in the proper place on top of the burner casting.

Sometimes, when the burner lights back, it will do so with a light popping. The ordinary cause for this is that the two main burner nozzles are not flowing equally, one of them being partially or wholly clogged up. See that they are made to flow evenly.

If the burner lights back with a loud popping, and this takes place often, it would indicate that there was either a leak around the burner casing, a leak in the vaporizer or burner casting, or a leak of steam in the boiler or superheaters over the burner. See that there are no air leaks around the burner casing, that the asbestos between the casing and the boiler is air tight, that the peek hole cover is closed, and that the fusible plug hole through the casing is packed with asbestos. If the popping continues, with full steam pressure on the boiler, take off the burner and examine the boiler. Then run the front wheels up against something immovable, and open the throttle valve so as to get a pressure of steam on the superheaters, and examine them. See that the burner casting is not cracked. If it is, it should be replaced. See that there is no leak between the burner casting and the sheet iron bottom which is crimped over the edge of the casting.

The size of the holes in the main burner nozzles should be as follows:

18" No. 64 drill
23" No. 62 drill
26" No. 60 drill

If they become larger pean the end of the nozzle until the holes are too small. Then ream them out to the right size. If they are too large it will increase the tendency of the burner to "whistle."

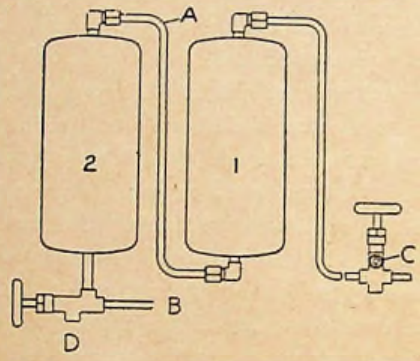
The Pilot Light

The hole in the pilot nozzle is the same size as in the main nozzle, but the pilot vaporizer screw has a wire in the end of it which goes through the hole and practically fills it. This wire is filed off slightly on one side to give sufficient opening so that the proper amount of gas will go to the pilot burner.

The pilot light should be as strong as it can be, and not raise steam while standing with full pressure on the fuel. It is good practice to take out the pilot screw and clean the wire before firing up each time.

If the pilot gets weak, with a screw driver turn the screw back and forth. This revolves the wire in the hole and cleans it. This is done with the pilot alone burning.

The Pressure Tanks

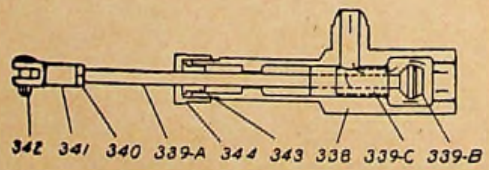


A is the pipe connecting the two tanks.

B is the pipe through which the gasolene is pumped.

C is a valve through which air is pumped.

D is a valve for drawing the gasolene out when desired.



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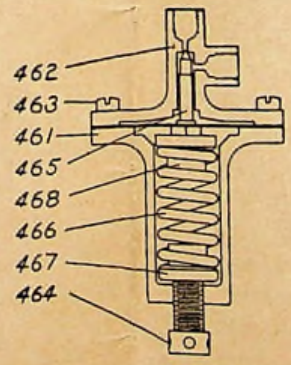
The Throttle Valve



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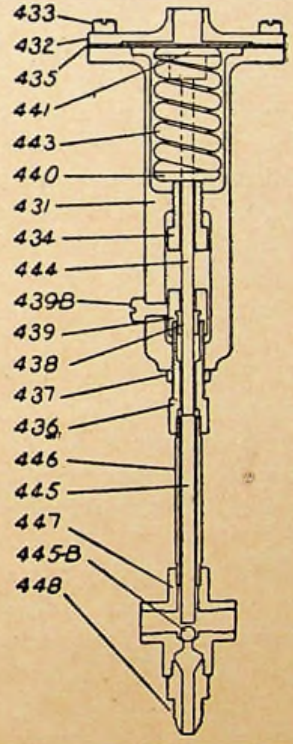
The Gasolene Automatic



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The Steam Automatic

The Pilot Light (*Continued*)

If the pilot light burns with a yellow, smoky flame, it indicates that it does not get air enough. If it burns with a very blue flame and "lifts" from the burner, it indicates that it gets too much air. The amount of air is regulated by the position of the nozzle in relation to the mixing tube. To give it more air, pull the nozzle further out from the mixing tube. To give it less air, push it in. This can be done by bending the pilot vaporizer tube slightly. The pilot light should burn with a blue flame, slightly tinged with yellow, and should lay down close to the burner casting. The pilot light should be adjusted when hot; that is, under road conditions.

It is the custom of many Stanley car owners when using the car every day, to leave the pilot light burning over night.

To do this, see that the boiler is well filled with water, that there is no leak from it through the throttle or other connections, and no leak of gasolene anywhere, and that the main burner and pressure retaining valves are closed with full pressure on the fuel.

Under normal conditions, the pilot light should burn for from twelve to fifteen hours.

If the pilot light should go out, on the road, shut the main and pilot valves and run the car a short distance, to clear the burner from gas. Then lift the hood lid and smoke bonnet lid and relight it.

The Pressure Tanks

The purpose of the pressure tanks is to supply the burner with gasolene under pressure, and avoid carrying a pressure on the larger quantity of gasolene in the main tank.

While running, more gasolene is pumped from the main tank to the pressure tanks by the power gasolene pump than the burner requires, and the surplus escapes through the gasolene automatic back to the main tank, thus maintaining a constant pressure on the fuel.

A quantity of air is carried in the pressure tanks in order to maintain a pressure on the fuel while the car is standing, with the pilot light burning. The amount of air required is a matter of volume rather than pressure.

Starting with the tanks empty, that is full of air at atmospheric pressure, if air is pumped in until the gauge registers 15 pounds, then gasolene pumped until the tank No. 2 is full of gasolene, the gauge will register about 45 pounds. If enough more gasolene is pumped to fill tank No. 1 half full, the gauge will register about 105 pounds. Then the 1½ tanks of gasolene can be drawn out, or can be burned in the pilot light before the gauge pressure will fall to 15 pounds again, provided there is no leak, and no air is absorbed by the gasolene.

Gasolene in contact with air under pressure will absorb some of the air, and this should be replaced.

As suggested in the article "To Steam Up," if about fifty strokes of air is pumped in while firing up each time, it will maintain about the right amount of air.

If the hand of the fuel pressure gauge vibrates while running, it indicates that there is little or no air in the pressure tanks.

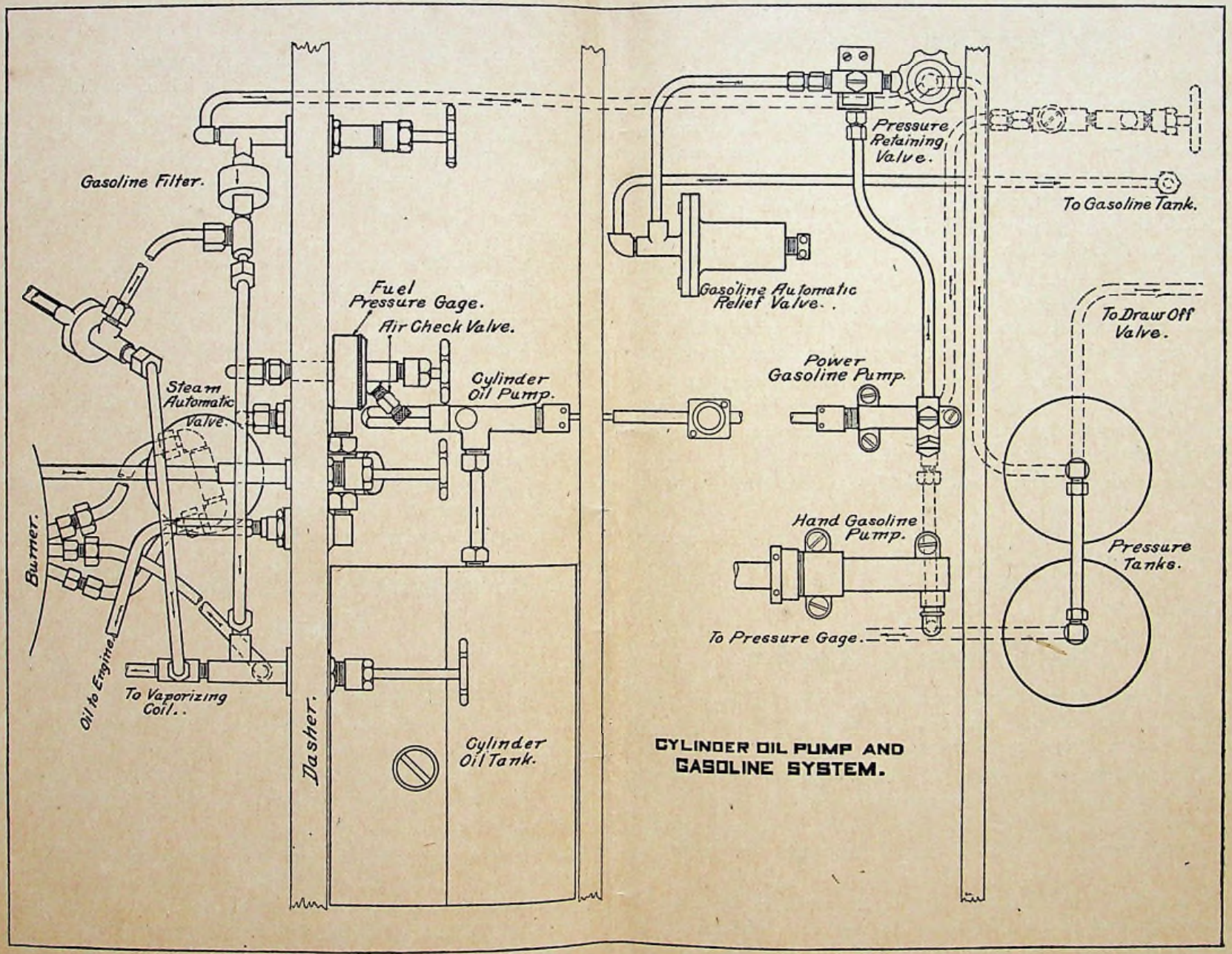
The purpose of the pressure retaining valve is to prevent any gasolene from escaping, by leakage, through the gasolene automatic, or check valves. It should be closed at all times except when running or pumping gasolene by hand.

The Gasolene Automatic Relief Valve

The purpose of this, commonly called the gasolene automatic, is to maintain a constant pressure on the fuel.

The spring holds the valve closed until the pressure overbalances it and opens the valve, allowing some gasolene to pass from the pressure tanks back to the main tank. To carry higher fuel pressure screw the adjusting screw farther in. Lower pressure farther out.

If the Gasolene Automatic does not shut tight there may be dirt or sediment on the seat. It can usually be cleaned out by backing out the adjusting screw so there is no tension on the spring, then working the hand gasolene pump leaving the pressure retaining valve closed. If this is not effective, it should be taken apart, cleaned, and if necessary the valve ground in.



CYLINDER OIL PUMP AND GASOLINE SYSTEM.

The Steam Automatic Valve

The purpose of this, commonly called the steam automatic, is to control the steam pressure in the boiler, by shutting off the supply of gas to the main burner when the pressure reaches the desired point. The spring holds the valve open until the steam pressure over-balances it and closes the valve, shutting off the gas to the main burner. When the steam pressure is reduced slightly the valve opens and the gas flowing to the main burner lights from the pilot light. To carry higher steam pressure, screw the adjusting screw farther in. Lower pressure, farther out.

To set the steam automatic valve loosen the lock nut and screw the body up until the valve closes, then turn it back three-quarters of a revolution and set the lock nut.

The stuffing box nut should not be screwed down harder than necessary to prevent leakage, as it would increase the friction on the valve stem, and thus require more variation of steam pressure to operate it.

If water leaks through the adjusting screw, it indicates that the diaphragm is cracked and a new one needed.

The Boiler

If the fire is started when there is no water in the boiler, or the boiler is allowed to run dry with the fire burning, the boiler will become overheated, commonly called "burned out", and when cooled it will contract, and leak around the tubes. This would not necessarily cause a permanent injury to the boiler, but would require re-expanding of the tubes. This is done by driving a taper expanding tool into the ends of the tubes, first dipping it in oil so it will come out easily.

To determine that there is water enough in the boiler to fire up safely, open the throttle to give vent to the boiler, and open the try-cock at the bottom of the low water automatic. If water flows out here it indicates that the water is above this point and that is sufficient. If there is any doubt always give the doubt full benefit and put some in. It is good practice to fire up with the boiler full and blow out some water after getting a little steam pressure.

To fill the boiler from town supply, connect a hose to blow-off pipe, using the hose coupling furnished with the car, and before turning on the water see that the blow-off valve is open. Open the throttle valve and steam chest drip valve, and let the boiler fill until it overflows and water runs out through the drip valve.

To pump water to the boiler by hand, see that there is water in the tank, open hand water pump valve, close front by-pass valve, leaving the rear by-pass valve open, and operate the pump.

To avoid pumping gasolene at the same time, close the gasolene tank valve, but remember to open it again.

See that the hand water pump plunger is in as far as it will go when closing the hand water pump valve.

If, after using the car, it is left with plenty of water in the tank when the boiler cools, the steam condensing will form a vacuum which will draw water from the tank until the boiler is full.

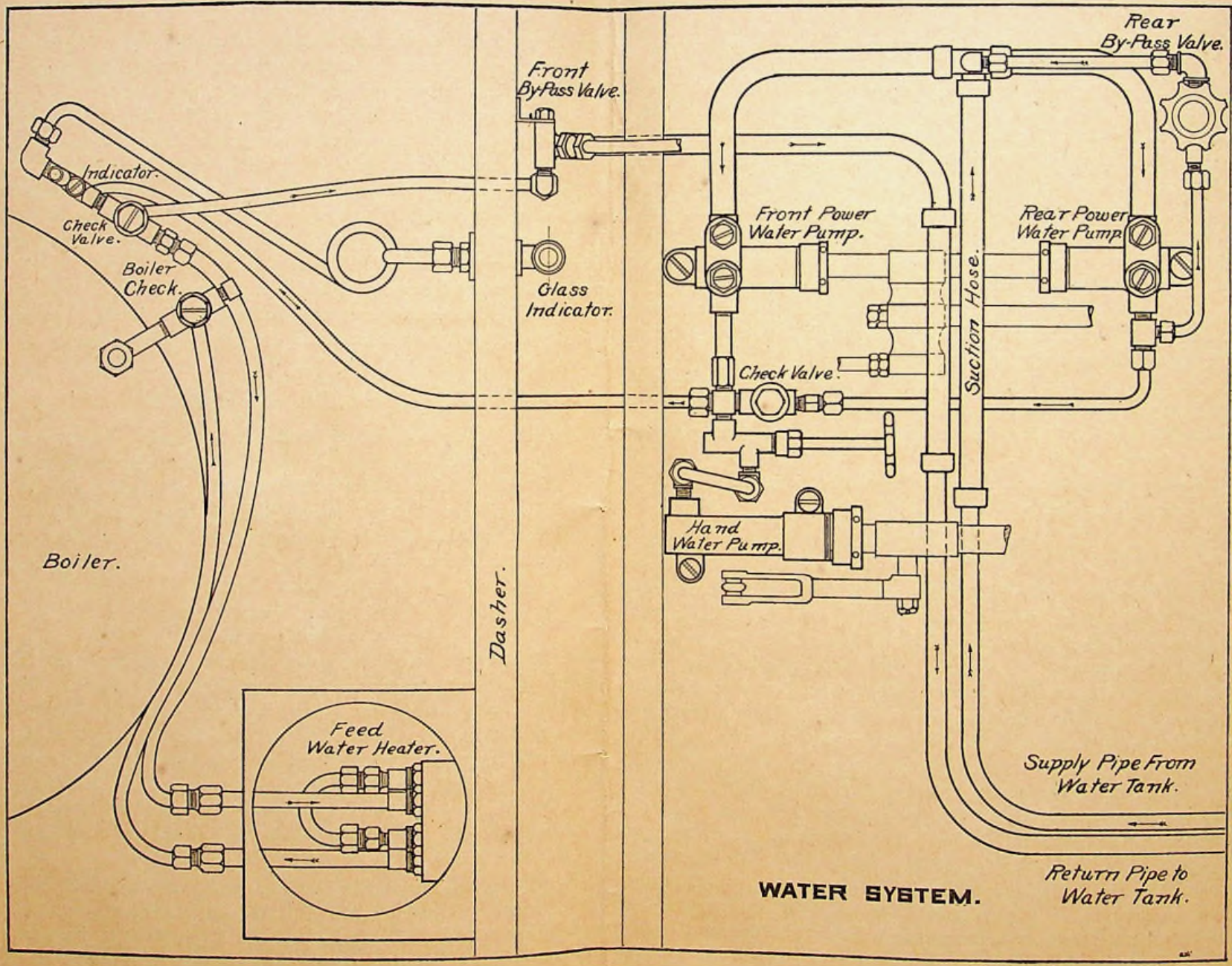
Hydraulic Pressure

If the fire is started with the boiler full of water with no vent, the heat will quickly expand the water, creating a hydraulic pressure that will close the steam automatic and perhaps lift the safety valve. Then if the throttle is opened, the pressure will instantly fall. In this case open the blow-off valve and draw out about one-quarter of the water. This would be in an

18" boiler 9 quarts
23" boiler 15 quarts
26" boiler 22 quarts

If the boiler is much more than three-quarters full when the throttle is opened, water or wet steam will go to the engine. This is called priming. When the boiler primes, if the throttle is opened wide the steam will rush out of the exhaust flue with a soft mushy sound, the engine will "pound" and seem to have but little power. When this occurs, open the by-pass valves and run the car slowly with the throttle open but a little, until enough water is used so that the boiler will not prime, or open the blow-off valve and draw out sufficient water.

To test the boiler under hydraulic or cold water pressure, fill it full of water, than pump water with the hand water pump until the steam gauge shows the desired pressure. Any boiler that has been used may "weep" a little around the tubes under a high cold-water pressure, and yet be perfectly tight under steam.



WATER SYSTEM.

Blowing of the Boiler

Since the water used in the boiler is apt to contain more or less sediment, and always soluble inorganic impurities, the most common of which is carbonate of lime, these solid impurities must of necessity accumulate in the boiler, unless the boiler is frequently blown off. If the water used is quite clear and soft, blowing the boiler off twice or three times a week will do very well. If, however, the water is quite hard, it is desirable to blow off every day, if the car is being constantly used. Even with this precaution the nipple where the feed water enters the boiler may become encrusted and in time become entirely closed. If the plug is taken out, this nipple can be easily drilled out.

After shutting the burner valves previous to blowing off, see that the fire is all out before opening the blow-off valve. Sometimes the flame in the pilot will burn some minutes after the valve is closed. It can be extinguished by blowing into the pilot mixing tube.

When blowing off, do not continue until the pressure is reduced to zero, but close the valve as soon as the water is all out and the pressure has dropped about one hundred pounds. This is desirable in two ways: First, it leaves sufficient steam for running the car a short distance, if desired; and, secondly, when this steam condenses, it forms a small quantity of chemically pure water that falls to the bottom of the boiler and tends to re-dissolve any scale that has formed.

No alkali should be used in a copper tube boiler.

The elbows on the superheater, main steam pipe and fusible fitting are made on a taper and driven into boiler tubes. To remove them, pry under the elbow, and hammer it at the same time, first one side and then the other, until it will loosen and come out.

The Fusible Plug

The *Fusible Plug* is contained in the inner end of the brass *fusible plug tube* which screws into the steel *fusible fitting*. The purpose of the fusible plug is to save the boiler from being burned out from low water. The elbows on the fusible fitting are made on a taper and driven into two short tubes in the boiler. So long as water covers these tubes there is a circulation of water through the fusible fitting which prevents the plug from melting. When the water gets below the ends of the short tubes, or about three inches from bottom of the boiler, the circulation ceases and the plug will melt and blow out. When a fusible plug blows out shut main burner and pilot valves and run the car as far as it will go, and as soon as the steam has nearly ceased blowing, screw out the fusible plug tube and screw in a new one. Then pump water by hand until it will flow out of the try-cock at the bottom of the low water automatic, showing that there is water enough in the boiler to steam up safely. Then steam up.

After a plug has blown, and it has been replaced, the boiler will siphon water from the tank, after it has cooled enough to condense the steam in it.

When a plug blows out it is well to learn the cause and see that everything is in normal condition before starting again. See that there is water in the tank, that the pumps are working properly, that there is no leak in the water line from the pumps to the boiler, and that by-pass valves shut tight and do not allow the water to leak by. (See Water Pump article).

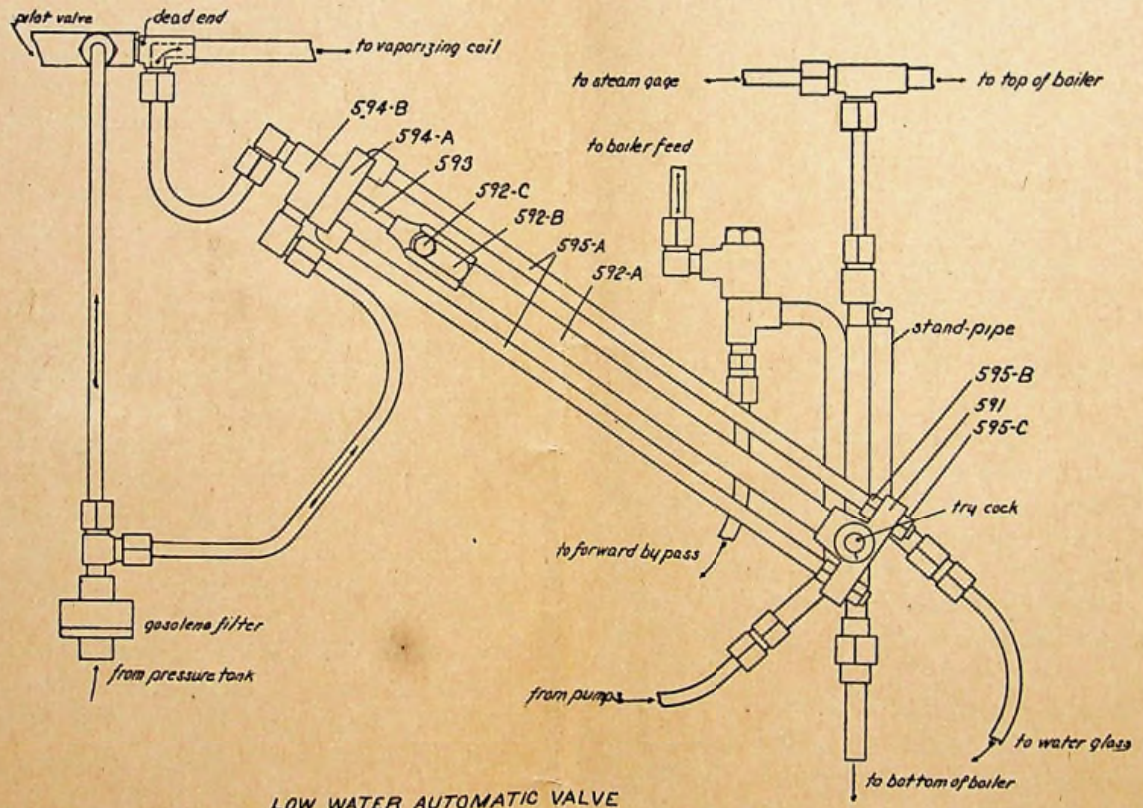
If the fusible plug melts out while there is plenty of water in the boiler, it indicates that there is something in the fusible fitting or the tubes of the boiler into which it is driven, that interferes with the free circulation of water through it, and when the plug blows out it may be cleared out by the steam blowing through. If a plug blows from low water the steam will be dry. Otherwise, it will be wet, and if anything is held in the stream, water will drip from it.

The fusible plug should be replaced when the boiler is cold, say once in two or three weeks.

The Water Level Indicator

The purpose of this, commonly called the indicator, is to show the level of water in the boiler.

The three tube indicator body is made up of three tubes brazed together. The middle one forms a part of the water column, water is pumped through the left one, and the right one is the stand pipe



LOW WATER AUTOMATIC VALVE
WITH
THREE TUBE INDICATOR BODY

The Water Level Indicator (*Continued*)

connected to the glass. The stand pipe and glass connected together by a copper tube, form a U. tube, which is filled with water, so that when cold the stand pipe, copper tube, and about one inch of the lower part of the glass are completely full of water and contain no air.

While running, so long as the water level in the boiler is above the stand pipe, the water pumped through the indicator body keeps is comparatively cool. When the water level gets below the top of the stand pipe the heat will vaporize some of the water in the stand pipe, and cause the water to rise in the glass. As the water level gets lower, more will be vaporized, raising the water higher in the glass, thus indicating the water level through a range of about three inches.

Remember that when the water is high in the boiler it is low in the glass, and *vice versa* when low in the boiler it is high in the glass.

When the boiler is cold the indicator gives no indication. That is, the water will be low in the glass whether the boiler is full or empty.

Should some of the water evaporate out of the glass, more should be put in to replenish it.

To fill the indicator, take out the screw in the top of the stand pipe, and run water into the glass faster than it can run out through the stand pipe, until it is certain that all the air has been expelled. Then with water still running, put in the screw, leaving it loose until the water falls to about one inch from the bottom of the glass, then screw it down tight. This should be done when the boiler is cold.

A little absorbent cotton with a piece of wire screen over it is placed in the indicator glass bracket under the glass to retard the flow of water through it, and to prevent a sudden fluctuation which might throw some of the water out of the glass.

To test the indicator. With steam up and boiler well filled, open the try-cock until the water rises in the glass, then if cold water is poured on the stand pipe, the water should fall in the glass.

While a car is standing with steam up, the stand pipe may get hot and raise the water in the glass, but after starting it will fall so as to indicate the level of the water.

If the car is to be run in freezing weather, a mixture of glycerine or alcohol and water, one to one, may be used in the glass to prevent freezing.

If the connection between the bottom of the boiler and water column should get clogged, the water column might remain full of water, even though there was none in the boiler; this would cause the indicator to register falsely, would prevent the low water automatic from operating, and water would flow from the try-cock when opened. It is important, therefore, to see that this does not occur. The blow-off line is through this connection and blowing off the boiler tends to keep it clear.

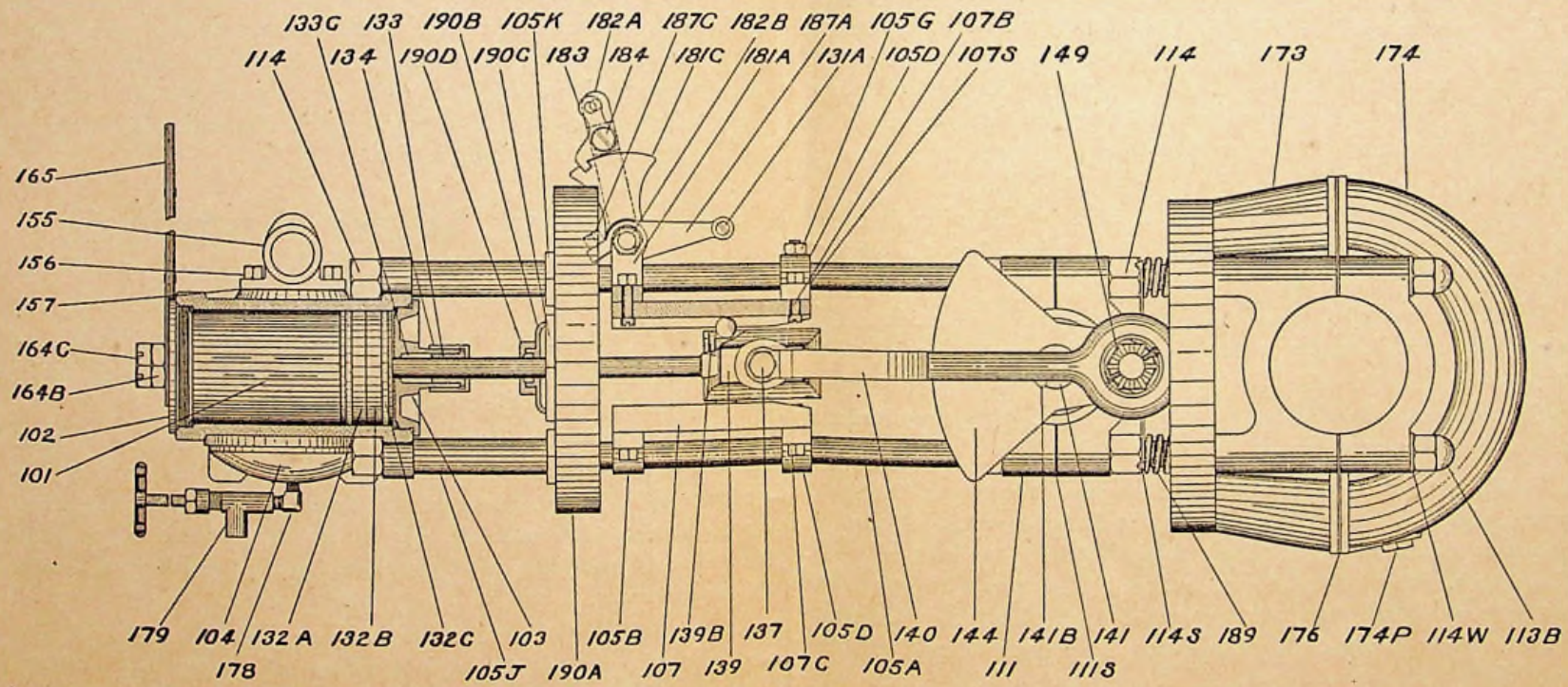
The Low Water Automatic Valve

This is an expansion valve, and the purpose of it is to shut off the supply of gas to the main burner before the water in the boiler gets so low that the fusible plug will blow out.

So long as the water level is above the point where it is connected into the water column, (marked "Try-cock" in the cut), it will remain cool. When, however, the water level falls to this point, the expansion tube will fill with steam and the heat will expand the tube and close the valve, thus shutting off the supply of gas to the main burner.

When the Low Water Automatic Valve closes be sure that there is plenty of water in the tank and that both pumps are working. Close both by-pass valves and run the car as far as it will go. This will probably gain enough water in the boiler to cover the connection to the Low Water Automatic Valve, so that it will cool and the main fire come on again. If it does not, jack up the rear axle and run the engine, or pump some water by hand.

Do not change the adjustment or attempt to set the Low Water Automatic Valve unless you are certain that you know how it should be done.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Boiler Check Valve

If a boiler check valve leaks, steam or hot water from the boiler may come back through the by-pass valve, or to the water pumps, and heat them, while the car is standing. When this occurs the check valve should be replaced. It costs but a small sum.

When replacing it, it would be well to take out the boiler feed extension which screws through the head of the boiler and extends down below the normal water level, and see that it is in good condition.

The Throttle Valve

If the throttle valve leaks steam, take it off and grind the valve into the seat, or put on a new throttle valve. It may appear to leak, on account of the lever not being properly adjusted. There should be some tension on the throttle valve stem when the lever is locked in a close position. There is a distance rod running from the body of the throttle valve through the dasher, parallel, and quite near to the throttle valve stem. To increase the tension, loosen the nut on the back side of the dasher, and take up on the nut on the front side of the dasher until you get proper tension.

There are three prick punch marks on the throttle valve stem which are in line with a port in the sleeve on the valve stem inside the body. These marks should be in line with the steam outlet of the throttle valve.

The Safety Valve

If the safety valve blows off, and does not close readily, rap the end of the valve stem. If it continues to leak, take it off and clean it and if necessary grind in the valve.

The Siphon

To fill the water tank with the siphon, drop the end of the siphon hose into the water, taking care that it does not go to the bottom where it would draw in dirt or sediment, and open the siphon valve.

The Engine

The packing of piston rods and slide valve stem should be given attention about once a week. To get at them take out the two screws in stuffing box case.

The stuffing box nuts should not be screwed down any harder than necessary to prevent leakage. If they are properly packed and adjusted often, so as to keep the right tension on the packing, they may run a whole season without repacking. When the nuts are screwed down to the end of the thread so that there is no more adjustment, some packing should be added.

We use Vulcabestine braided cord packing for this purpose.

The cone bearings on the end on the connecting rods where they join the crossheads should be kept adjusted so that there will be no noticeable knock when running. Great care should be taken not to get them so tight that they will heat, as this might lead to serious damage.

To adjust a one piece connecting rod such as are on 10 H. P. engine, loosen the lock nut on inner end of wrist pin and screw the wrist pin down tight. Then back it out about one-eighth of a turn and set the lock nut.

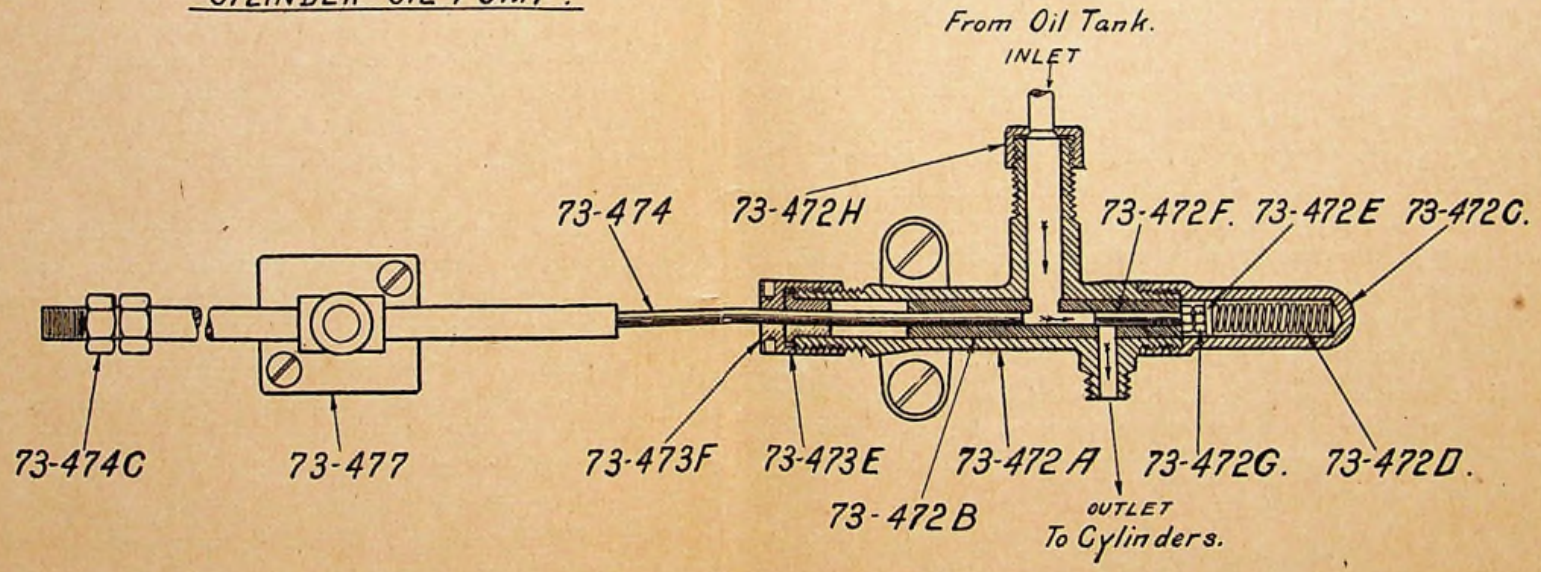
In two piece connecting rods such as are on 20 and 30 H. P. engine, thin washers are used between the cones, and the wrist pin draws them together. Great care should be taken that there are washers enough so that the cones will not bind and heat.

The cone bearing on the outer end of the right wrist pin at the rear end of the bent pump rod has the same method of adjustment as the two piece connecting rod.

There should be tension enough on the crosshead rollers, so that while they can be moved they will not slide easily. This tension can be adjusted by the nuts at the top end of the engine frame screws. These are castle nuts and are fastened with cotter pins.

The hoop-up pedal overlaps the reverse pedal. To hook up the engine, press on the reverse pedal only, until the dog drops into the notch. To release, press on the hook-up pedal and when the foot is removed the spring should pull it into full forward gear. To reverse, press both pedals together as far as they will go before opening the throttle. After reversing, be sure that pedals come back into

73-470
CYLINDER OIL PUMP.



the full forward gear position before opening the throttle. Always start with engine in full forward gear, and hook up directly after starting. In full gear the engine cuts off at five-eighths stroke, therefore, has no dead centre. When hooked up it cuts off at about one-quarter stroke, therefore is more economical, and should be run hooked up all the time, except when a stop is imminent, as in congested traffic.

The Cylinder Oil Pump

This pumps oil from the cylinder oil tank through the oil sight feed on the dasher to the main steam pipe leading to the engine.

The plunger No. 73-474 should be set so that the end of it will just come to the outlet, when it is in the extreme forward position. To set the plunger, remove the delivery stub cap and the delivery check ball, and insert a small wire in the outlet. Then, with the pump crosshead in the extreme forward position, set the plunger so that the end of it will strike the wire, and set up the lock nut No. 73-474C. If for any reason the position of the pump crosshead on the drive rod is changed, care should be taken that the cylinder oil pump plunger is adjusted accordingly.

The amount of oil pumped depends on the distance between the inlet port of the pump and the end of the adjusting piston No. 73-472F when the adjusting nuts No. 73-472G are against the shoulder, as shown in cut. To pump less oil, set these adjusting nuts so that the end of the piston will be nearer the inlet, and to pump more oil set them so that it will be farther from the inlet. The pump can be adjusted so as to pump a gallon of oil in running from four to five hundred miles.

It is well to keep plenty of cylinder oil in the tank. If it is all pumped out, the oil pump may become air bound, and this may make it necessary to disconnect the copper tube leading from the pump and operate the pump until the air is worked out of it, and it is primed with oil.

Cylinder Oil. Important

It is very important that only cylinder oil that is adapted to the conditions should be used in Stanley cars. A cylinder oil that is suitable for an ordinary steam engine may be unsuitable and injurious in a Stanley engine where superheated steam is used, and may cause serious damage, and make extensive repairs necessary before it becomes known to the operator.

The Harris Superheat Steam Cylinder Oil furnished by the A. W. Harris Oil Co., Providence, R. I., and the Oilzum High Pressure Superheated Steam Cylinder Oil furnished by the White & Bagley Co., Worcester, Mass., are particularly suited for use in our cars, and we would urge each Stanley owner to have one of these oils on hand at all times and use it exclusively.

Oiling

Cylinder oil may be used in all places requiring oil. Enough oil should be maintained in the engine and gear case so that it will be one-half to three-quarters inches deep at the front end of the centre case. The oil should be thin enough so that it will splash well. To thin cylinder oil, add good machine oil. This will oil the working parts of engine differential, driving gears and inside rear axle bearing. An oil cup is provided to oil the outside rear axle bearing.

The pump rocker shaft has roller bearing at the top. Below this is a cone bearing where the straight pump drive rod connects, and a ball and socket bearing at the lower end where the bent pump rod connects. These last two should be oiled every day.

Put oil in the steering post through a hole in the outside tube near the foot boards.

A thin graphite grease should be used in the grease cups on steering gear, brake parts and pump guide rod.

The Water Pumps

The power pumps, being driven directly from the engine, are running all the time that the car is running. When the by-pass valves are closed the water is pumped to the boiler. When they are open it returns to the tank. If it appears that the boiler is not getting sufficient water, see that there is plenty in the water tank, that the strainer is not clogged, and that water flows freely to the pumps. With rear wheels jacked up, the engine running, and the by-pass valves closed, see that there is no excessive leak through the packing of the plungers, and no leak from any pipes or fittings in the water line from the pumps to the boiler. See that the pumps are pumping. To do this, pinch the rubber tube leading to the pumps. If they are pumping the water will be drawn out of the tube and it will collapse.

If water is drawn from the tube when the plunger goes out, and returns to it when the plunger goes in, it indicates that something prevents the ball in the suction check from seating. If no water is drawn in, it indicates that the ball sticks to the seat. In either case, take off the suction check cap and clean the ball and seat.

There is a spring which forces the ball in the delivery check on to the seat, and as the power of the water to force it off the seat is very great, it is almost impossible for it to fail to operate.

See that the by-pass valves shut tight. Disconnect the copper tube leading from the by-pass valve to the tank, and see that water does not come through the valve. If the lever on the front by-pass valve stem strikes the steering post before the valve is shut, take off the lever and set it back one square on the stem.

If the water pumps become air bound, that is, filled with air, as they might, if for instance the water was pumped entirely out of the tank, after filling the tank run some distance with the by-pass valves open, until the air is forced out and the pumps primed with water.

The water pumps are packed with hemp packing. The stuffing box nuts should not be screwed down any harder than necessary to prevent leakage.

If it should be necessary to pump water by hand, close the main burner valve and run some distance to reduce the steam pressure, open the hand water pump valve, close the front by-pass valve, leaving the rear by-pass valve open, and close the gasolene tank valve so as to save pumping gasolene.

After pumping by hand, close hand water pump valve while the plunger is in, as far as it will go.

As the hand water pump is seldom used, it very likely will be full of air. To get the air out and get it primed with water, take out the stem of the hand water pump valve, place a finger over the hole, and draw back the plunger,—lift the finger and push the plunger in, repeating until water comes.

The Gasolene Pumps

If the power gasolene pump gets air bound, or the check valves do not operate, a few strokes of the hand pump will usually clear it out, as the hand pump forces through the power pump.

To pack the power gasolene pump, first put in a thin leather washer, then three of the special packing rings which we supply for the purpose, and then another thin leather washer on top, and screw the stuffing box nut only as tight as you can screw it with your fingers. If this nut is screwed down too tight, it causes the plunger to cut out the packing. If the gasolene pump is properly packed and the nut is not screwed down too tightly, it should not need repacking for a whole season.

In order that the hand pumps may work easily, the stuffing box nuts should not be screwed down any harder than necessary to prevent leakage.

Adjustments

The taper bearings on the front wheel spindles, steering gear, pump rocker, and engine hanger strap, should be kept in adjustment so there will be no lost motion. But care should be taken not to get them too tight. The eccentric bushing at the bottom of steering post can be turned to take up wear between the pinion and sector gear.

Adjustments (*Continued*)

To take out the engine, disconnect the steam pipe at the packed swivel joint, pull off the exhaust hose, disconnect the reverse rod, take off the centre case, take off the four engine frame nuts at the back of rear gear case and remove the case. Take off the nut at the engine hanger bracket, pull the hanger strap off the bolt, and let the front end of the engine down. Then pull the engine forward until it clears the rear axle.

The engine should be in line at right angles to the rear axle and the gears set so that the end of the teeth are about one-thirty-second of an inch from bottom, or as close as they can be, and not grind.

The bearings in the aluminum gear case on the axle should be adjusted so they are a fit, and yet free to revolve when the body goes up and down on the springs.

The differential is held in position sidewise by the pinions coming in contact with the bevel gears. If it is loose, shims can be taken out from between the axle frame in the centre.

The rear axle truss rod should be adjusted so that the frame will be in line up and down, and the perches and brace rods adjusted so it will be in line forward and back.

The front wheel bearings should be adjusted so there is a slight motion to the wheel, and kept packed with grease.

Feed Water Heater

The combined muffler and feed water heater is attached to the frame of the car by two "U" bolts running up through the sills. It is not attached to the flue.

To remove the flue and muffler, after disconnecting the water tubes and detaching the flue, pull off the exhaust hose and screw off the muffler elbow. Loosen the nuts on the "U" bolts, so that the muffler can be revolved, and turn it so that the nipple coming through the side of the flue will point more nearly straight down. Then the flue can be dropped off.

Storage Battery

The manufacturers instruct us as follows:

If any of the solution has been spilled, fresh solution (composed of one part chemically pure sulphuric acid and three parts water) should be added until plates are covered to the depth of half an inch.

Vent plugs should be removed and cells examined every week. *Plates must always be kept covered with solution.* The water in the solution evaporates, but the acid does not. When examination shows the top of the plates uncovered, refill cells by adding distilled water only, not acid.

Every car owner should have a specific gravity hydrometer for testing electrolyte to accurately determine the condition of the battery. The specific gravity of the solution should read between 1.280 and 1.300 when battery is fully charged. If the reading is lower, don't add acid, but charge battery until specific gravity rises to the proper point.

In general, therefore, our condensed instructions are as follows:

Unscrew vent plugs and inspect cells weekly.

Keep plates fully covered with solution—always.

Never add anything to solution except distilled water.

Keep specific gravity at 1.280 to 1.300 by charging battery.

Laying Up for the Winter

If the road conditions do not permit the car to be used in winter, to protect from injury by frost, fire up the car and run it either on the road or with the rear wheels jacked up so that everything will be hot. Turn out the fire and blow off the boiler. Before the steam is all blown off, open the safety valve and the siphon valve and take out the fusible plug, so as to clear the water out of these. Drain the water out of the tank. Take off the caps of the check valves and blow into the suction hose to clear the water from the checks in front.

General Remarks

To operate an automobile with success and pleasure one must know the car thoroughly. To know how every part is constructed, how it is supposed to operate, and what to do in case any part fails to perform its function, implies a knowledge of the machine that can come only from careful study.

If your car is kept at a public station, do not say to the attendant when you come in at night, "Look this car over carefully, and be sure that everything is all right in the morning." But, instead, tell him exactly what to do, and, if necessary, just how to do it, and before starting out in the morning see that it has been done.

Always start the car slowly, bringing it up to the desired speed gradually.

As much as possible make adjustments in the garage, and not on the road.

Keep the boiler well filled with water, particularly on a strange road; otherwise, an unexpected hard hill may compel the use of the hand pump, or the risk of blowing a plug.

Keep the tires well inflated. This makes the tires last longer, increases the speed of the car, and adds to the mileage on gasolene and water.

Never open any of the valves more than two or three full revolutions, as, if they are turned twelve or fifteen revolutions, they will come clear out. If a valve on the gasolene pressure system is screwed out while the fire is burning, it may cause serious fire.

Much more skill is required to run a car backward than forward. With the head turned so as to look backward, to operate the reverse, to open the throttle, and to steer, all at the same time, involves a combination of movements quite difficult for the beginner. After reversing, be sure that the pedal has come back so that the engine is in forward gear, before giving steam.

Remember that to back down a steep hill is much more difficult and dangerous than to back on level. Never reverse the engine when you are headed up a hill, even if you wish to back. Do not try it till certain you possess the skill to do it without an accident.

Older Models

While the foregoing instructions relate to current models, they will apply to older models with few exceptions.

To pump water to the boiler by hand, it is necessary to close both by-passes in older models.

In cars having a glass water level indicator with body of cast brass, to re-fill the standpipe take it out, screw out the stub end, fill it, and put back the stub end, and screw in again.

Engines that do not run in an oil-bath obviously should be oiled every day.

To adjust the cylinder oil pump that has no adjusting piston,—to pump more oil, screw the plunger farther out of the part which drives it, so that it will enter the pump farther.

Combination Gasolene and Kerosene Burners and Fuel System

The 1914 Stanley cars will be equipped with a burner and fuel system in which gasolene, kerosene, or a mixture of the two may be burned in the main burner.

The new main burner casting is the same as the old one, except that it has a boss on it just back of the pilot casting, through which a hole is drilled for the pilot vaporizer.

The vaporizer is quite different — that part of the vaporizer which supplies the pilot light having less surface exposed to the flame, while the part supplying the main burner has more. This is accomplished by bending the pilot vaporizer tube downward directly back of the pilot casting and inserting it in the above mentioned hole in the main burner casting, so that the supply to the pilot light comes up through the bottom of the burner, over the pilot burner, through the casting, and down to the nozzle. The main tube of the vaporizer makes one coil in passing through the burner.

The front ends of the vaporizer tubes are not bent downward, but a small tube is welded into the side of each one, and these lead down to the nozzles. A cap is screwed on to the end of the large tube, and the wire cables are inserted and can be removed from the front. The cables extend in only as far as the tubes are straight.

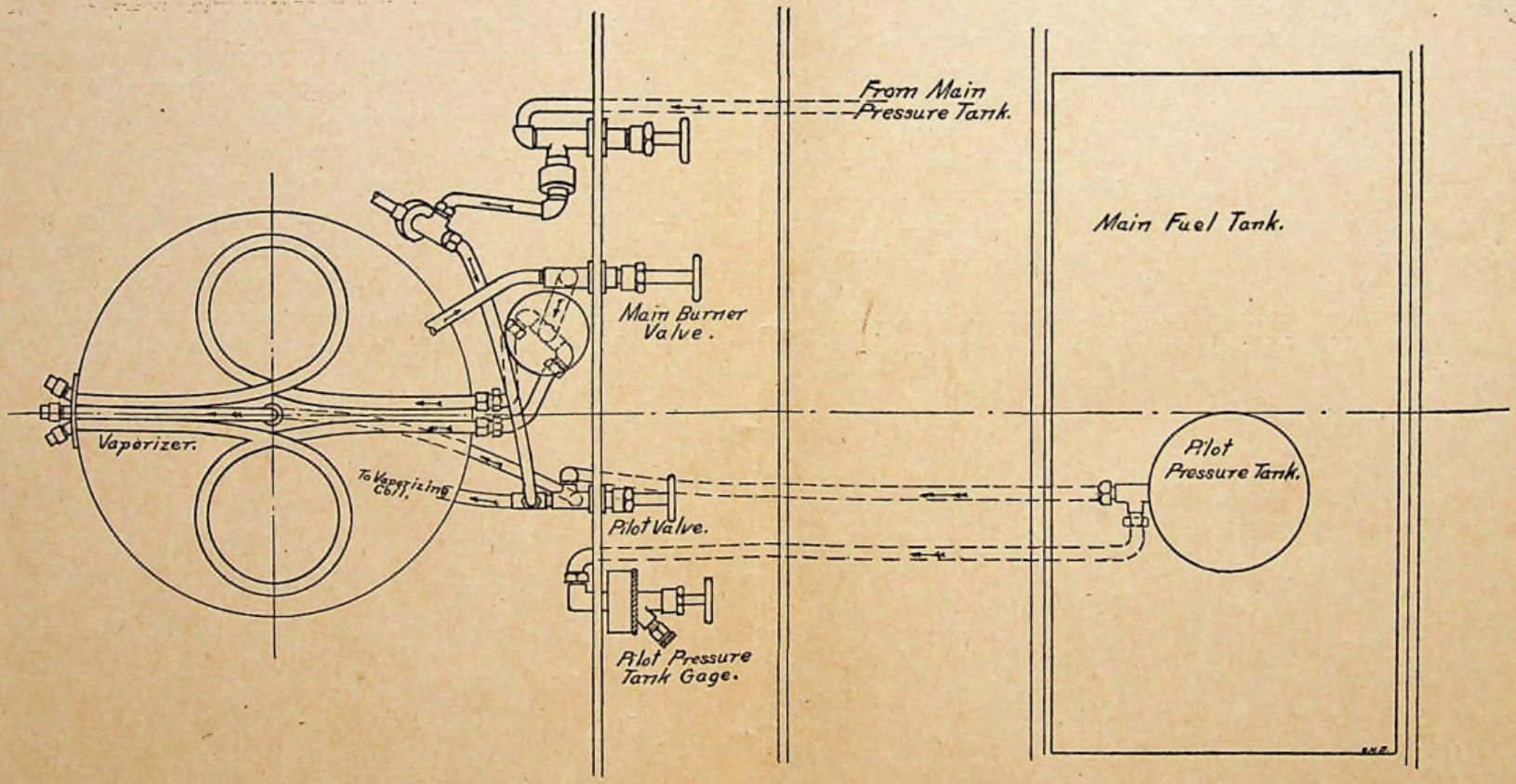
The tips of the nozzles which contain the small orifice through which the gas goes to the mixing tubes are removable, the same as the clean-out screws are.

The fuel system, pressure tanks and pumps for the main burner are the same as in the past, but the pilot is supplied from a separate tank, the normal pressure for which is 20 to 30 pounds, and is had by pumping air with the hand air pump. This low pressure gives a better working pilot light, because the pressure does not vary much. Under normal conditions it should not go down more than 5 or 10 pounds in burning over night, and with a low pressure on the gas, it does not have so much tendency to carbonize as with a higher pressure. The main burner pressure system being separate, any desired pressure may be maintained on it. While the car is standing, no gas is being used from the main pressure tank, consequently but little hand pumping is necessary.

Gasolene alone should be used in the pilot tank, but the main fuel tank may be filled with gasolene, kerosene or any combination of the two.

We consider this a better gasolene burner and fuel system than we have previously had. Under normal conditions it should give about 20% more mileage per gallon of gasolene than the old one, and the mileage on kerosene will be about equal to that of gasolene.

It takes more heat to vaporize kerosene than gasolene, consequently when using kerosene in steaming up from cold, the pilot should be allowed to burn good and strong until the vaporizer is hot enough, so that when the main burner valve is open, it will not flood the burner with liquid kerosene. When steaming up, or after the car has been standing for some time with the pilot alone burning, care should be taken not to turn on the main fire too quickly, and thus flood the burner. Our experience indicates that there is no more difficulty and no more attention required in burning kerosene than gasolene. In fact, it easily may be less, but it may require a little different kind of attention. This relates principally to taking such a precaution as to avoid flooding the burner with liquid kerosene.


From Main
Pressure Tank.
Main Fuel Tank.
Main Burner
Valve.
Vaporizer.
To Vaporizing
Coil.
Pilot Valve.
Pilot
Pressure Tank.
Pilot Pressure
Tank Gage.

FUEL SYSTEM.

The Stratton Press, Inc.
Newton, Mass.