INSTRUCTIONS

for operating the

Stanley Steam Car

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1909

Stanley Motor Carriage Company
NEWTON . . . . MASSACHUSETTS

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.

General Remarks

TO operate a Stanley steamer with success and pleasure one must know the car, and know it thoroughly. It is a question of knowledge, not of skill. The skill necessary to perform the various operations is quickly acquired, but to know what to do, and how to do it under all circumstances, 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.

Of course, in a pamphlet like this, only general directions can be given. A knowledge such as is mentioned above can be acquired only by a study of the machine itself. The old adage, "Experience is the best schoolmaster," holds true here as elsewhere.

Filling the Boiler

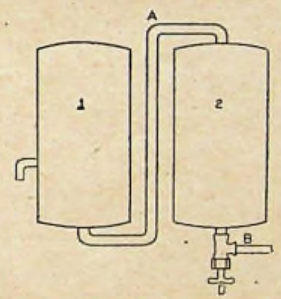
Before lighting the fire be sure the boiler is filled full of water If the boiler is empty, it can be filled by using the hand water pump, provided, of course, the water tank has been first filled. Or it can be filled from the town supply through a hose. A coupling is furnished with each car for this purpose which connects with the blow-off valve.

If at any time there is doubt whether or not there is water in the boiler, give the doubt full benefit, and pump some in before lighting the fire. Be sure when pumping water by hand that the by-pass is closed; otherwise the water will go back into the tank.

After the boiler is blown off at night, close the by-pass, fill the water tank, and, when the steam in the boiler condenses, a vacuum is formed, and the water will flow from the tank into the boiler till it becomes full. Then, before lighting the fire, open the throttle valve and also the drip valve on the steam chest; then when the water expands it will flow through the throttle and also through the superheating tubes, which are exposed to the fire, and protect them from injury.

Gasolene Pressure

The gasolene is carried in a tank under no pressure. From this tank it is pumped into the pressure tank. The pressure tank is a double tank, or, rather, two tanks situated side by side, so piped that the bottom of one is connected with the top of the other, as shown in the illustration.



A is the pipe connecting the two tanks.

B is the pipe through which the gasolene is pumped.

C is the air valve through which air is pumped with an ordinary hand air pump.

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

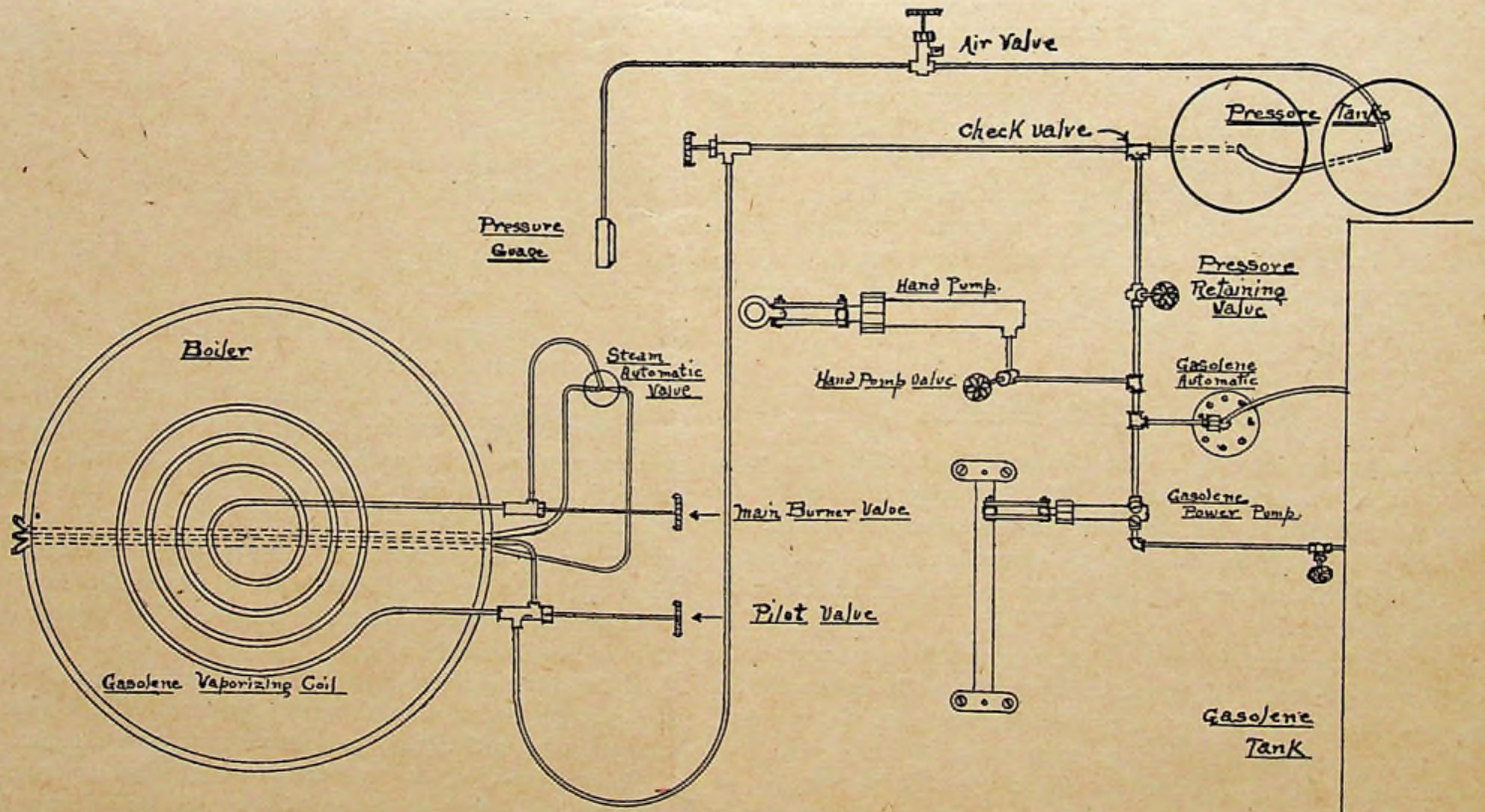
We will now suppose the tanks to be empty, in which case the gauge would stand at zero, and we are to get up gasolene pressure in order to start the fire. Proceed as follows: With the hand gasolene pump, pump gasolene till the gauge registers between ten and fifteen pounds. If we could now look into the tanks, we would find tank No. 2 nearly full of gasolene. The air in this tank has been driven by the gasolene into tank No. 1, and, being compressed, is under a pressure, as indicated by the gauge. Now, attach the hand air pump to valve *C* and pump air into tank No. 1 till the gauge indicates some eighty or ninety pounds. The pressure tanks are now in good working order.

If the fire were now lighted, and allowed to burn for some time, the gasolene pressure would gradually drop. But it would only be necessary to use the hand gasolene pump to raise it again.

When running on the road the power gasolene pump supplies the gasolene and keeps up the pressure. As this pump delivers an excess, an automatic relief valve is provided, adjustable as to pressure, through which the excess passes back into the supply tank.

The air in the pressure tank will be gradually absorbed, and more will occasionally have to be pumped in. The need of this will be

Piping of Gasolene System



indicated in two ways. First, when running, the hand on the pressure gauge will be seen to vibrate. Also, when standing with the pilot burning, the pressure will drop rapidly, owing to too little air for expansion.

In the latter case, to be certain the rapid drop in pressure is due to want of sufficient air, and not to a leaky automatic or pump valves, close the valve designed for cutting these out. This is designated, "Pressure retaining valve," in cut on page 4: Then, if the pressure continues to rapidly fall, the cause is surely insufficient air in the pressure tank.

Occasionally, it is well, in order to know definitely the relative amount of air and gasolene in the pressure tanks, to draw all the gasolene out through valve *D* and start anew, as described above. In doing this it is sometimes necessary to pump in air to drive out all the gasolene. If the car is to stand for some time with pilot burning, close the pressure retaining valve. This prevents the gasolene from going back through the valves and automatic. Be sure to open again on starting.

Firing Up

A small gasolene torch, with directions for lighting, is furnished with each machine, to be used in heating the burner nozzles, preparatory to lighting the burner.

To start the fire successfully, heat the burner nozzles thoroughly. The main burner nozzles, as well as the pilot nozzle, should be heated. The heat should be applied sometime after they are sizzling hot.

Light the pilot first. To do this, open the valve one complete turn, then immediately point the torch flame into the peek hole designed for this purpose, its slide having been previously opened. After the pilot is lighted, close this slide before turning on the main fire. Open the main burner valve very slowly and bring up the fire gradually.

Open the throttle valve, and the drip valve to the steam chest to allow the first steam formed to pass through, and protect the superheaters, which are empty and exposed to the fire. On account of injury to the superheaters it is always best to fire up slowly. This is not necessarily time wasted, as one can spend the time making adjustments, oiling up, or inspecting the parts of the car, things which always should be done before starting on a journey. When the steam pressure rises to twenty or thirty pounds, it is best to close the throttle, otherwise the car might run away. After getting up some steam pressure open the blow-off valve, leaving it open until the boiler is only about three-quarters full.

Unless there is a steep hill to climb, immediately on starting out, better start when the pressure reaches about two hundred pounds. By so doing, there is less liability of injuring the engine should there happen to be water in the cylinders, and it is less severe on the superheaters.

Always start the car with the steam chest valve open. By so doing the steam pipe and steam chest are freed from water. By running the car back and forth a few times very slowly the cylinders will be freed from water and then the drip to the steam chest may be closed. Immediately before starting on your journey turn the main burner valve wide open, that is, give it one or two complete turns.

On all cars with hood in front raise the hood when firing up.

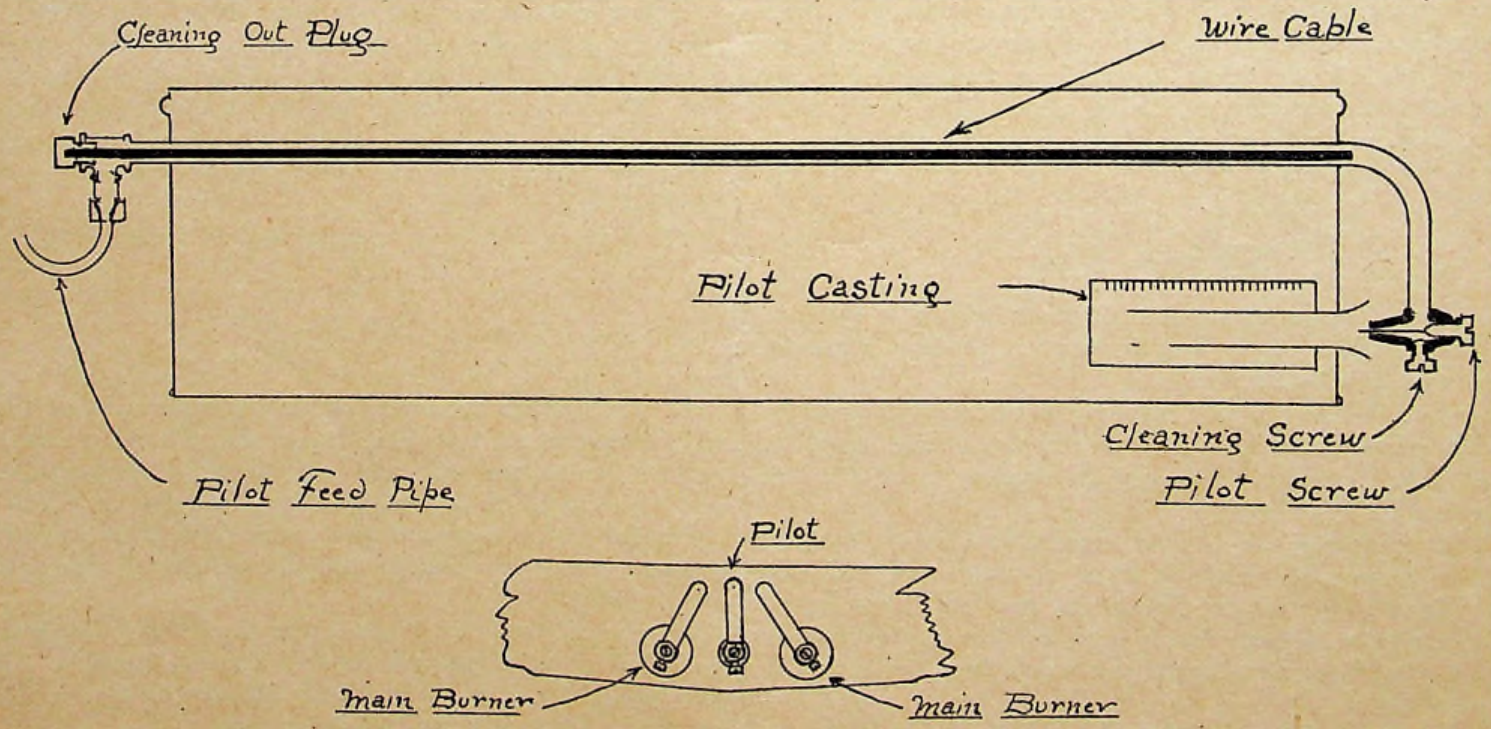
Oiling

All the bearings on the engine, on the pumps and on the rear axle should be oiled at least once a day; oftener would do no harm. For the rear axle, engine bearings and the pump bearings use the same oil as is used in oiling the cylinders. The most convenient way to apply this oil is by use of an oil syringe or force pump. The oil can be taken from the cylinder oil tank under the foot board.

Be sure all the bearings get a liberal supply. The eccentrics are more apt to be neglected, as they are less accessible. In oiling these, if the oil is put in the top, between the two, it will flow down and find its way into both ball races.

If the bearings on the steering gear are oiled once in two or three days it is sufficient. Of course, if at any time it works stiff find where it sticks and oil thoroughly.

Section of Burner
Showing
Plan of Pilot Light



Cylinder Oiling

Owing to the great importance of proper and ample cylinder lubrication we treat this subject separately.

Cylinders and pistons of a Stanley engine, if oiled continuously with a suitable quantity of good cylinder oil, would probably show no injurious wear after running many thousand miles. Yet a run of one hundred miles, or even less, with the cylinders dry, might result in serious injury.

In order to insure perfect cylinder lubrication an automatic power feed oiler is employed, which, if kept in good working order, is sure to accomplish the desired result.

To keep this in working trim the first essential is to keep the tank well supplied with oil. Should the tank run dry the pump would become air bound, and when the tank was refilled it might fail to work. It would then be necessary to prime the pump. To do this, uncouple the pipe leading to the steam pipe at the point nearest the pump and work the pump by hand till the air is all out. When each thrust of the plunger throws a good supply of oil the pipe may be connected up again.

Keep the packing nut properly adjusted and the mechanical parts of the pump working well, and use nothing but the best superheat steam cylinder oil, and you may be assured that the cylinders will be well oiled.

It is costly practice to experiment with cylinder oils. The damage is done within the engine before making itself known to the operator. Observation over a period of many years in our own repair shop has shown us that much of the cylinder, valve and piston trouble, some of which is so mysterious and unaccountable to the driver, is caused by the use of inferior or unsuitable oils.

The question of lubrication is one of vital importance to the economical operation of any car, and it is to the mutual interest of Stanley owners and ourselves that the oil best adapted to meet the requirements existing in Stanley Cars should be used at all times. After giving this matter much care and attention, we adopted, and have used exclusively for some years, the Harris Super-heat Steam Cylinder Oil, furnished by the A. W. Harris Oil Company, Providence, R. I., and would urge each Stanley owner to have this oil on hand at all times, and always to run his car with this oil, feeling confident that thus the best results will be obtained.

The Fusible Plug

If the water in a fire tube boiler were all evaporated, and the fire kept burning, the boiler would become so heated as to cause it to leak so badly as to require recaulking before it could be used again. To avoid this, all our boilers are equipped with a fusible plug. When the water in the boiler gets within three inches of the bottom of the boiler the plug melts, and the noisy escape of steam notifies the operator, who immediately shuts off the fire, both pilot and main burner, thus protecting the boiler from injury.

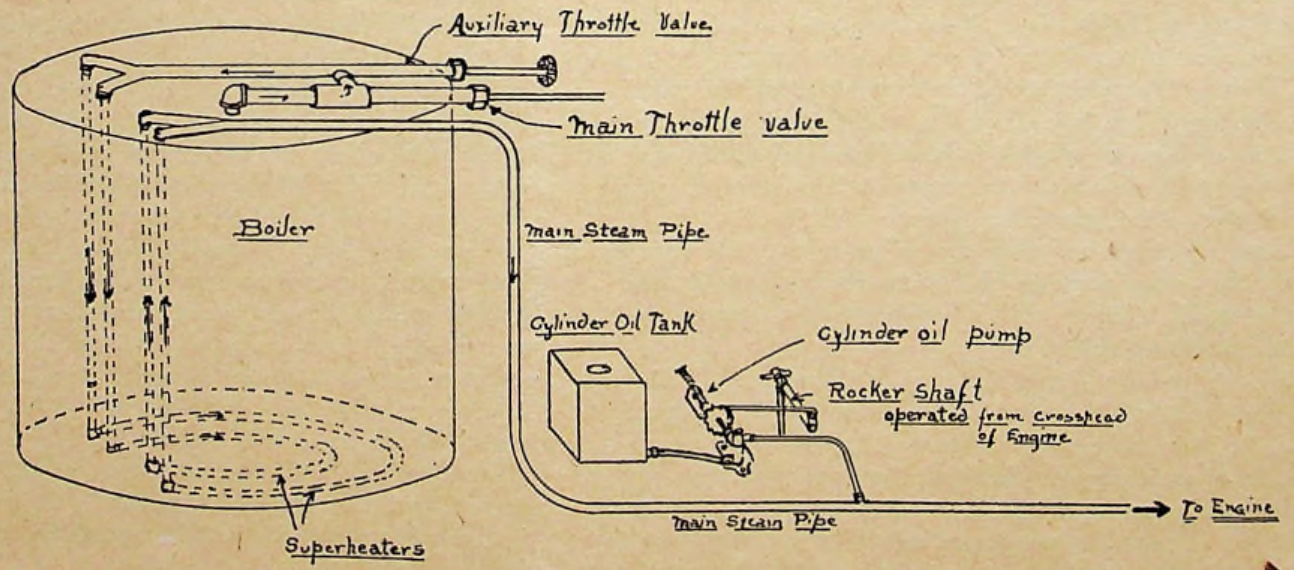
When the plug blows and the fire is shut off it is a good plan to keep on running till the steam pressure is so reduced as to compel a halt. Then close the by-pass, and with the hand pump pump water into the boiler till it is cool enough to allow the plug to be removed and a new lead inserted, and the plug put back in place again. The pumping may then be continued, and when the indicator shows that the boiler is at least one-third full of water, the fire may be lighted. Usually this can be done without reheating with the torch, provided renewing the plug has been quickly done.

It is well to keep on hand one or more tubes with lead all fitted to facilitate matters. The material used in the fusible plug is common lead, which melts at a temperature of about 618 degrees Fahr.

All our cars are now equipped with a fusible plug fitting having a shut-off for the steam. When the plug blows the operator can, after shutting off the fire, stop the car, get out and screw in the shut-off and stop the escaping steam. It is better, however, that the valve stem shut off should be carried separately, and not in the plug.

In case the water is low, simply from the fact that the car has been run too far with the by-pass open, the by-pass can be closed, the pilot lighted and the engine run with the rear wheels jacked up till it is safe to light the main fire. This can be told by the try-cocks. If water shows in the lowest try-cock, it is safe to light the main fire. A new plug should be put in at the earliest convenience, otherwise there is danger of a scorched boiler.

Steam and Oiling Systems



The Water Indicator (Old Type)

Owing to the high pressure carried in the Stanley boilers, a directly connected glass for showing the height of water in the boiler cannot be used. This fact led to the invention of the water indicator. This indicator consists of a cylinder containing a float. The cylinder is so piped that it fills with water to the level of that in the boiler. At the top of the cylinder is a chamber which contains a pulley mounted on a shaft, one end of which passes out through the side of the chamber. To prevent the steam from escaping through the hole, on the shaft, is a conical bearing, fitting a conical seat. This acts like a clapper valve in preventing the steam from escaping, at the same time allowing the shaft to turn. The float mentioned above is attached by means of a chain to the pulley, causing it to turn as the float rises or falls by the changing water level. As the float is heavier than water, being a metal bucket open at the top, and full of water, it has to be counterbalanced by a weight and pulley on the outer end of the shaft.

An examination of the indicator, with the above description, will enable one to understand its construction and mode of operation. But since there are some things which may happen to the indicator to cause it to register falsely, it is well to mention them here.

First, when running over bad bumps, the cord attached to the weight may get off the pulley. In this case, the index would point down with a full boiler. All that is necessary to right it is to put the cord back in place again. Should the cord break the same thing would happen as described above.

When the boiler is blown off and the steam pressure reduced to zero, it is possible for the water to evaporate out of the bucket. The weight being heavier than the empty bucket, would cause the index to stand up vertical with no water in the boiler. This condition can readily be determined by turning the index down and releasing it. The speed with which it flies back and the sound will indicate the absence of water in the indicator. In such a case, after pumping water into the boiler, the index should again be turned down, which will allow the float bucket to sink and fill with water. It is then in good working order.

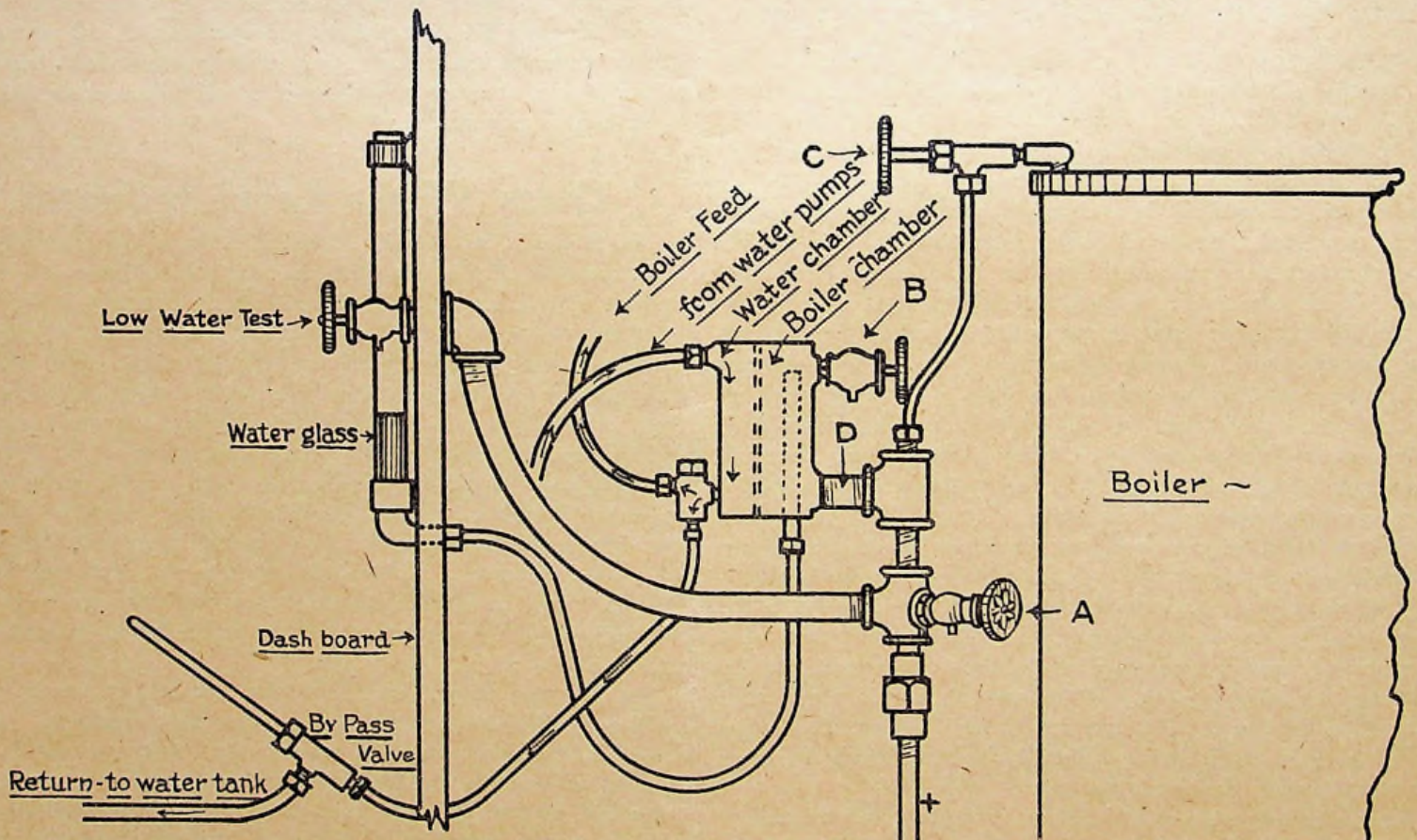
It is sometimes true that the index, when turned down, will not come back into place again, provided there is full steam pressure and the car is standing still. When the car is in motion, however, the jar will cause the float to find the proper level. It is good practice to move the index down every now and then, while running, to test it; and if it works back up it is reasonably certain that the water level is as indicated.

Glass Water Level Indicator

The Stanley Glass Water Level Indicator, as illustrated by the accompanying sketch, may be described as follows:—A water column is so connected with the boiler at its top and bottom that the water will stand at the same level in the column as in the boiler. Connected with the water column at "D," about eight or nine inches above the bottom of the boiler, is a casting which we call the "indicator body," containing two adjacent chambers, one of which fills from the boiler through the connection "D." Through the other chamber the feed water is pumped, whether going to the boiler or through the by-pass back to the tank. For convenience we will call this latter chamber the "water chamber," and the other the "boiler chamber." It will be readily seen that the "boiler chamber" will be filled with water provided the water in the column is above the connection "D;" otherwise it will be filled with steam.

The indicator proper is a "U" tube, one end of which is of metal and sealed at the top. We call this the "standpipe." This end is inserted some distance up into the "boiler chamber," and must at all times be surrounded by either steam or water. The other end of the "U" tube is a glass tube, placed vertically on the dash board (see sketch). This "U" tube is filled with water so that the standpipe is filled entirely, and the water when cold stands in the glass an inch or two from the bottom.

It operates as follows:—As long as the chamber surrounding the standpipe is filled with water and the feed water is being pumped through the other chamber, it will keep the water in the former chamber comparatively cool and also the water in the standpipe, and the water will remain at a low point in the glass. As soon, however, as the water gets below the connection "D," the "boiler chamber" will fill with steam, and as it surrounds the "standpipe" it will vaporize some of the water in it and force the



A - Try cock and blow off cock

B - Try cock

C - Shut off valve

To clean out pipes +++ Close C. and open A, when Steam is up.

water out of it and up in the glass, thus showing that the water level in the boiler is below the indicator. Whereupon the by-pass should again be closed until the water falls in the glass again. This will indicate that the water in the boiler is above the connection "D" on the indicator.

Usually when the car is standing the indicator will receive sufficient heat to throw the water up into the glass. In this case, if the water in the boiler is above the connection "D," it will immediately cool off, and the water will drop again in the glass when the car is run and water is pumped through the "water chamber."

Should some of the water evaporate out of the glass, more should be put in to replenish it, and if the parts are taken off the car or disconnected, great care must be taken that the inner end of the "U" tube is full of water and does not contain air, as otherwise it would not operate. But once full and connected up tightly there is no way that the water can get out of it.

To fill the standpipe with water it is necessary to turn it upside down, then remove the union stub end and, after filling it, replace the union stub end. The hole in this is so small that the water will not run out when it is turned right side up again. After connecting up the tube leading to the water glass, fill the water glass full of water, loosen the union nut at the bottom of the standpipe, and let the water flow out through it until it is within about an inch of the bottom of the glass, then tighten up the union. This will allow any air that is in the vertical part of the copper tube to escape, and insure its being full of water.

The upper end of the water glass has a short piece of rubber tube around it, and the glass is so placed that this rubber comes between the two pressure gauges, which serve as a bracket or support.

The copper tube leading from the standpipe should extend downward six or seven inches before bending upward again to the water glass bracket, so that the hot water or steam from the standpipe will not pass up into the water glass.

Some three inches below the connection "D" mentioned above, there is another connection, and a pipe from this leading up through the dashboard, at the end of which is a petcock, indicated on the sketch. This we call the low-water test.

As long as the water covers this connection this petcock will remain comparatively cool, and if opened water will come out. If, however, the water should get below this connection, the pipe will fill with steam and the end would be burning hot, and if the petcock were opened, steam would come out. By means of this the operator can determine whether or not the water in the boiler is getting near the point where the fusible plug would melt out.

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 the boiler is cold, whether or not it contains water, the water will always be low in the glass. Consequently, before firing up, one of the petcocks should be opened and the throttle valve or siphon valve opened, so as to vent the boiler. If water comes out of the petcock it indicates that the water in the boiler is above that point. If not, it is below that point. The petcock should be kept open long enough to allow what water might be in the tube to run out, provided it happened to be held in by capillary attraction when the water in the boiler was really below the petcock. The operator should never start the fire until he is certain that there is water in the boiler.

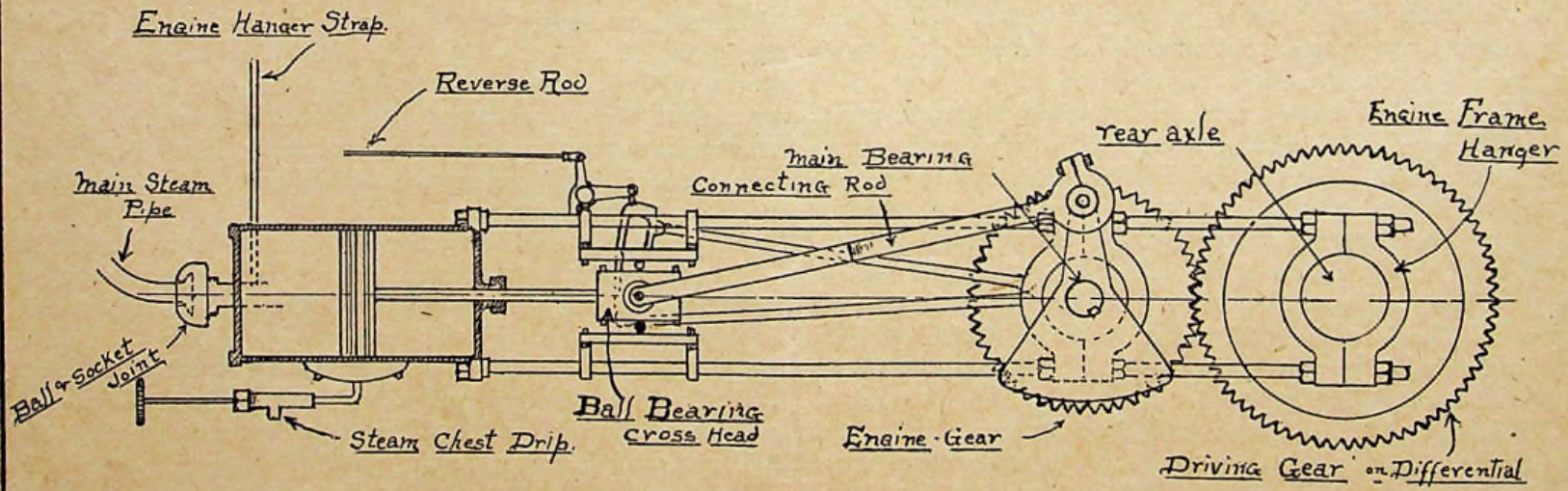
The connection between the bottom of the boiler and the bottom of the water column must be kept clear, otherwise the water might remain in this column, even if there were none in the boiler. To clean this, close the valve "C" and open the petcock "A" when the pressure is up in the boiler. This will blow out any sediment that may be in the lower end of the water column. Be careful after doing this that valve "C" is again opened, otherwise the indicator would be inoperative.

It is sometimes desirable to test the indicator to see that it is working properly. To do this have the boiler well filled with water, say considerably above connection "D." With steam up, open petcock "B;" this will cause either hot water or steam to flow through the boiler chamber of the indicator, and if the indicator is working properly, the water should rise in the glass. Then close petcock "B;" and with the hand pump pump cold water through the water chamber in the indicator. This will cool the boiler chamber and cause the water to fall again in the glass. The pumping can be done with the by-pass open, which saves pumping against boiler pressure.

Side View

of

Ball Bearing Engine.



If the car is to be run in freezing weather, a mixture of glycerine or alcohol and water, one to one, should be used in the "U" tube to prevent freezing.

The advantage of this device over our former water level indicator is that it has no moving parts, and there is practically nothing about it that can get out of order.

Care of the Boiler

There is no way the boiler can be injured so easily as to fire up with no water in the boiler, or to allow the boiler to run dry and not shut off the fire. In either case the boiler would be so heated as to cause it to leak. This would not cause a permanent injury to the boiler, but it means a repair job and possibly being towed home.

When running on the road, the fusible plug, as mentioned elsewhere, will warn the operator when the water gets too low. But it would, of course, give no warning when firing up without water in 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. If this matter of blowing off is properly attended to the boiler can be run continuously on very hard water with no injurious scaling or deposit.

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.

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.

The superheating tubes and the fusible fitting are driven into place and held by friction. When prying them out, hammer them sideways to start them. Do not confuse the term *fusible fitting* with the term *fusible plug*. The brass *fusible plug* containing the *fusible lead* is threaded and screws into the steel *fusible fitting*.

To Remove Superheaters, Etc.

The elbows on the superheater, main steam pipe and fusible fitting are made on a taper and driven in through the 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 Water Pump

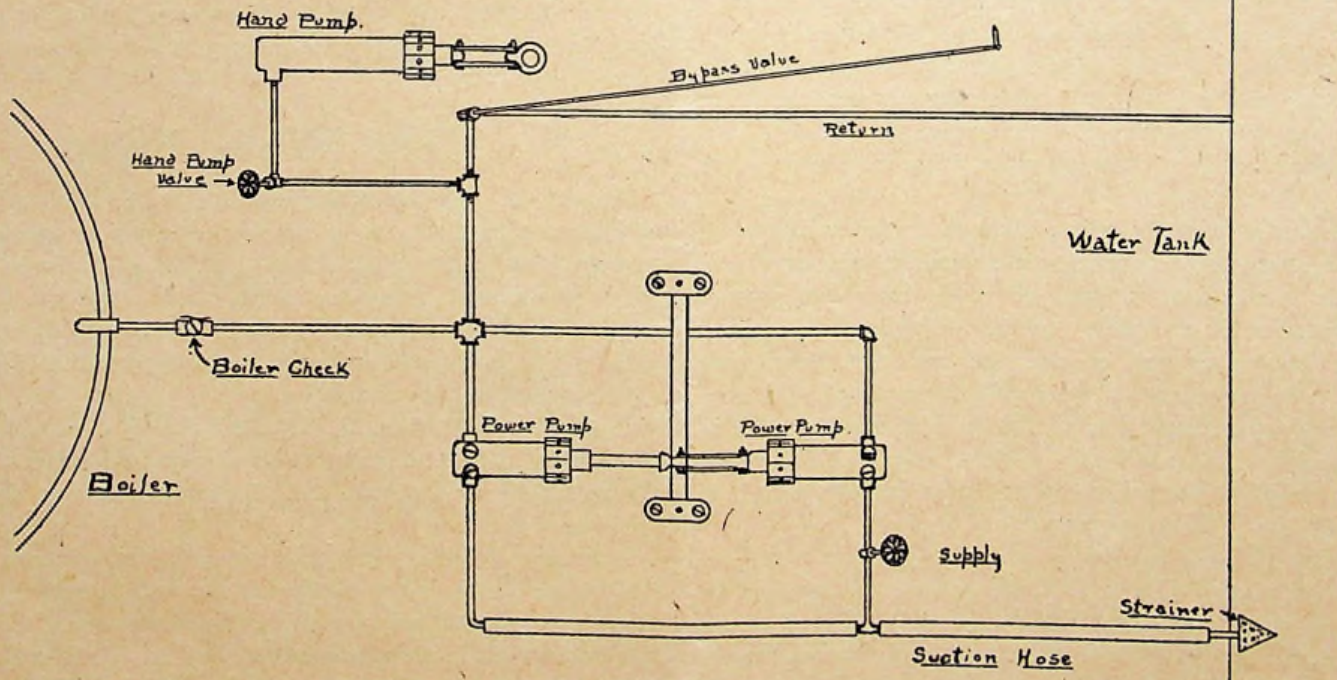
As will be seen by inspection, the power-water pump works continuously when the car is running. Having a capacity sufficient to supply the boiler when running up hill and over bad roads, it must of necessity pump too much water when on good roads. Hence the use of a by-pass, operated by hand to allow the water, when the boiler is sufficiently full, to be pumped back into the tank again, instead of into the boiler.

Remember that when the by-pass valve is closed, the water is being pumped into the boiler. When open, it is pumped back into the tank. By this means, the amount of water in the boiler is under control.

If at any time the pump fails to work first examine the water tank to see that it is not empty. If the tank is well supplied with water the cause of failure must be found elsewhere.

There are three principal causes, any of which may make the pump fail to work. They are as follows: First, the pump may be air bound; that is, the pump cylinder and valves may be full of air, which, with the by-pass closed, would be simply compressed and re-expanded as the pump plunger goes in and out, and its presence would prevent the water from entering the pump. To remedy this, open the by-pass valve and run a few rods. The pump being relieved of boiler pressure, the air will be pumped out through the

Piping of Water System



by-pass and the pump will then be primed. If the by-pass is now closed the pump will work all right.

In the second place, difficulty with the valves may cause the pump to fail to work. Connected with the water system are three check valves. Two are on the pump, one the intake valve and the other the outlet valve. Beyond the outlet valve, towards the boiler, is the third valve, called the boiler check valve. The by-pass pipe is taken off between the two last mentioned. The intake valve is generally the one to cause trouble. Something may get into the valve causing it to fail to seat. To remedy this, remove the valve cap, take out the ball and clean the seat. Be careful not to scratch the ball or seat, as this would cause the valve to leak. The other two valves very rarely have trouble. Should the one next the boiler go wrong, it would not prevent the water from being pumped into the boiler with the by-pass closed, but would cause trouble when the by-pass was open, as the steam would flow back into the water tank. This valve can only be examined when there is no pressure in the boiler.

In the third place, the packing to the pump may be in such a condition that much of the water leaks by instead of going into the boiler. This is generally remedied by simply tightening the packing nut, otherwise repacking is necessary.

Do not screw the packing nut up too hard, as it causes unnecessary friction. A little leakage can be tolerated to save friction.

Water pump troubles are of rare occurrence and generally easily remedied. Should, however, something happen to cause complete failure of the power pump, the hand water pump can be used to enable one to get home, when faulty parts can be put right again.

Before pumping by hand reduce the pressure by running with the main fire off, as it is easier to pump against one hundred pounds than four hundred pounds.

After using the hand water pump, the valve should always be closed with the plunger in; otherwise, it could not be forced in as there is no way for the water to escape except through the valve, and this would prevent the working of the hand gasolene pump.

The Gasolene Pump

Much that is said about the water pump will apply equally well to the gasolene pump. In some respects, however, it is different.

The by-pass connected with this pump, as mentioned elsewhere, is automatic, and opens when the pressure gets to a certain fixed point, and lets the excess flow back into the supply tank.

Should this pump become air bound, it can be primed by using the hand gasolene pump. This pump, being many times larger, and drawing its supply through the power pump, will draw out all the air and fill it with gasolene. It will then work all right.

No leakage of gasolene through the packing gland can be tolerated, as it is both wasteful and dangerous. Owing to the small size of the pump plunger and the liberal amount of packing in the gland, it will run a very long time, fully six months, and only need adjusting occasionally, without repacking.

Sometimes the hand gasolene pump will become air bound and fail to work. To remedy this, unscrew the valve stem, which is opened when the hand pump is used, till it comes out. Now, if there is a good supply of gasolene in the tank, by placing the thumb on the valve stem hole when the plunger of the hand pump is pulled out, and taking it off when the plunger is forced in, the air will be forced out and the pump primed. The valve stem can now be screwed in and the pump will work all right.

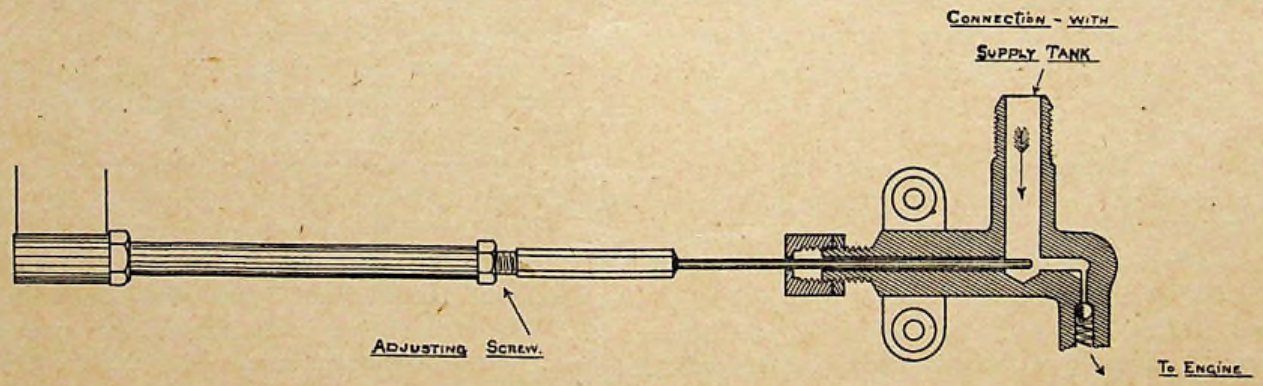
Keep all the bearings on both gasolene and water pumps well adjusted and well oiled. This prevents wear and noise.

The hand gasolene pump and the hand water pump work together on most of our recent cars. To enable the hand gasolene pump to work easily (and this is important as it is used more or less every day), have the packing nut on this pump screwed up just tight enough to stop the gasolene, and have the packing nut on the water pump so adjusted that it will run perfectly free. This latter pump is only rarely used, hence, it is not necessary to keep the packing tight.

To Pack Gasolene Pump

To pack the 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

Cylinder Oil Pump.



packed and the nut is not screwed down too tight, it should not need repacking for a whole season.

Care of the Engine

The first and most important thing in caring for the engine is to see that it is properly oiled. The kind of oil and method of oiling have been spoken of under the heads "Oiling" and "Cylinder Lubrication," but we wish to emphasize its great importance here. Should, at any time, any of the bearings show the slightest discoloration from rust, you may rest assured they have been insufficiently oiled.

Graphite may be added to the cylinder oil used on the bearings with good results. It prevents rust and lessens friction.

Successful cylinder lubrication depends upon keeping the mechanical parts of the oiling device in perfect order and the tank well supplied with first-class cylinder oil.

Adjustment of bearing comes next in importance. As a rule, adjustments of any description rarely have to be made. The packing glands of the piston rods and valve stems require most attention. New packing is rarely needed, but merely tightening the packing nuts.

The bearings, namely, the crossheads, the wristpins, the crankpins, the main journals and the eccentrics, seldom need adjustment, but, when necessary, can be adjusted as follows:

The slides to the crossheads, when it is found that the balls are loose, can be brought nearer together by screwing down the nut on the bolt that holds the frame rods together. There should always be sufficient pressure on the balls to keep them from rolling back and forth, except when the crosshead moves.

The wristpin bearings are conical bearings and are adjusted with a screw which is held from turning by a checknut. In adjusting these, loosen the checknut, turn up the screw till it stops, then back it out one-eighth of a turn and then set up the checknut again.

The crankpin bearings can be adjusted by removing the bolt, taking out the plug and reducing it in thickness by filing. When the plug is put back and the bolt screwed in, the bearing should have no perceptible play.

The main journals and eccentrics can be adjusted only when the engine is out of the car. With the engine out, one-half of the cup on the bearing to be adjusted can be removed and carefully ground at the ends so that when put back in place there will no longer be any lost motion.

New Engine Cut-off

In order that an engine of the type used in the Stanley steamer may always start when given steam, it is necessary that the cylinders take steam at each end through more than one-half the length of the stroke.

In order, however, that the steam may be used with the highest degree of economy when running at a fair rate of speed, it is necessary to cut off much earlier than one-half stroke.

Hence, an engine best adapted to use must have some means of varying the cut-off. In the new Stanley engine, this is accomplished as follows:

On the engine is a quadrant similar to the quadrant on a steam locomotive, only it has but one notch instead of several as on the locomotive quadrant. The dog which drops into this notch and holds the reverse lever in the desired position when hooked up is operated by a pedal, which we will call the clutch pedal, just beside the reverse pedal. Pressing on this pedal releases the clutch, and if the foot is then removed the spring will pull the reverse lever back and the valves will be in full forward gear.

To "hook up" the engine, press on the reverse pedal only. When this is sufficiently far forward the dog will drop into the notch and lock the reverse pedal. The engine is now "hooked up," and the cylinders take steam only about one quarter stroke.

To reverse, press on both pedals at the same time.

In starting always have the engine in full forward gear.

It is economy to run the engine "hooked up" when it can be done without "back lash" to the gears; otherwise, not.

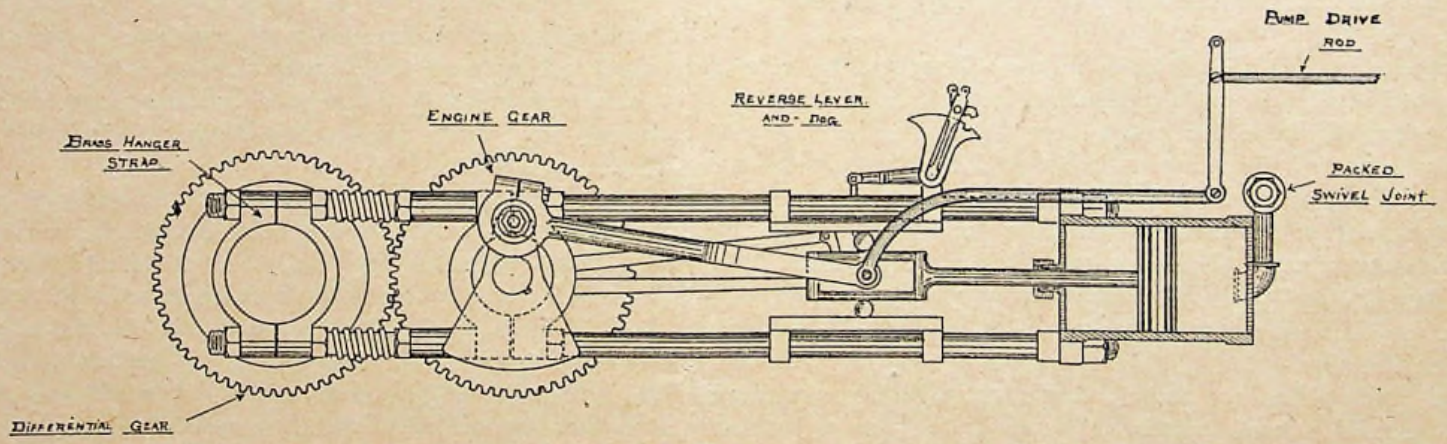
Always when speeding have the engine "hooked up." When running slowly, as on a crowded street, have the engine in full forward gear.

Caution.—Never try to reverse on the clutch pedal alone, but on both pedals.

Be sure that the engine frame hangers are properly adjusted. Should the nuts work loose, allowing the hangers to separate, there

STANLEY

BALL BEARING ENGINE.



is nothing then to prevent the other end of the engine from swinging from right to left. This would injure the engine case, besides causing the gears to be thrown out of adjustment.

When, however, it is necessary to adjust the engine frame hangers, see that they are not left so tight as not to revolve freely around the rear axle. It is safe to make them as tight as possible and still revolve. The proper adjustment can be obtained by placing between the parts of the hanger thin pieces of metal.

The only way to inspect these parts is by removing the rear engine case.

To Prevent Bending a Crank

If the engine was started with water in the cylinders it would be very likely to bend a crank, and a bent crank would cause the connecting rod to vibrate with every revolution of the crank, until it would crystallize and break. If a connecting rod should break, and you should put a new one onto a bent crank, it would be very likely to break in a short time. You can determine whether a crank is bent, by disconnecting the wrist pin which holds the connecting rod to the crosshead, and by revolving the engine slowly by hand, see if the front end of the connecting rod moves from side to side in revolving the crank; if it does, it would indicate that the crank was out of line.

When a connecting rod breaks, it usually knocks out a cylinder head, because the first time that steam is admitted to one end of the cylinder, it drives the piston with great force against the other end.

Care of the Burner

The source of all power in a steam car is the heat produced in the burner. A good burner kept in perfect condition is the first essential in a steam-propelled machine. If your car "does not steam well" look at once for the trouble in your fire.

The thing most likely to cause trouble with your fire is low gasolene pressure. The burner is made to run on about one hundred pounds pressure. If the pressure is only fifty pounds good results cannot be expected.

With the gasolene pressure all right, the next thing to cause trouble is a clog somewhere in the gasolene flow. This may occur in the automatic valve, in the vaporizing tube, in the burner nozzle or in the main burner valve. Wherever it occurs it must be found and removed.

If the burner is double, having two mixing tubes, see if both sides are equally affected. If one side burns well and the other poorly, then the trouble is not in the automatic; otherwise both sides would be affected alike. It must be either in the vaporizing tube or nozzle. Most likely in the nozzle. The nozzles can be cleaned by running a small wire through them with the screw out, or by using a bent wire with the screw in. In the latter case the fire does not have to be turned off.

If there is a clog in the vaporizing tubes, it will be necessary to uncouple at the back of the burner and take out the bundle of wires in the tubes and clean both tubes and wires thoroughly. The bundle of wires can be used as a swab to knock off particles that may cling to the tubes. The screw on the burner nozzle can be removed and the air pump used to blow all dirt out of the tube. Should the clog prove to be in the automatic, this valve must be cleaned, and the same is true of the main burner valve.

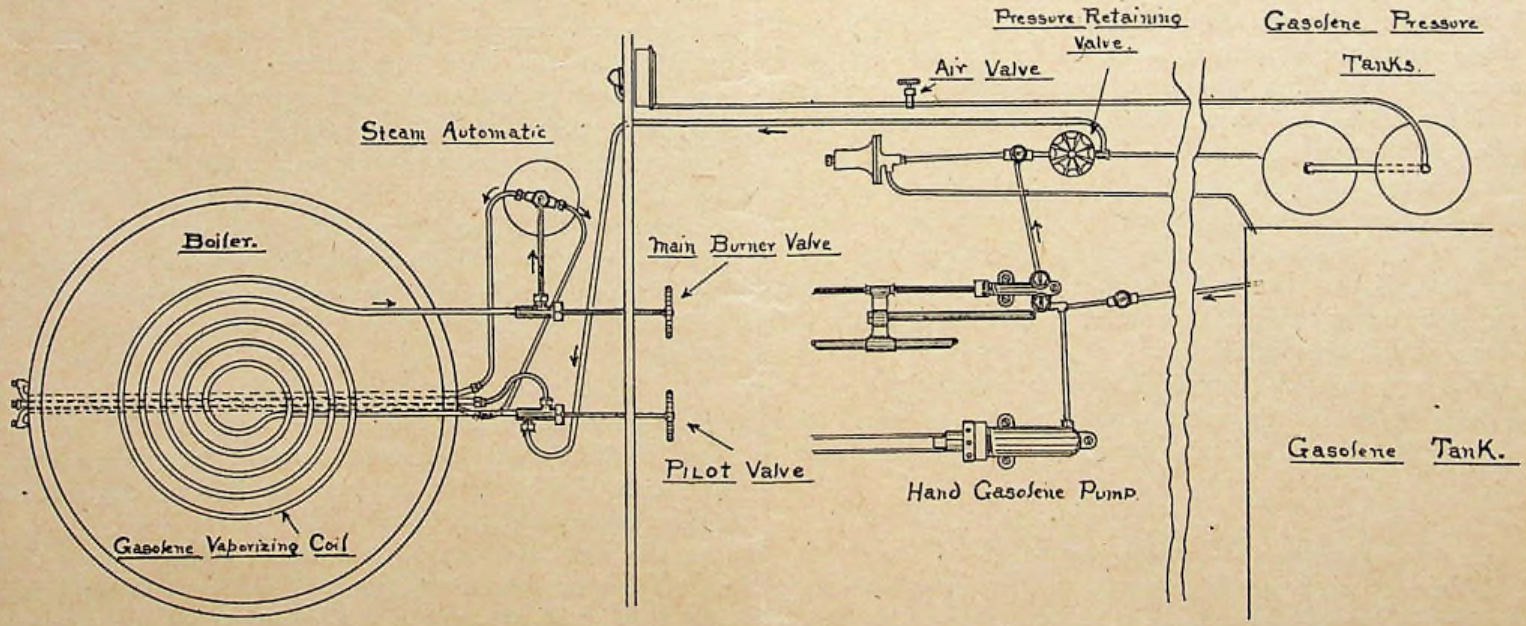
Thus far mention is made only of main burner troubles. The pilot light may go wrong. Owing to the small amount of gasolene consumed by the pilot, there is rarely ever trouble, except with the nozzle.

The screw in the pilot nozzle has attached to it a wire which passes through the hole in the nozzle to restrict the flow of gasolene. If the pilot is 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.

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. This can be done by bending the pilot vaporizer tube slightly. To give it more air, pull the nozzle further out from the mixing tube. To give it less air, push it in. 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.

Never use a reamer or broach for cleaning either pilot or main

Gasolene System.



burner nozzle, as it would be likely to enlarge the hole, allowing too much gas to go in for complete combustion, which would be wasteful.

To Adjust the Automatics

Steam pressure is controlled by the automatic valve. To carry a higher pressure, screw the adjusting screw on the automatic valve further in; to carry a lower pressure, further out. The same is true of the gasolene relief valve, in regard to the fuel pressure.

If the Burner Back-fires or "Pops"

Sometimes, after stopping a car 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. Sometimes, under these conditions, the burner will light back; 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 explosion. If it occurs with a loud explosion and takes place often, it would indicate that there was either a leak in the burner or a leak of steam in the boiler or superheaters over the burner. To determine if there is a leak of steam; after getting up steam pressure, 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 in the superheaters, and examine them.

Remarks on Operating

If asked to name the most common mistake made by those who run the Stanley steamer, we would say unhesitatingly, it is in opening the throttle too wide when starting. It is altogether too common to see the operator, in starting, shove the throttle forward and start the car on a jump, with a crack to the exhaust as loud as in going up a 25 per cent. grade. This is entirely wrong. It brings a tremendous and unnecessary strain on the working parts of the engine, and is still more injurious should there happen to be water in the cylinders.

Hence, start slowly, bringing the car up to the desired speed gradually. In time this will become a habit, and a good one.

On a good level road, at any legal speed, a Stanley car, with all bearings properly adjusted and lubricated, is practically noiseless in its operation. If a thump or knock is heard, however slight, find its cause, and do not be satisfied till it is stopped. The difference between success and failure is embodied in the old saying, "A stitch in time saves nine."

As much as possible make adjustments in the garage, and not on the road. It is much more convenient and decidedly more agreeable.

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.

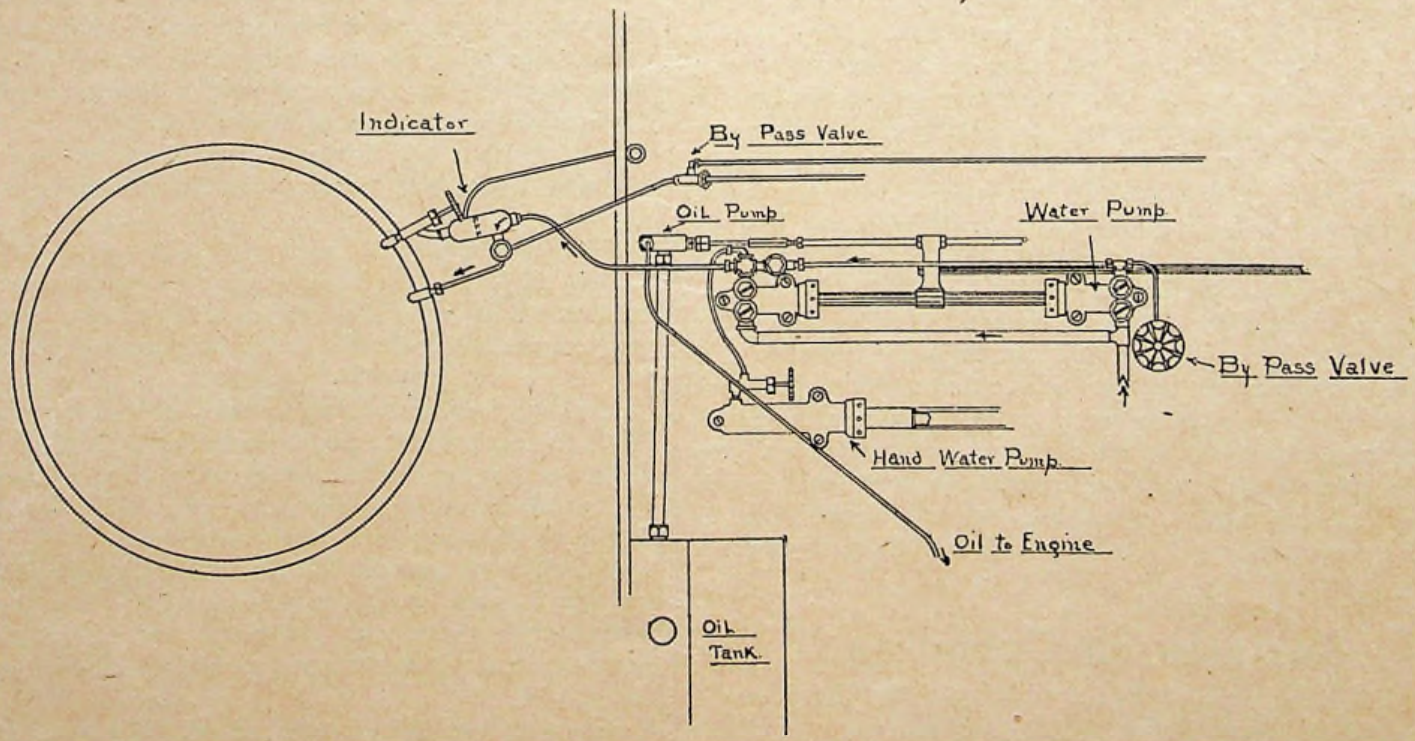
Never open any of the valves more than two or three full revolutions, as, if they are turned twelve or fifteen revolutions, they will come clear out. If the valve on the gasolene pressure system were screwed out while the fire was burning, it might cause serious fire.

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. Hence, the frequency of accidents in backing.

Make it a rule, especially at first, to back slowly, with ample sea room, and do not attempt to make an exhibition of skill till absolutely sure you possess it. 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.

Water System



Should the fire go out on the road, shut both burner valves, run a short distance in order that the exhaust may draw the unburnt gas out of the burner, then stop and light the pilot with a match. Then turn on the main fire slightly, and after starting it again, it may be turned on full.

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. Take off the indicator by disconnecting the union on the top and bottom and turn it upside down to drain the float.

When a car is to be left unused for a long time, say for a month or more, with or without water in it, it would be well to put a teaspoonful of Bichromate of Potash, or four to five pounds of Carbonate of Soda into the water-tank, so that it may be pumped into the boiler and prevent rusting.

The gasolene system will require no extra attention for winter.

Special Instructions

To Adjust the Throttle

If the throttle valve leaks steam, it is necessary to take it off and grind the valve into the seat, or put on a new throttle valve. It may appear to leak, however, 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 closed 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 on the throttle when the lever is back, 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.

Throttle

On some of the recent cars the throttle valve is so constructed that it can be taken off without removing the smoke hood, as the connection with the steampipe to the superheaters is outside this hood. This makes the task of removing the throttle for regrinding a simple matter.

THE IMPORTANCE OF CYLINDER OILS

It is costly practice to experiment with cylinder oils. The damage is done within the engine before making itself known to the operator. Observation over a period of many years in our own repair shop has shown us that much of the cylinder, valve and piston trouble, some of which is so mysterious and unaccountable to the driver, is caused by the use of inferior or unsuitable oils.

The question of lubrication is one of vital importance to the economical operation of any car, and it is to the mutual interest of Stanley owners and ourselves that the oil best adapted to meet the requirements existing in Stanley Cars should be used at all times. After giving this matter much care and attention, we adopted, and have used exclusively for some years, the Harris Super-heat Steam Cylinder Oil, furnished by the A. W. Harris Oil Company, Providence, R. I., and would urge each Stanley owner to have this oil on hand at all times, and always to run his car with this oil, feeling confident that thus the best results will be obtained.