INSTRUCTIONS

FOR THE CARE AND OPERATION OF THE

Twenty-Seventh Year

STANLEY CAR

Stanley Motor Carriage Company
Newton, Massachusetts, U. S. A.

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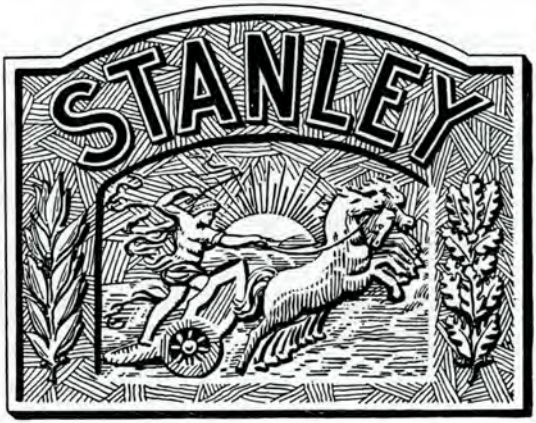

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FOREWORD

In appearance, the Stanley is like other cars of the highest class. Its condenser (radiator), body, wheels, axles, chassis frame, steering gear, brakes, storage battery and dynamo are similar to other cars. Only its power plant and power control are different, and they are much simpler and more obvious. The power plant consists principally of

A simple, two-cylinder double-acting steam engine, suspended from the chassis and riding on the springs, but geared directly into the rear axle so that engine and rear axle—in fact, the whole driving mechanism—form a single unit, attached to the chassis frame at three points:

A boiler which supplies steam to the engine:

A burner which supplies heat to the boiler:

A set of tanks and pumps which automatically supply water to the boiler, fuel to the burner and lubricating oil to the engine cylinders:

A set of automatic valves which control the supply of water to the boiler and fuel to the burner:

A condenser which condenses the exhaust steam and returns the water to the water tank:

A storage battery which supplies current for lights and horn and for starting the pilot:

A dynamo which automatically charges the storage battery:

The power control consists of a throttle lever and a reverse pedal.

Mechanical knowledge is not necessary in order to drive an automobile sucessfully, but a thorough understanding will enable the operator to get the best results under all conditions. This is more easily acquired in the Stanley than any other cars, since the Stanley's functions are simpler and more obvious.

STANLEY MOTOR CARRIAGE CO.

NEWTON, MASSACHUSETTS

CHASSIS LUBRICATION

(See Chassis Lubrication Chart, next page)

The Stanley chassis is lubricated by a high pressure lubricating system which forces oil to the bearings at a progressive pressure and permits the important work of lubricating the chassis to be done better and more quickly than by ordinary methods.

The system (see Fig. 1) consists of the gun, the nipples, and the dust caps for the nipples. The nipples have ball-check valves, installed at lubricating points (see Chassis Lubrication Chart) at the proper angles for easy use of the gun with one hand only.

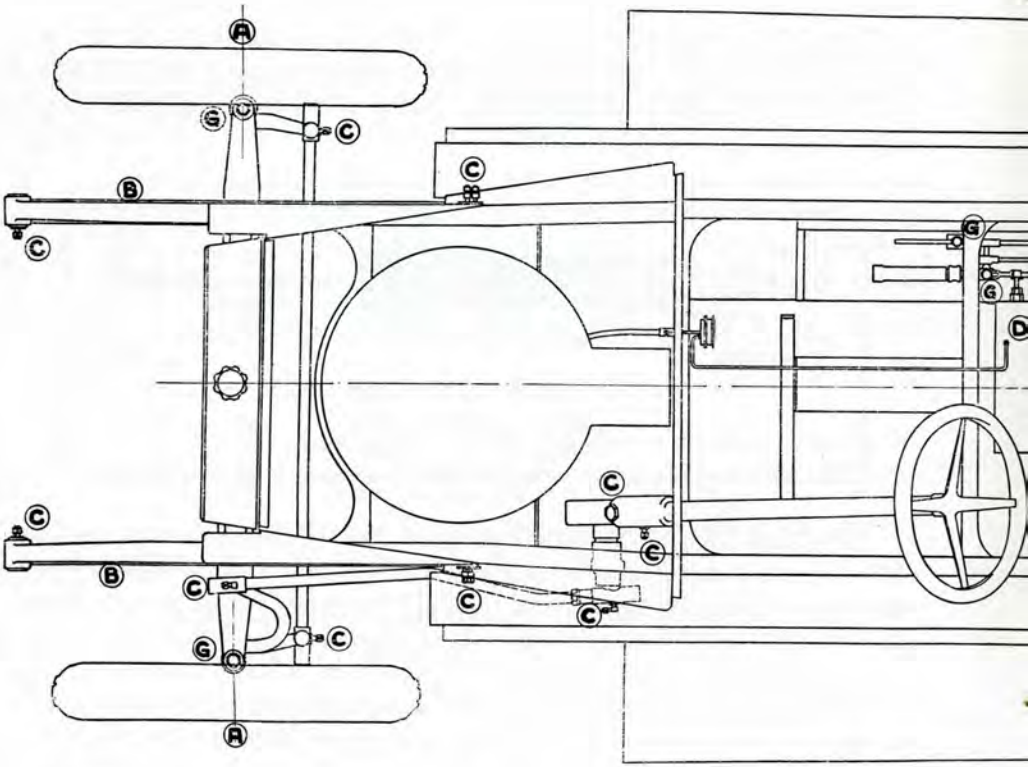
Fig. 1. The Gun and Fittings

TO USE THE GUN. Place the nozzle end of the gun over the nipple and give it a quarter turn to the right, which will first clamp the nozzle securely and then open the automatic valve, whereupon the oil may be forced into the bearing by turning the handle of the gun to the right.

A slight turn raises the pressure and fills the bearing with new, clean lubricant, forcing out the old. Because of the automatic valve, the pressure in the gun does not have to be released before detaching, but is retained for lubricating the next bearing.

To wash out a clogged or gummed bearing, gasoline or kerosene can be used in the gun.

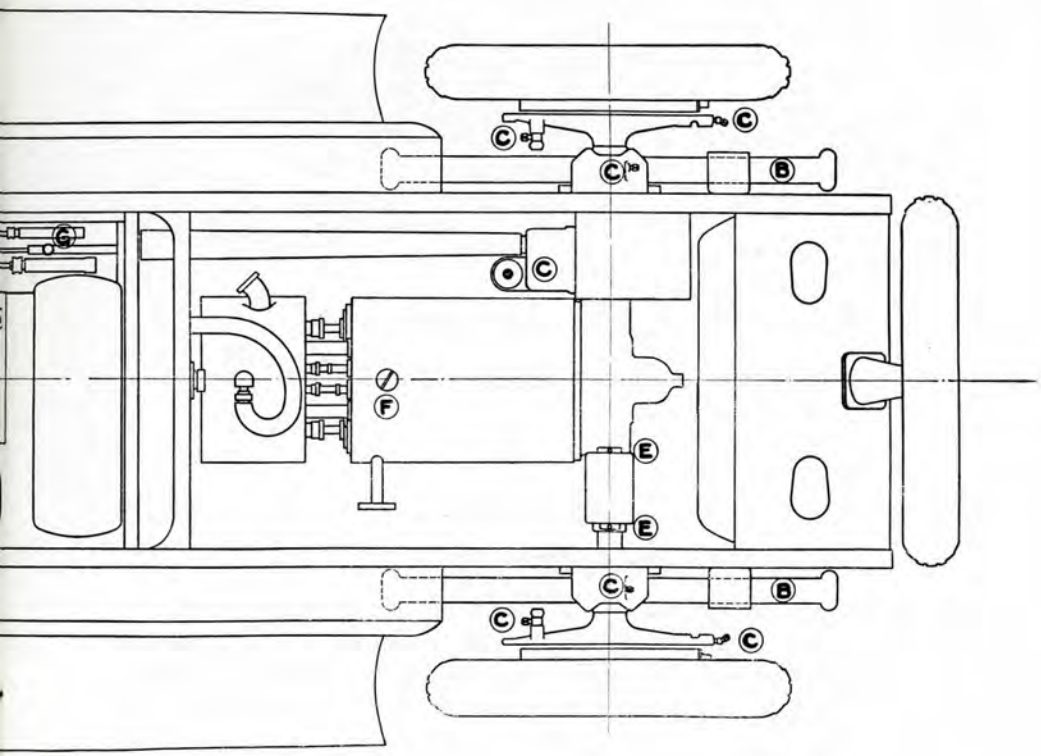
TO FILL THE GUN. (See Fig 2). Screw back the handle as far as it will go, then screw off the gun cap from the barrel of the gun; then fill with oil and replace the cap.



EVERY 10000 MILES:
Ⓐ PACK HUB WITH GREASE.

EVERY 15000 MILES:
Ⓑ PACK SPRING COVER WITH RED B MINERAL JELLY.

EVERY 1000 MILES:
Ⓒ MOBIL OIL C.
Ⓓ ATLANTIC REF. Co's 20TH CENTURY OIL.
Ⓔ A FEW DROPS OF LIGHT MACHINE OIL.



EVERY 1000 MILES:

Ⓕ EXAMINE OIL LEVEL 1¼ INCH MEASURED UNDER FILLER CAP, MOBIL OIL C.

EVERY 500 MILES:

Ⓖ MOBIL OIL C.

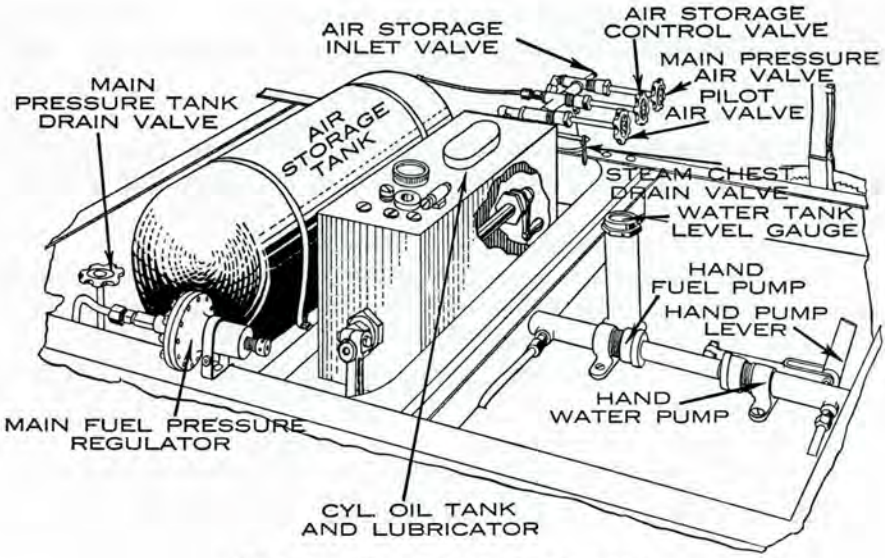


Fig. 1. Under the Front Seat

ARTICLE 1

TO STEAM UP

We are going to assume in this article that the car is in the condition it naturally would be in if it had been run previously. That is, that it has water in the boiler and water tank; fuel in the main and pilot fuel tanks; oil in the cylinder oil tank; and pressure on the main pressure tank and pilot tank.

The main fuel tank, at the rear of the car, has a quantity gauge on the right end. See that it contains kerosene.

The pilot fuel tank, at the rear of the car, has a quantity gauge on top. See that it contains gasoline.

If it does not, read Paragraph 2 of Article 3.

The air storage tank under the front seat has a pressure gauge extending through the front seat board on the left. See that it contains 120 lbs. pressure.

If it does not, read Paragraph 7 of Article 3.

See that there is 30 lbs. pressure on the pilot fuel tank, as shown by the small hand and small figures on the duplex fuel pressure gauge on the dash. (See Fig. 2.)

If there is not, read Paragraph 4 of Article 3.

See that there is 100 lbs. or more pressure on the main pressure tank as shown by the large hand and large figures on the duplex fuel pressure gauge. (See Fig. 2).

If there is not, read Paragraph 6 of Article 4.

Open the engine steam chest drain valve, the stem of which comes through the floorboard at the driver's heel (or in earlier Model 740's, through the left running board shield).

Open the throttle by moving the throttle lever on the steering post forward. (See Fig. 2).

Set the emergency hand brake.

Lift the left side of the hood and open the small door in the top of the flue over the boiler.

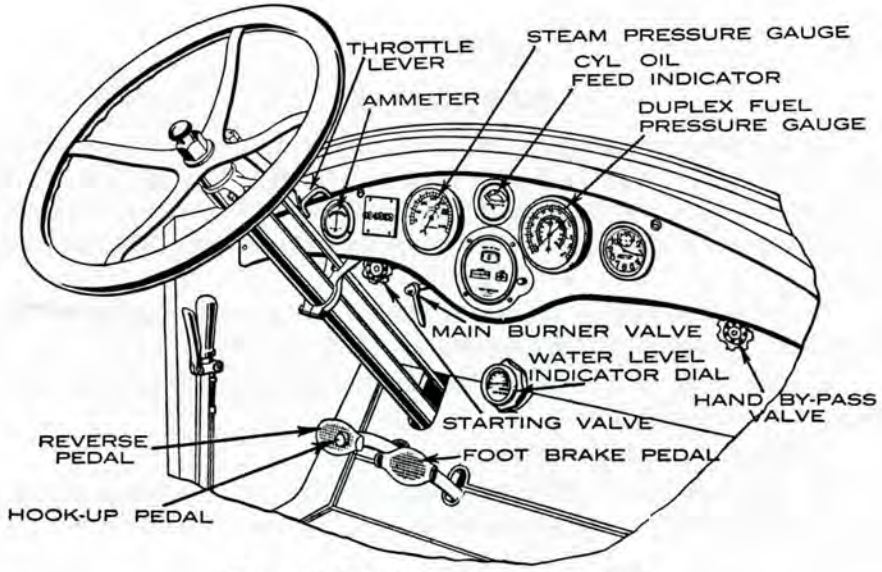


Fig. 2 The Front Compartment

Open the surface blow-off valve at the front of the boiler on the left (see Fig. 4), until it comes up to a shoulder; see that water runs out of it, confirming the water level indicator on the dash.

If it does, it indicates that the water in the boiler is above this point, and that is sufficient for steaming up.

More does no harm but will take more time to raise steam.

If no water runs out read Paragraph 1 of Article 3.

To Start Pilot. (See Fig. 3).

Open the door in the left running board shield near the front.

Open the peek-hole in the side of the burner casing.

Attach the pilot electric heating connection to the terminal post on the pilot vaporizer.

Press the starting button for ten seconds.

Open the pilot fuel valve and light the pilot by inserting the sparking gas-lighter into the peek-hole.

In case the pilot does not ignite and burn at once with a vigorous, clean, blue flame, strong enough to be plainly audible, press the starting button immediatley again for two or three seconds, and repeat intermittently until it does so burn.

If the pilot does not appear strong, turn the pilot screw back and forth quickly a few times with a screw driver; or shut the pilot fuel valve and take out the screw and clean the wire. (See Article "The Pilot," Page 11.)

The pilot should burn with a vigorous, blue, audible flame for four or five minutes so as to heat thoroughly the main vaporizer before admitting fuel to the main burner.

Close the peek-hole.

Disconnect the pilot electric heating connection.

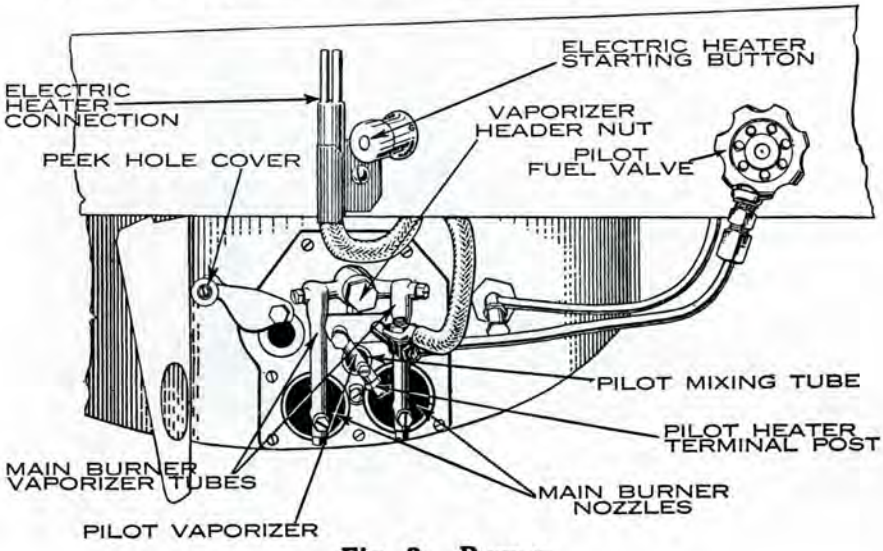


Fig. 3. Burner

To Start Main Burner

The starting valve has a wheel handle at the extreme left of the dash concealed under the instrument board. (See Fig. 2).

This valve permits the admission of gasoline into the main vaporizer which, since gasoline will vaporize more readily than kerosene while only the heat from the pilot is available, will accelerate starting the main burner.

Open the starting valve until fuel comes out of the nozzle. (See Fig. 3.) If the fuel is liquid, close the starting valve at once (to prevent flooding), and allow the fuel thus admitted to assist the pilot in heating the main vaporizer.

Continue to do this until the fuel at the nozzles is a vapor.

After this initial heat is thus supplied to the main vaporizer the starting valve may be closed at any time and the main burner valve may be opened, admitting kerosene. (See Fig. 2).

If, because the valve is opened too quickly, or because of a slight leak in the main burner valve, the burner chamber is filled with a mixture so rich that it will not burn inside, pump some air into the mixing tubes with the air pump.

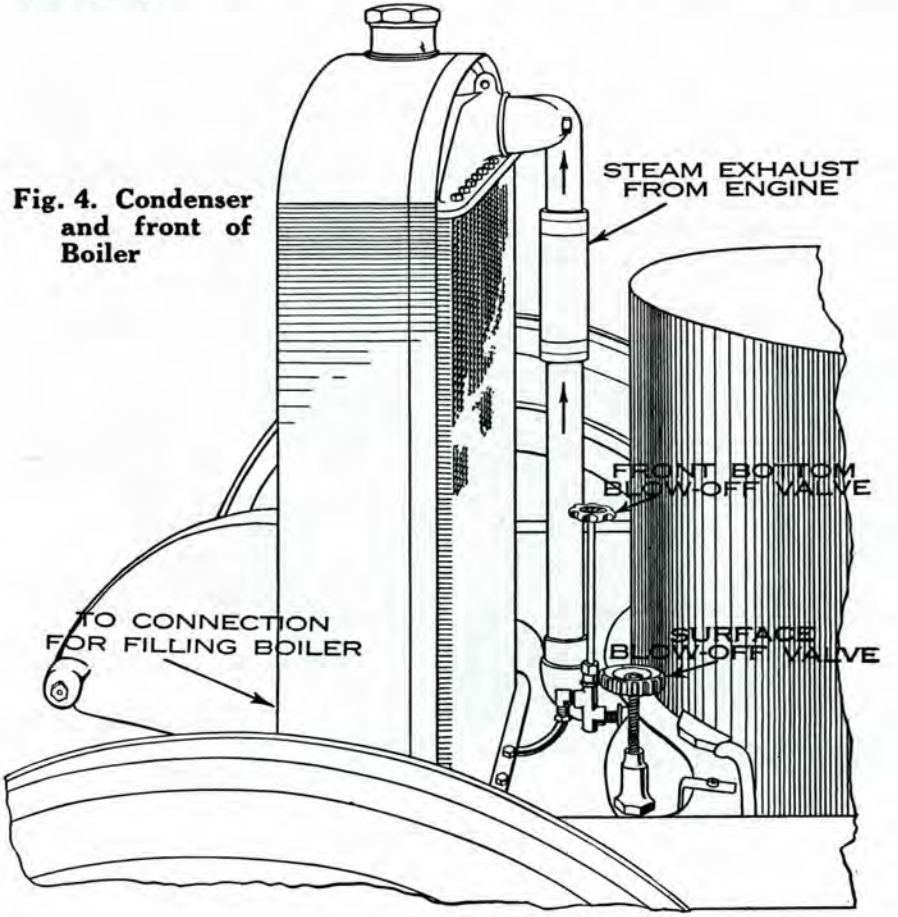


Fig. 4. Condenser and front of Boiler

Open the main burner valve slightly at first, being sure that the kerosene is well vaporized, then leave it open.

Time and effort can be conserved if you learn to tell, when you open the burner valve, by the difference in sound, whether the fuel is liquid or whether it is a vapor.

Best results are obtained in conserving both time and fuel if the valve is not opened enough to permit whistling.

As the pressure falls on the main burner fuel (as indicated by the large hand and the large figures on the duplex pressure gauge) it may be restored if necessary by operating the hand fuel pump. (See Fig. 1).

This pump takes the place, when the car is at rest, of the power fuel pump, which operates while the car is in motion, and pumps fuel from the main fuel tank to the main pressure tank where only a small amount is kept under pressure. (See Article "Hand Fuel Pump," Page 19.)

The main pressure tank contains an air cushion to stabilize the pressure and render it more elastic. This cushion also prevents the pulsations of the power fuel pump from following through the line, which would do no harm, but would cause the main burner also to pulsate and the hand on the pressure gauge to vibrate.

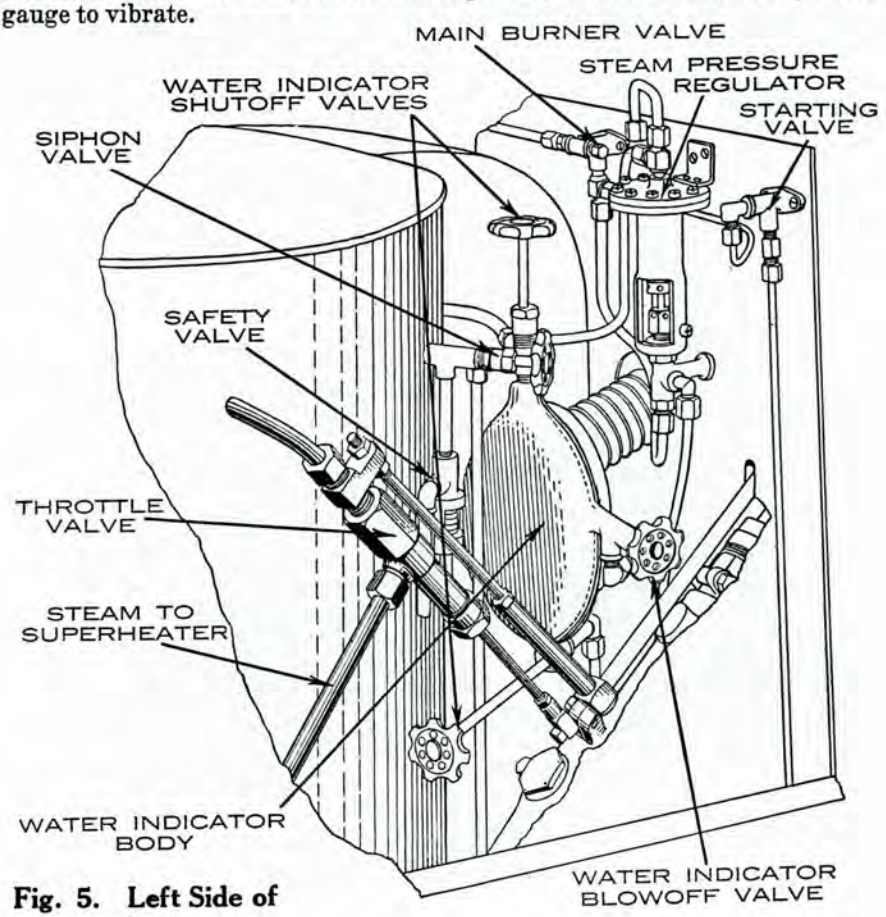


Fig. 5. Left Side of Boiler

Lack of sufficient air cushion is indicated also by the main fuel pressure receding rapidly when the main burner valve is opened.

It is highly desirable to have the correct air cushion on the main pressure tank. The most opportune time to supply the air is when the fuel pressure has been permitted to recede to a low point, as when steaming up.

Then, open both the control valve (the middle one) on the air storage tank, and the main pressure tank air valve (the one on the left), to admit air to the pressure tank. (See Fig. 1.) The lower the pressure is permitted to recede at this time, the easier it is to supply a large volume of air.

Admit enough air in this way so that the pressure does not recede rapidly with the main burner valve open.

When steam begins to generate, it will first be noticeable by escaping at the steam chest drain valve. This opening may be restricted by partly closing the throttle so as to keep only enough coming through to provide circulation through the superheater.

The car is ready to start as soon as sufficient steam pressure has been generated to move it, which will vary with road conditions.

Thereafter the burner valve may be closed at will; or the steam pressure regulator valve will shut off the fuel at 500 lbs. pressure. (See Article "Steam Pressure Regulator," Page 17.) The main burner valve, in fact, need not be closed, except when leaving the car.

Close the throttle by moving back the throttle lever and lock it with the locking screw.

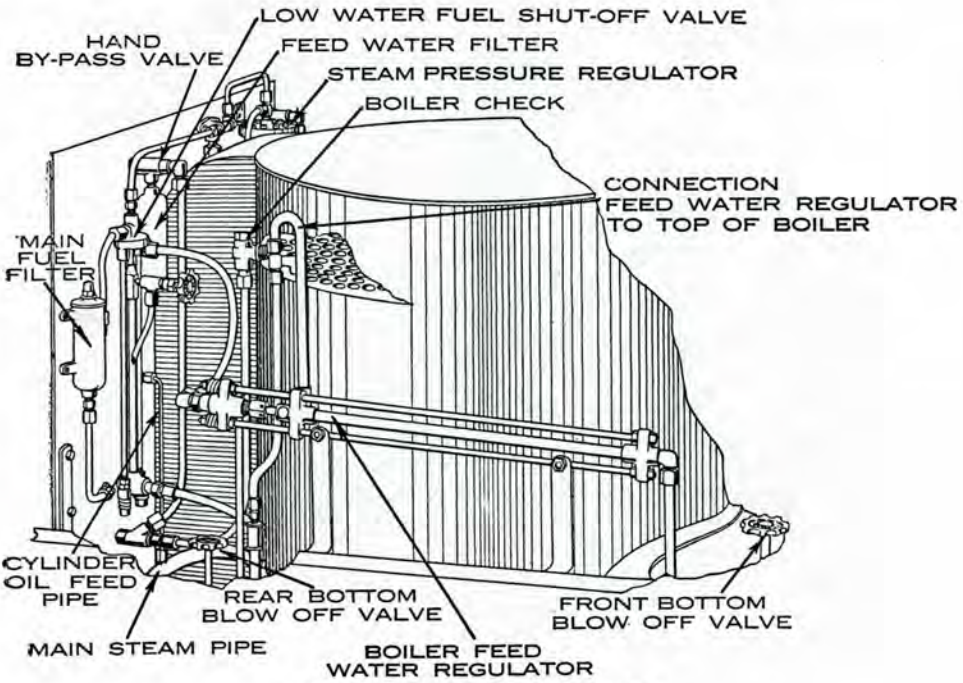


Fig. 6. Right Side of Boiler

ARTICLE 2

TO DRIVE THE CAR

The Throttle

Open the throttle by moving forward the throttle lever. (See Fig. 2).

This admits steam from the boiler to the engine, the amount of steam and therefore the speed and power being governed by the distance the throttle is opened, thus affording the operator quick and positive assurance of control.

The Reverse

To back the car, press forward the reverse pedal and the hook-up pedal (at the left, at the driver's feet) together as far as they will go and hold them there. (See Fig. 2.) This will reverse the position of the valves and permit the engine to operate immediately in the opposite direction, when the throttle is opened, with the same assurance and power as when going forward.

On releasing the reverse pedal, be sure that it comes back to the full forward position, not stopping in the hook-up, or cut-off, position.

The reverse pedal has a small round pedal protruding through it for varying the cut-off position of the engine valves, which gives greater economy.

We suggest ignoring this hook-up, or cut-off, pedal when learning to drive, as the performance and enjoyment of the car are not impaired when it is not used, and its function will later be readily apparent.

After you have driven the car enough to be somewhat familiar with it, you may begin hooking-up the engine as desired. (See Article "The Hook-up, or Cut-off," Page 25.)

ARTICLE 3

TO PREPARE CAR FOR STEAMING UP

Paragraph 1 — To Fill the Boiler

When shipping a car from the factory it is usually devoid of water and fuel.

If a pressure water system is available use the hose connection furnished for the purpose to fill the boiler through the front bottom blow-off valve at the front of the boiler on the right. (See Fig. 4.)

Open the surface blow-off valve as wide as it will turn. (See Fig. 4.)

Fill the boiler until the water runs out of the surface blow-off valve. More water does no harm, but will take more time to raise steam.

See that the water level indicator on the dash (see Fig. 2) confirms the surface blow-off valve. (See Article "The Water Level Indicator," Page 22.)

If no pressure water system is available the boiler may be filled with the hand water pump (see Fig. 1) from the water tank.

To fill the boiler with the hand water pump. (See Article "Hand Water Pump," Page 19.)

Paragraph 2 — To Fill the Pilot Tank

This is at the left end of the fuel tank at the rear, with a quantity gauge on top.

Fill with gasoline only.

PARAGRAPH 3 TO FILL THE MAIN FUEL TANK

This is at the right end of the fuel tank at the rear with quantity gauge on the right side.

Fill the tank with kerosene. If kerosene is not available gasoline may be used, without alteration.

PARAGRAPH 4 TO PUT AIR INTO THE PILOT TANK

Attach a hand or power air pump to the air inlet valve of the air storage tank (See Fig. 1) and open the pilot air valve (the one at the right), and admit air into the pilot tank until a pressure of 30 lbs. is indicated by the small figures and small hand on the duplex pressure gauge on the dash.

Air may be admitted to the pilot tank from the air storage tank (See Paragraph 7) by opening the control valve on the air storage tank (the middle one) and also the pilot air valve (the one on the right).

PARAGRAPH 5 TO PUT FUEL INTO THE MAIN PRESSURE TANK

With the hand fuel pump (See Fig 1), pump fuel from the main fuel tank into the main pressure tank until there is 5 lbs. pressure in the main pressure tank, as indicated by the large hand and large figures on the duplex pressure gauge on the dash. Then admit air to the main pressure tank as instructed below.

PARAGRAPH 6 TO PUT AIR INTO THE MAIN PRESSURE TANK

Attach a hand or power air pump to the air inlet valve on the air storage tank and open the main pressure tank air valve, (the one on the left).

Air may be admitted to the main pressure tank from the air storage tank by opening the control valve on the air storage tank (the one in the middle) and also the main pressure tank air valve (the one on the left).

PARAGRAPH 7 TO PUT AIR INTO THE AIR STORAGE TANK

Attach an air hose to the air inlet valve (See Fig. 1), and open the control valve admitting the pressure up to 150 lbs. if available.

PARAGRAPH 8 TO FILL THE CYLINDER OIL TANK

Fill the cylinder oil tank (the square one under the front seat) with cylinder oil. (See Fig. 1).

For condenser cars of Model Number 740, and earlier cars changed to Model 740 lubricating system, use **"Atlantic 20th Century Cylinder Oil,"** made by Atlantic Refining Company, Philadlephia, Pa.

This oil is available at the Stanley factory and at all Stanley dealers, as well as at all branches of the Atlantic Refining Company. Do not use any other kind of oil for the Model 740 cars.

We believe all automobile manufacturers are justified in their insistence that patrons use only the oil they recommend. It is costly practice to experiment with cylinder oils—costly not only in money for repairs but also in loss of power and increased fuel consumption.

The consistent use of **"Atlantic 20th Century Cylinder Oil,"** as directed above will give consistently satisfactory and economical results.

THE BURNER

Vaporization of fuel in the Stanley is by heat, that is, the fuel is turned into gas by the heat of the burner itself. This method is superior to atomization, carburetion, or spraying, because it is more positive, because no mechanical processes are involved, and because it permits the use of low grade fuels, with assurance, even in the coldest weather.

The burner, sealed beneath the boiler, consists of two parts — the main burner and the pilot; the latter contained within the main burner and incorporated with it.

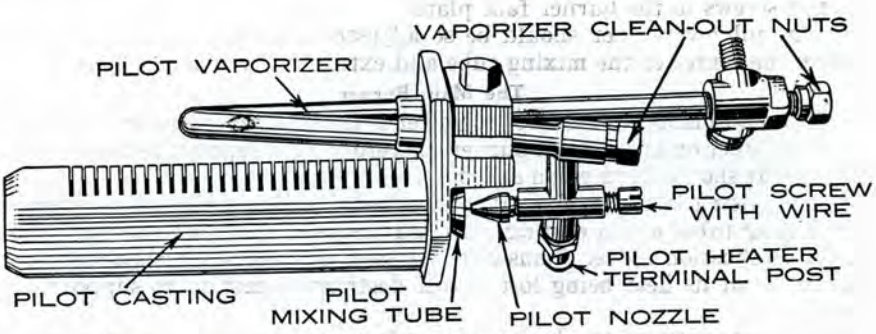


Fig. 7. The Pilot

The Pilot

The pilot burns continuously; its functions are:

To ignite the main burner fuel when turned on; to keep the main vaporizer hot for vaporizing this fuel; to supply sufficient heat to the boiler, when standing, to maintain the steam pressure.

The pilot should burn with a clean, blue, audible flame. Its intensity can be varied to meet the operator's requirements by merely varying the pressure on the pilot fuel. It should be clean and blue and audible at any pressure between five and fifty pounds. We recommend burning it continuously at a strength which will maintain steam pressure when standing.

The pilot, which maintains heat in the water and in the fuel system while standing, permits the operator to leave his car for long intervals, winter or summer, with the assurance, upon his return, of a smooth, powerful, quiet start and immediate combustion. The fuel consumed is not wasted. It is storing and maintaining heat and energy.

The pilot is simple in construction and is easily detachable, as a single piece, for examination, or may be adjusted on the car.

It is a burner of the Bunsen type. The fuel, passing through the vaporizer is there turned into gas, passes into the mixing tube, drawing with it the correct amount of air for perfect combustion, and this mixture passes up through the slots in the casting and burns on the upper side.

The pilot screw has a wire in the end of it which goes through the hole in the pilot nozzle and fills it except where it is filed off on the upper side, thus giving sufficient opening so that the proper amount of gas will be admitted.

It is essential to keep the fuel passage clear, to insure a clean, blue pilot. If any carbon restriction occurs in the vaporizer, it may be blown out by removing the pilot screw and blowing vigorously with its own pressure. If neglected, and a greater obstruction is allowed to accumulate than can be removed by blowing, it may be readily removed by running through the vaporizer arms the drill which is supplied for the purpose.

This may be done with the pilot assembly in position, or it may be easily removed by disconnecting the fuel pipe and the heater cable and taking out the two screws in the burner face plate.

The pilot vaporizer should be so adjusted that the nozzle delivers its fuel in the center of the mixing tube and extends into it about $\frac{1}{8}$ inch.

The Main Burner

In an automobile the source of power is the heat produced from the fuel.

The function of the main burner, therefore, is to supply the heat to drive the car. It should burn clean and blue.

Its construction is simple, of the Bunsen type, consisting of a vaporizer, two mixing tubes and a casting, through the holes of which the fuel passes up for combustion above. Thus it will be seen that the burner is a motionless part, none of its heat being lost in self destructive motion to support combustion.

The intensity of the burner depends upon the fuel pressure and on the free passage of fuel from the pressure tanks to the nozzles. The normal maximum pressure is 140 pounds, at which it is set at the factory; if less than this, it will merely reduce correspondingly the intensity of the burner.

With sufficient pressure on the fuel, with the main burner valve open, and with the boiler pressure not so high that the boiler pressure regulator is closed, the burner should burn freely. If not, it indicates either that the low water automatic fuel shut-off valve is closed, or that there is an obstruction in the fuel line between the pressure tank and the nozzles.

The low water automatic fuel shut-off valve seldom has occasion to operate, (due to the reliability of the pumps and other parts) except when the water tank has run dry. Nevertheless, it is advisable to examine this first, and if for any reason it has functioned, it will be sizzling hot from the steam which has been admitted to it. If it is hot, (see Article "Low Water Automatic Fuel Shut-off Valve," Page 18.)

If there is an obstruction in the line it may be easily located. First, see that the nozzle holes are clean; if not they can be cleaned by removing the vaporizer screws and using the small drills supplied for the purpose, using first the large and then the smaller. It is inadvisable to use anything which might enlarge the holes.

Next, with the main burner and pilot extinguished, take out the vaporizer screws and see if there is a free flow of fuel. If not, it indicates an obstruction farther back. The arms of the vaporizer header should be cleaned with the drill supplied for the purpose; this may be done in position; or it may be easily removed by taking off the header nut. Remove the screen and its retainer from the main vaporizer and clean it. If the obstruction is thus shown to be farther back, proceed as above, disconnecting each union in turn until the stoppage is located, back to the pressure tank.

Inside the vaporizer, where the fuel enters it, is a wire cable about four feet long. It is desirable to remove and clean this often enough to anticipate any stoppage; which would be indicated by lack of force in the burner. Before replacing it, flush out the vaporizer with fuel, using its own pressure, by opening the main burner valve with the vaporizer screws removed. Consistent use of clean fuel will greatly obviate the necessity of cleaning the fuel line.

If the pilot is permitted to burn weak or yellow, it may cause the main burner fuel to ignite in the mixing tubes with a slight pop. Should this occur, the main burner valve should be closed until the burning in the mixing tubes has ceased.

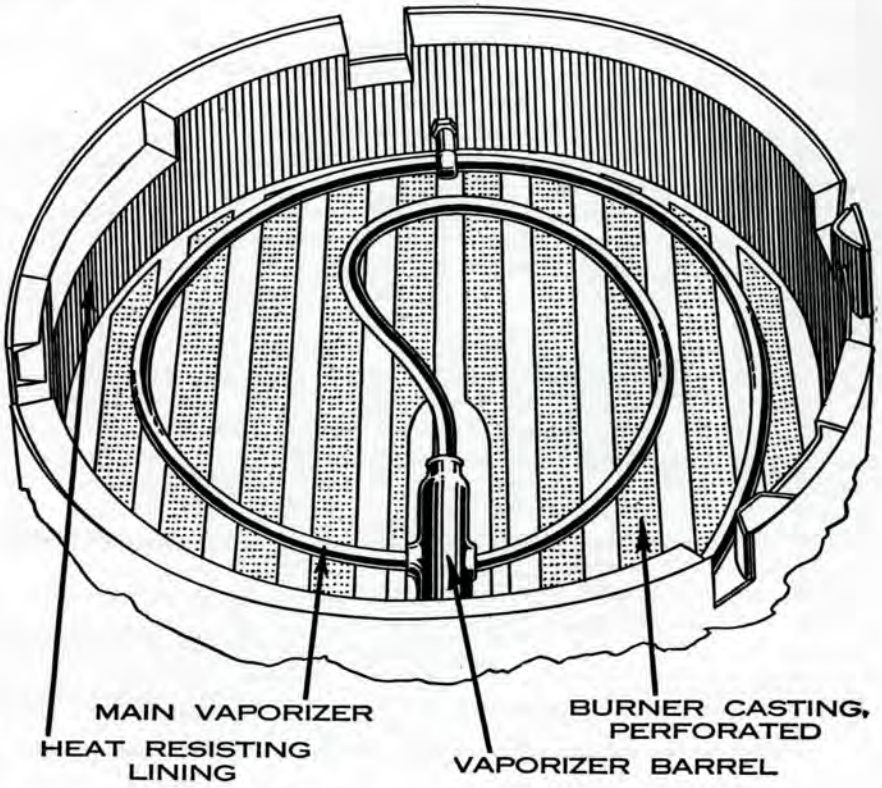
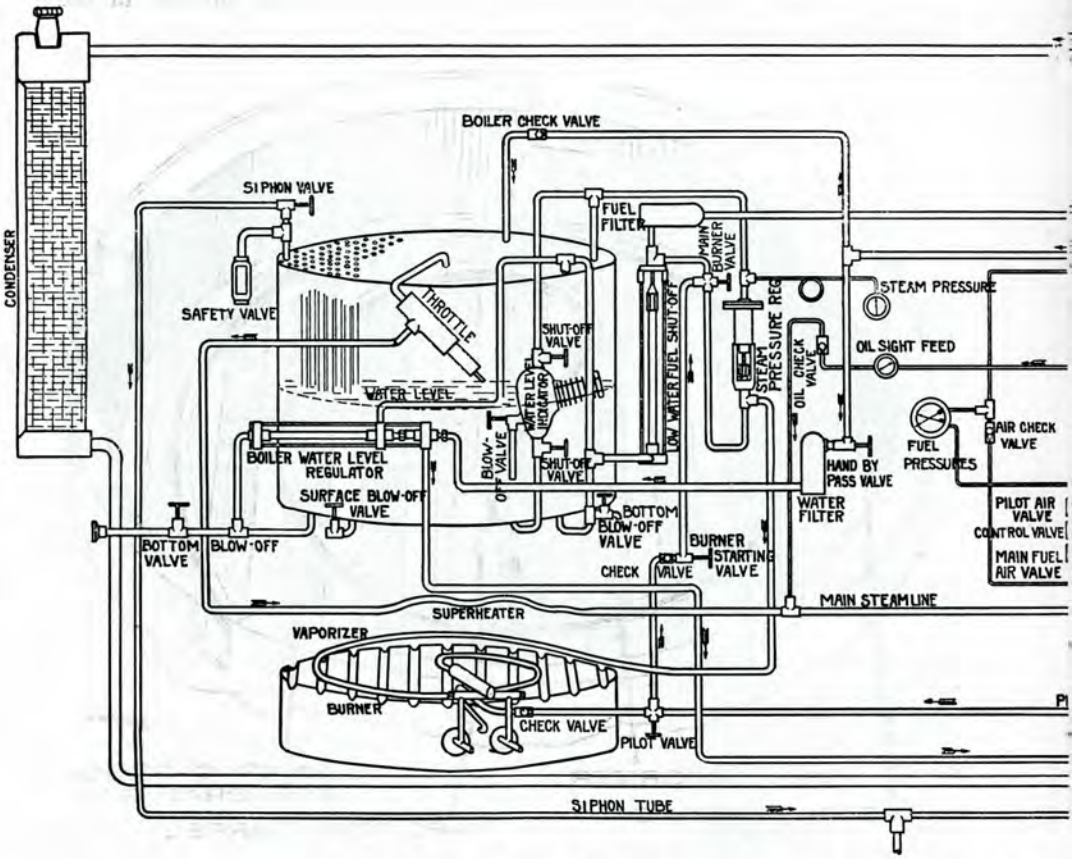


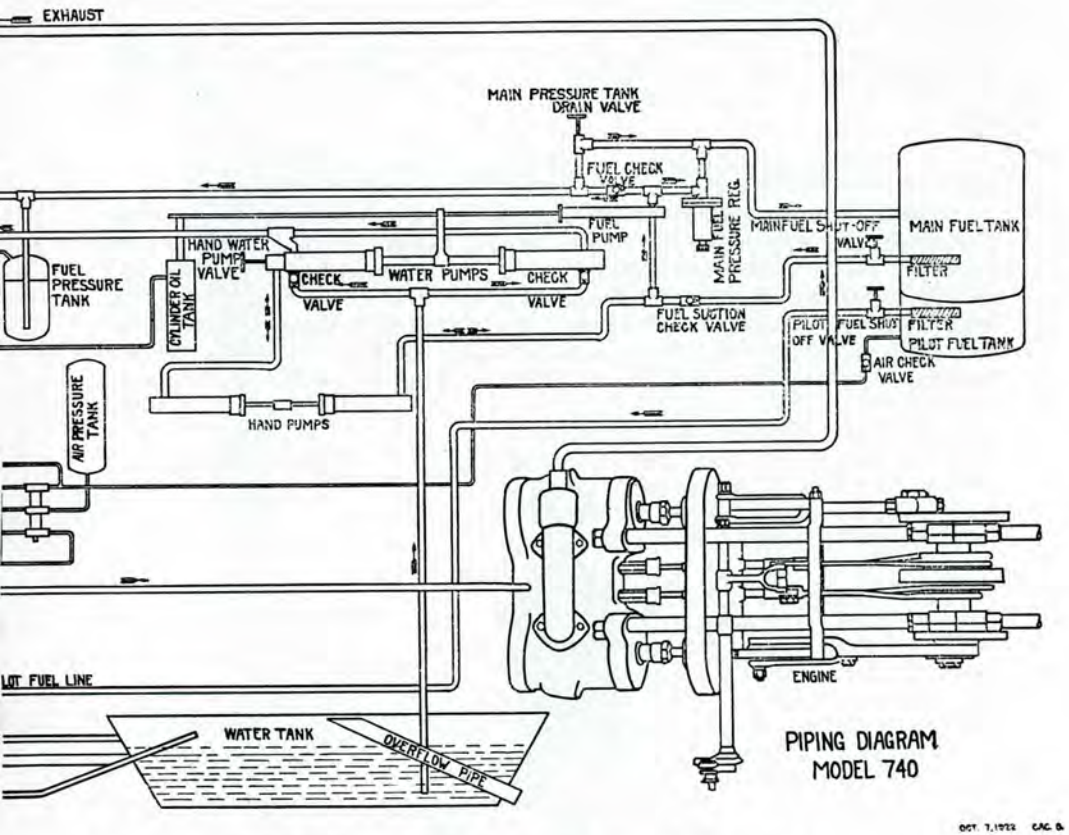
Fig. 8. Interior of Burner

If unclean fuel is used, or if the cable is neglected, one of the main burner nozzles may become partially or wholly obstructed, causing an uneven flow of fuel and resulting, also, in igniting in the mixing tubes.

This may occur, also, if the peek-hole cover is left open, or if there is a leak around the burner casing or in the burner casting, or in the vaporizer.



This diagram shows every essential part of the Stanley car boiler, burner and engine; fuel, steam, and water systems comp the utter simplicity of the Stanley as compared with internal



except the axle, body, and steering gear assemblies. It includes lete, with every valve and pipe on the car. It makes obvious explosive cars.

THE FUEL FILTERS

There are Fuel Filters at the outlets of the main fuel tank and of the pilot fuel tank. There is also a filter of basket form on the main fuel line in front of the dash.

THE MAIN PRESSURE TANK

The Main Pressure Tank is located just forward of the pump box. Its function is to keep a small quantity of fuel under pressure for supplying the main burner, the supply being automatically maintained while running by the power fuel pump. The fuel may be drained back to the main tank by opening the main pressure tank drain valve, located under the driver's seat.

THE MAIN FUEL PRESSURE REGULATOR

The Main Fuel Pressure Regulator is located under the driver's seat. It controls the pressure on the fuel in the main pressure tank. The spring holds the valve on the seat until pressure on the tank, acting on the diaphragm, overcomes the spring and opens the valve. The tension on the spring determines the pressure at which the regulator will function. Increasing the tension on the spring, (by means of the adjusting screw), increases the pressure at which the regulator functions; reducing the tension increases it.

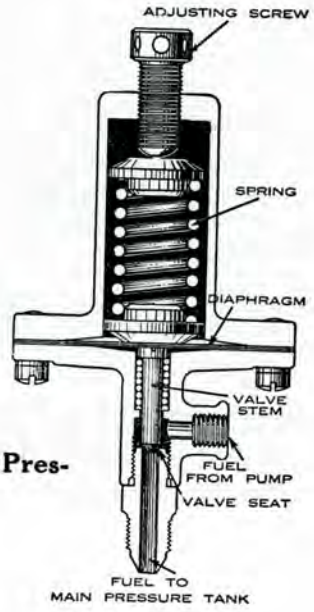


Fig. 10. Main Fuel Pressure Regulator

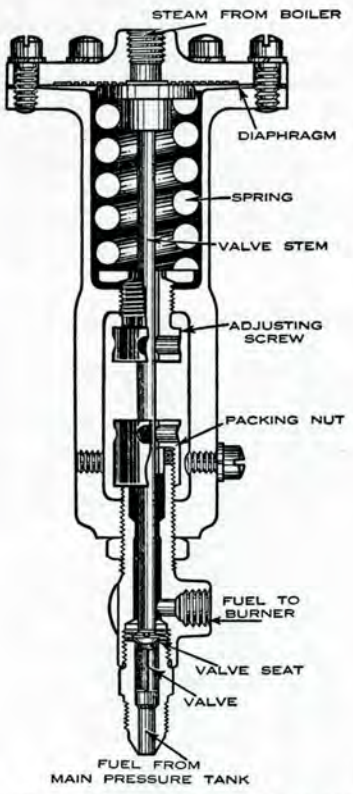


Fig. 11. Steam Pressure Regulator

THE STEAM PRESSURE REGULATOR

The Steam Pressure Regulator is located in front of the dash on the left. It controls the steam pressure in the boiler by shutting off the fuel to the burner as soon as the steam pressure has reached 500 pounds, (the point at which all steam pressure regulators are set when leaving the factory) and opening again when the pressure is reduced. The spring holds the valve open until the boiler pressure acting on the diaphragm overcomes the spring and closes the valve. The tension on the spring determines the pressure at which the regulator will function. Increasing the tension by means of the adjusting screw increases the steam pressure at which the regulator closes; reducing the tension decreases it. Experience has shown, however, that any pressure above 500 pounds is for abuse, not use, and is not to be encouraged. The movement of the valve is slight. Its proper adjustment (which is rarely necessary to alter) is made by screwing the valve up until it seats, and then turning it back three-quarters of a revolution.

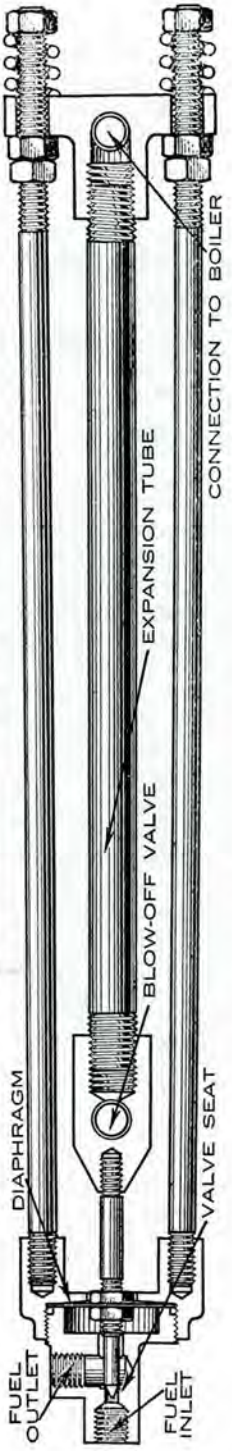


Fig. 12. Low Water Fuel Shut-off Valve

LOW WATER AUTOMATIC FUEL SHUT-OFF VALVE

The Low Water Automatic Fuel Shut-off Valve is located in front of the dash on the right. Its function is to shut off the fuel to the main burner if the water in the boiler should get extremely low. The expansion tube is connected at the bottom with the boiler. So long as the water level is above this connection the valve remains open, but when steam enters the tube it expands the valve and closes it. Due to the reliability of the pumps and the boiler feed water regulator, this valve rarely has occasion to function, but if it does, stop and restore the water level in the boiler, before proceeding.

THE POWER WATER PUMPS

The Power Water Pumps are simple, positive plunger pumps located in the pump box and are driven from the rear axle. Their capacity is greater than is required, even in extreme conditions, to maintain the water level in the boiler, the surplus returning to the tank through the automatic boiler feed water level regulator.

An emergency hand by-pass valve is provided, which normally remains open. Closing it permits filling the boiler above the point where the automatic water regulator functions, thus building a greater reserve which is often desirable when about to stand for long intervals. It also permits regulating the water if the automatic regulator is inoperative.

If for any reason the pumps become inoperative, first see that there is water in the tank, then that there is no obstruction in the strainer, then that the pumps are not leaking from improper packing, and then see that the check valves and seats are clean. To confirm your inspection, with the wheels jacked up and engine running, loosen a union nut in the water line near the pumps and if they are working, water will spurt out.

These pumps are packed with vulcabestine cord packing.

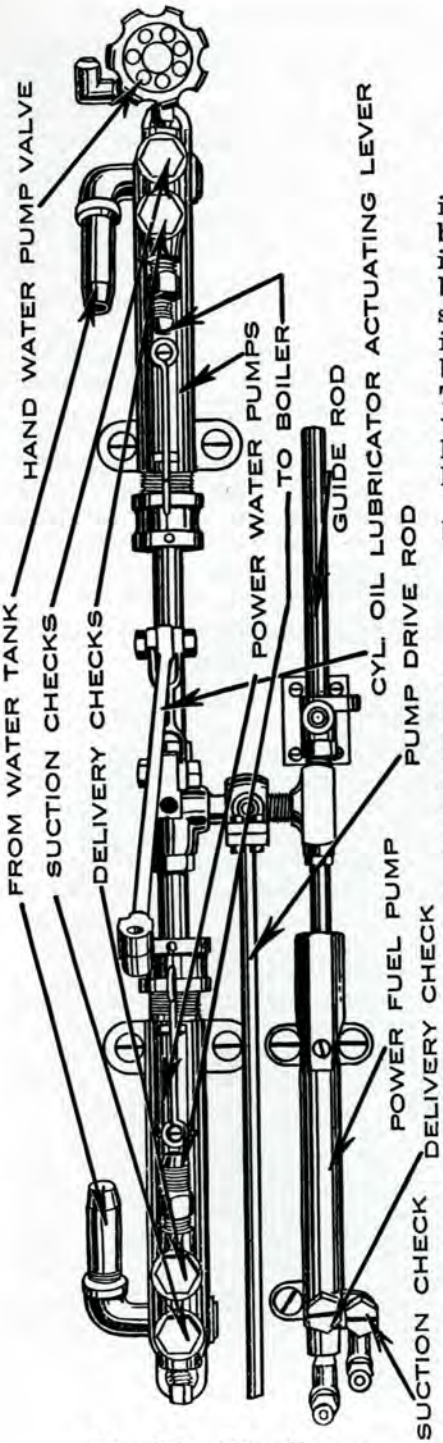


Fig. 13. The Pumps

THE HAND WATER PUMP

An emergency Hand Water Pump is provided under the front floorboard. It is rarely necessary to use it, but it may be employed to fill the boiler when there is neither a pressure water system available, nor steam in the boiler (so that the engine may be used to drive the power pumps). To operate, open the hand water pump valve and actuate the hand pump handle placed on the hand pump lever.

This pump is packed with vulcabestine cord packing.

THE POWER FUEL PUMP

The function of the Power Fuel Pump is to supply fuel from the main fuel supply tank to the main burner pressure tank. It pumps more fuel than the burner requires, even in extreme conditions, the surplus returning to the main fuel tank through the main fuel pressure regulator.

This pump is packed with special packing rings, supplied by us, between thin leather washers.

THE HAND FUEL PUMP

An emergency Hand Fuel Pump is provided under the front floor board for pumping fuel into the main burner fuel pressure tank, if desired, when the car is standing. To operate, place the hand pump handle on the hand pump lever.

This pump is packed with vulcabestine cord packing.

THE CYLINDER LUBRICATOR

Since the Stanley Engine has but two cylinders moving slowly (always 924 revolutions per mile at any car speed), and since there is neither fuel nor combustion in the cylinders, cylinder lubrication is a simple and positive matter. The steam on its way to the engine becomes impregnated with the cylinder oil which is fed to it by an advanced type of lubricator. The oil tank containing the lubricator is located under the driver's seat and the lubricator actuated by a lever driven from the pump crosshead. It delivers positively a definite amount of oil for each revolution of the engine. The lubricator is set, when leaving the factory, to deliver the maximum amount of oil. This may be cut down materially after the car has run a few thousand miles.

Extreme care should be used in securing the proper oil for the cylinder lubricator. We recommend and urge to be used exclusively, the Atlantic Refining Co.'s **"Atlantic 20th Century Cylinder Oil."**

The cylinder oil indicator on the dash is a dial with the hand following a semi-circular line, a segment of which is marked "Off" and the remainder "On." It operates by pressure instead of quantity. That is, the distance the hand travels indicates the pressure on the oil line rather than the quantity of oil delivered. The pulsating of the hand indicates the feeding of oil. The lubricator is geared to run at a very low speed which accounts for the time necessary to build up the required pressure in the oil line and cause it to register on the indicator. A crank is provided for hand operation in emergency.

THE BOILER

The Boiler is of the fire-tube, water-level type, shaped like a drum and standing on end. The tubes are expanded into the upper head and expanded and welded into the lower head. The strength of the shell is multiplied many times by the windings of piano wire and it is this construction, originally devised by us, which makes the Stanley boiler the most efficient, the most compact and the safest boiler in the world, as twenty-six years' use in the public's hands has proven it to be. Big cannon have been wound in this way for years and for the same object — to get great efficiency and safety in light, compact size.

Since the shell with its wire windings is many times stronger than the tubes, the latter, in case of excessive pressure, would yield first and collapse; the weakest one would collapse first and perform the functions of a safety valve. For an explosion every one of the tubes would have to collapse at once, which is just as impossible as to pull a chain and make all the links break at once.

The heating surface in the boiler is sufficient to generate steam for continuous requirements, even under extreme conditions. Its design permits a high degree of superheating, insuring delivery to the engine of steam in its most efficient form. The design also permits carrying a large reserve of power which is available instantly whenever conditions warrant. This stored power, instantly available, is what makes possible the simple control by one throttle and what gives the operator the sense of security and mastery when driving the Stanley. It is one of the factors in the Stanley's unmatchable flexibility.

The boiler is not subject to frictional wear, and therefore requires no attention for lubrication, adjustment, etc. It requires no special care except to blow it off occasionally.

Blowing Off Boiler

The surface blow-off valve (see Fig. 4) is for removing from the surface of the water any accumulation of oil or other floating matter. It is a sleeve valve; open it as wide as it will turn; it should remain open until the water or wet steam ceases and dry steam appears; when closing, turn it until it seats.

The surface blow-off valve is not sufficient alone, however, to remove all foreign matter, and thus maintain proper circulation in the boiler and fittings. To accomplish this, the boiler should occasionally be blown entirely down and cleansed by flushing out with kerosene and hot water. This will obviously not only maintain the boiler's greatest steaming capacity, but will also prolong its life. A hose of sufficient length to conduct the exhaust away from the car and muffle the sound may be conveniently installed in the garage, to encourage blowing the boiler frequently. It should be attached to the right front blow-off valve.

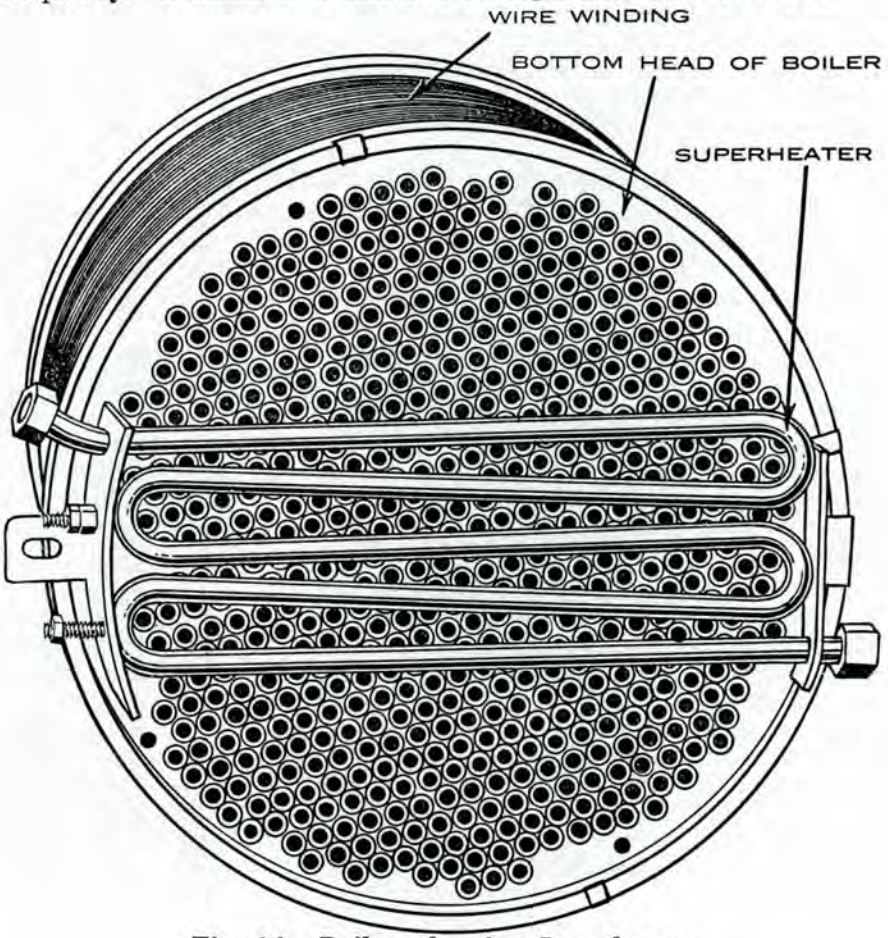


Fig. 14. Boiler, showing Superheater

The steam left in the boiler when it is blown completely down, will condense and form a vacuum, which may draw sufficient water from the tank to fill the boiler. Do not assume that this will always be the case, but before steaming up again, make certain that there is water in the boiler. If the burner is started with no water in the boiler, the boiler will become overheated and may leak around the tubes, which might require re-expanding at the top and rewelding at the bottom.

If the boiler has siphoned full as indicated above, it is advisable to draw off some of the water before steaming up; otherwise, if the throttle remains closed, a hydraulic pressure may be created which would do no harm but might cause the safety valve to blow.

Should the boiler prime while running, through the hand by-pass being left closed, wet steam would pass to the engine and make it knock. Make sure that the hand by-pass is open, and proceed cautiously until the engine runs freely; or the excess water may be removed at once by blowing off a little if convenient.

THE SUPERHEATER

The Superheater is located directly under the boiler, and exposed to the heat of the burner, for the purpose of superheating the steam as it passes through from the throttle to the engine. To the Stanley method of superheating the steam after it leaves the throttle is attributable in a great measure the activity and flexibility of the Stanley car. (See Fig. 14).

THE WATER LEVEL INDICATOR

The Water Level Indicator is a chamber connected top and bottom to the boiler so that the water level is the same as in the boiler. In the chamber is a float which indicates the water level on the dial, without pressure, by means of a shaft with a magnetic hand.

THE BOILER FEED WATER REGULATOR

The Boiler Feed Water Regulator is located on the right side of the boiler. It controls the supply of water to the boiler. The expansion tube is connected top and bottom to the boiler, and when steam enters it, it expands and closes the valve. This causes the water to go into the boiler, and as soon as it is high enough it fills the expansion tube and cools and contracts the tube; this opens the valve and allows the water to return to the tank.

The valve stem is packed with hemp packing.

The boiler feed water regulator seldom needs adjustment, but when necessary this may be easily done. With 100 pounds pressure on the boiler, jack up the rear wheels, disconnect the return pipe from the regulator back to the tank and run the engine slowly so that you can see if the water flows out of the return pipe. Open the right front blow-off valve, permitting steam to circulate through the expansion tube until it is very hot. This should close the valve; if it does not, slack up on the rear adjusting nuts a little at a time, and take up on the front nuts correspondingly, until the valve closes. Now cool the expansion tube by applying cold water outside, and see that the valve opens.

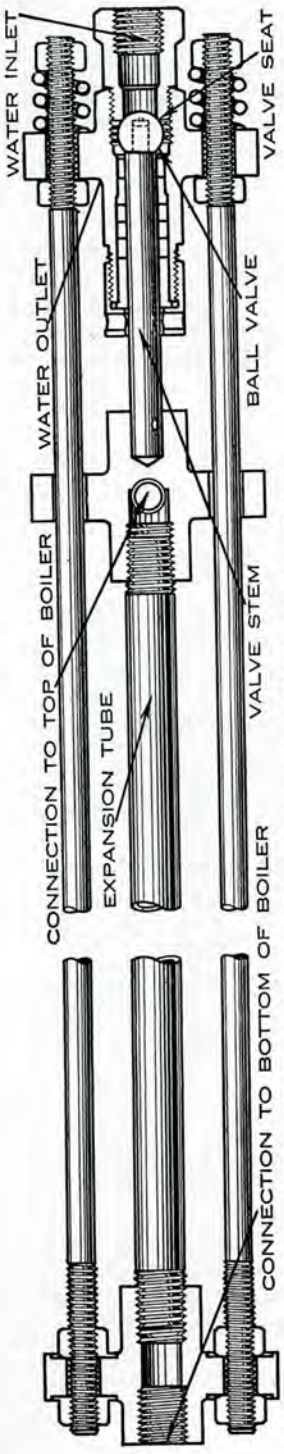


Fig. 15. Boiler Feed Water Regulator

THE WATER TANK

The Water Tank is suspended from the chassis just forward of the engine. The top of it being lower than the bottom of the condenser, the condensed steam returns to it by gravity. It is good practice to overflow and flush the tank occasionally.

THE CONDENSER

The Condenser is of the fin-and-tube type. It occupies the place of the radiator on an internal explosive car and is similar in appearance. It requires practically no attention.

The condenser performs three important functions. It permits the use of the water over and over again, assuring 150 to 250 miles to one filling of the tank; it greatly reduces the possibility of sediment in the boiler; and it eliminates the show of exhaust steam, years ago identified with steam cars.

The exhaust steam from the engine enters the condenser in the top header, is condensed to water as it passes through the tubes and flows by gravity from the condenser to the water tank. The condenser is always empty when standing.

It is good practice, every few thousand miles, to flush out the condenser with kerosene, at the same time draining the water tank, allowing the kerosene to flow out through the tank. It is advantageous to do this when the condenser is warm, after a run.

THE BOILER CHECK VALVE

The Boiler Check valve is located in the water line just in front of the dash. When the boiler water level regulator is open the water will not lift this check, but will return to the tank; when it is closed, the water cannot return to the tank, so it lifts the check and goes to the boiler.

THE SIPHON VALVE

The steam pressure may be used for filling the water tank by means of the Siphon Valve. This is rarely used, but is a convenience when no pressure water system is available. For filling the tank, apply the hose to the siphon connection inside the left running board shield door, immerse the other end, and open the valve, which is located at the left of the boiler.

THE SAFETY VALVE

An automatic Safety Valve is provided, located at the left of the boiler. It is of the spring type, the spring holding the valve closed until the pressure overcomes it.

THE ENGINE

The Stanley Engine does not generate the power; it merely delivers it. Therefore, no explosive self-destructive effort is involved, there is no fuel or combustion in the cylinders, and no power is lost in sustaining combustion, and none is wasted in "idling."

The engine has two cylinders, each with 4-inch bore and 5-inch stroke. It is of the single-expansion type; and it is double acting.

The engine is geared 1½ to 1. It turns always in constant relation to the distance travelled, irrespective of car speed — 924 revolutions to the mile. Thus it turns 46 revolutions at 3 miles an hour; 231 revolutions at 15 miles an hour; 462 revolutions at 30 miles an hour, etc.; and, because the driving force is variable with the steam pressure admitted by the throttle, the engine can exert its maximum effort at any car speed and does this without having to resort to a gear shift.

With two cylinders, less than twenty moving parts altogether, and turning at a low rate, the engine lubrication is simple and positive. The crank and bearings are lubricated by an oil bath in the crank case. (See Article "Lubrication," Page 26.)

The cylinders are lubricated independently of the crank case oil, by the cylinder lubricator. (See Article "Cylinder Lubricator," Page 20.)

The engine gear meshes directly into the rear axle differential gear. The engine is carried on the chassis frame, being suspended therefrom by the engine hanger strap.

Because of the expansive force of steam, and the simplicity of lubrication, the Stanley engine is remarkably free from need for adjustment. The main bearing clamps are in pairs with shims between them for adjustment. The crosshead slides are also adjusted by shims. The crank pins and wrist pins are also adjustable. The hanger strap has cone bearings, top and bottom. When any adjustments to the engine are required, the

ordinary mechanical precautions should be taken that the bearings are not set up too tight.

The piston and valve stem packing boxes are packed with rings of metallic packing made to size. It is advisable to set the packing box nuts up after the first 500 miles; thereafter they will require little or no attention.

The Engine Hook-up or Cut-off

The engine valves are provided with means for varying the cut-off from full forward position to one-third cut-off.

The hook-up, or cut-off, permits taking advantage of the expansive force of steam to achieve greater economy, under average to excellent driving conditions, than the same throttle opening would give with the valves in full forward position.

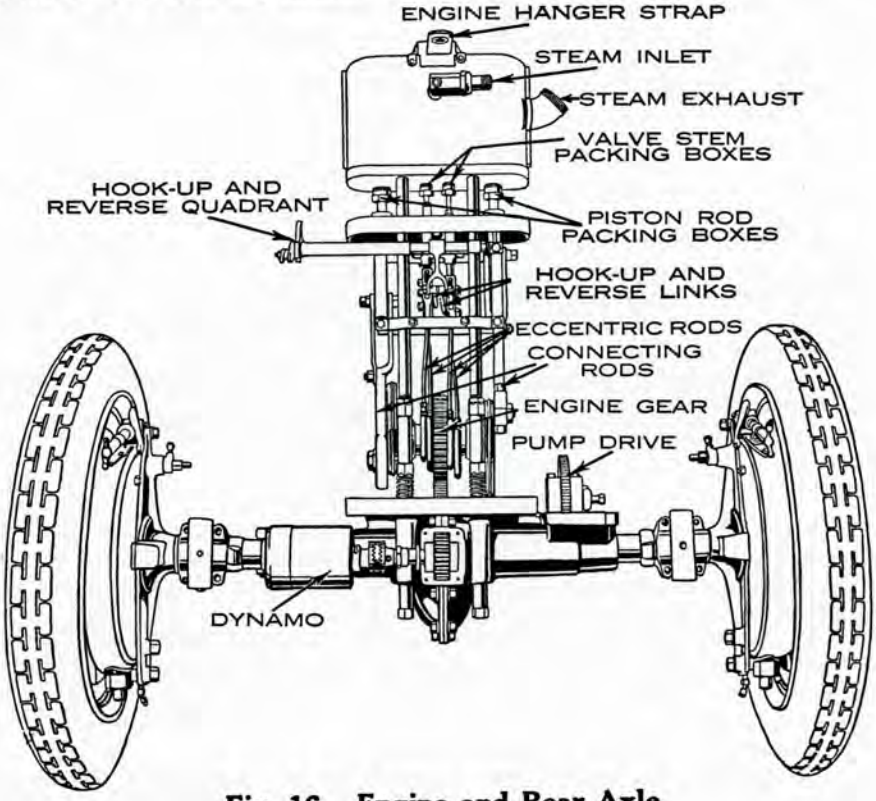


Fig. 16. Engine and Rear Axle

On the other hand, under certain conditions as in starting, or on steep hills, or in deep sand, full steam admission to the cylinders is desirable and is permitted when the valves are in full forward position.

To hook up, press forward gently on the reverse pedal only, until you feel the catch drop into its notch on the quadrant, and it is held there. (See Fig. 2).

The hook-up pedal will then be seen to protrude farther through the reverse pedal.

To release, press the round end of the hook-up pedal gently, whereupon the catch will lift and the reverse pedal will come back to its original position.

If, when standing still, the throttle is opened before unhooking, sufficient steam to start may not be admitted to the cylinders on account of the position of the valves; but the pressure thus admitted against the valves may hold them against their seats so that merely pressing the hook-up pedal will not bring the reverse pedal back to full forward position. In this event, the reverse pedal may be assisted back to full forward position with the hand or foot, or the pressure may be released immediately by opening the steam chest drain valve.

It is good practice, when parking, to leave the car with a margin of a few inches between the rear wheels and the curb, especially when pointed up a severe hill. This will permit reversing, if necessary, to secure the full opening of the valves for starting ahead.

THE THROTTLE VALVE

The Throttle Valve is located at the left of the boiler and is operated by the throttle lever on the steering post. A tension clamp is provided on the throttle lever quadrant, by which tension on the lever may be adjusted to suit the operator's preference. The throttle requires little or no attention, but in case of adjustment, see that the three prick punch marks on the throttle valve stem are in line with the outlet to the superheater, which will insure a full opening.

By the nature of its construction, in the event of any possible breakage of connections, the throttle automatically closes.

The throttle valve is packed with vulcabestine cord packing.

LUBRICATION

Since the number of moving parts in the Stanley is under forty (including wheels, steering gear, etc.), and since the parts move slowly, (the engine turning only 924 revolutions per mile at any car speed), Stanley lubrication is simple and positive.

The engine cylinders are lubricated by an advanced type of cylinder lubricator, the oil being delivered into the steam on its way to the engine in a definite quantity for each revolution. For cylinder lubrication we recommend and urge to be used exclusively the Atlantic Refining Co.'s **"Atlantic 20th Century Cylinder Oil."**

The engine crank shaft and bearings run in an oil bath and as the engine is in union with the rear axle, the differential and inside rear axle bearings are lubricated from this same source. The oil bath should be carried at a height which will assure thorough splashing. The oil in this bath is not consumed in lubricating the cylinders, nor can it be contaminated by leakage from them; nevertheless, it is well to remove the filler cap from the crank case occasionally and add oil if needed. For the engine bearings we recommend a first class engine oil, such as Mobile C. When cold weather is approaching, we recommend that this be diluted with thinner oil of similar quality.

The rear axle pump drive assembly runs in an oil bath in an independent housing with filler cap.

For the usual oil cups in the steering gear, running gear, etc., an advanced type of oil cup with oil gun is provided. The fitting on the end of the flexible tube of this oil gun fits over the oil cup, and a turn of the oil gun handle drives the oil with great force into the bearing.

The springs are enclosed in spring covers packed in grease and readily detachable for regreasing.

THE BRAKES

The Brake design on the Stanley reflects the most advanced practice. The service brake friction surface is 49⅜ x 2½ inches, with a total area of 124 square inches, and the design permits the band to engage the drum with equal tension for the full circumference, and equally well when in reverse or forward motion.

The brakes are on the drums on the rear hubs. They are lined with fibre asbestos. Simple, positive and easily accessible adjustment is provided, and lubrication is by an advanced type of oil cup with force-feed oil gun. The service brakes are of the contracting type; the emergency or hand brakes are of the expanding type.

THE ELECTRIC SYSTEM

The Electric System on the Stanley car is called upon to supply current merely for the lights and the horn, and occasionally for initially heating the pilot vaporizer, as when the car has been left with the pilot extinguished. A dynamo driven directly from the rear axle charges the battery while running. The highest grades of dynamo, battery, horn, etc., are used. The operation of the car is not in the least dependent on electricity in any form. This lessens the burden on the electric system and the amount of care needed. Nevertheless, it should receive the necessary attention.

WINTER USE

The Stanley unquestionably has a greater range of flexibility for winter use, enabling it to meet the demands of the owner in extreme cold weather, than any other car. The pilot maintains the pressure on the boiler and keeps the fuel system hot while standing for long or short intervals which assures immediate combustion of fuel and a quiet, powerful start.

The full half-day stop unprotected out-of-doors can be practiced with assurance with the Stanley right up to the extreme cold weather without any other precaution than maintaining a strong pilot, which is desirable at any time.

For added protection where the use is abnormal in cold climates we offer the following suggestions:

First; keep a good pilot.

Second; the water pumps, while well protected, are the most remote from the boiler which is the source of stored heat. Place heavy paper or canvas over the metal cover which encloses the pump drive rod and seal

it up air tight where it joins the pump box. Paint or varnish this covering to render it weather-proof. Let this protection extend over the small air space between pump box and water tank, as there is some heat given off from the tank when left well filled after the car has been run sufficiently to warm the water.

Third, the products of combustion from the boiler and burner when standing are delivered directly against the water tank, which assist it to retain its warmth.

Cover all but three or four of the front louvers of the hood by placing a piece of black cardboard inside. This helps in retaining the heat, and the added air circulation to the condenser is not needed in cold weather.

Fill the steam gauge with heavy oil. This is retained by a reducing bushing which is easily removed for filling.

Dilute the oil in the engine case with thinner oil of the same quality keeping the oil at a consistency that will splash easily.

There is no likelihood of the condenser freezing as it is empty in standing and heated when running. There is no likelihood of the engine freezing as the throttle is on the boiler, therefore the engine and steam line are empty in standing.

To prepare for storage, drain the water tank and drive the car a few yards to expel water from the pumps, etc.; then blow off boiler. Remove steam gauge and safety valve.

POWER

Correctly Generated
Correctly Controlled
Correctly Applied
to the
Rear Wheels

Reproduced by:

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CAUSTIC-CLAFLIN COMPANY
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