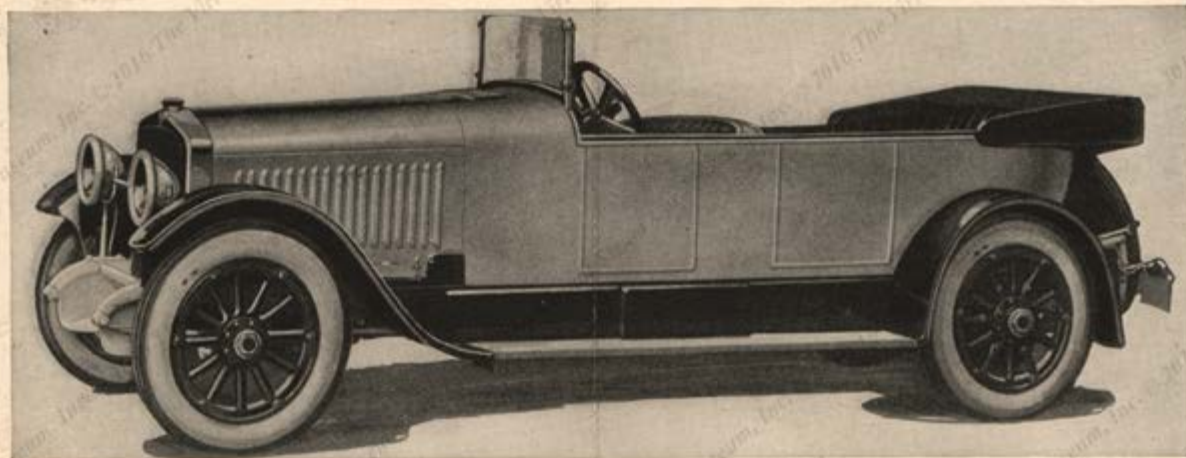


The
DOBLE-DETROIT
Steam Car

SANDERS-DUFFEY AUTO CO.
Distributors for Texas
FORT WORTH.

DOBLE-DETROIT STEAM MOTORS CO.
DETROIT, MICHIGAN

THE DOBLE-DETROIT STEAM CAR



DOBLE DETROIT SEVEN PASSENGER TOURING CAR

THERE is nothing freakish or unusual in the appearance of the Doble-Detroit Steam Car. It conforms to the most advanced standard of automobile design and expresses both in the beauty of its lines and the richness of its finish the best thought of automobile builders in this country and abroad.

It is a car of beauty and distinction and character.

But it is upon its remarkable operative qualities that the Doble-Detroit Steam Car bases its fundamental claim to supremacy. Actual performance is after all the final test of motor car quality. This is what the Doble-Detroit Steam Car will do: It will creep along at less than one mile an hour and accelerate instantly and smoothly to express train speed by merely moving a small lever.—*That is flexibility.*

It climbs any hill, on which the wheels can secure traction, although the engine is geared 42 to 54 with the back axle.—*That is power.*

There are only twenty-two moving units in the Doble-Detroit Steam Car, of which eleven are in the engine. There is no change speed gear-set clutch, or drive shaft.—*That is simplicity.*

The Doble-Detroit Steam Car uses kerosene only for fuel, and in fuel mileage compares favorably with the best gasoline cars of the same weight and power.—*That is economy.*

The exhaust steam is condensed and used over and over again, thus insuring silence and conserving heat energy. The water supply is adequate with one filling of the water tank for the longest continuous run ordinarily made.

The fuel is ignited by an electric spark. There is no pilot light or supplementary gasoline burner to fuss with.

The car will start in about one and one-half minutes although perfectly cold. After standing several hours it will start in a few seconds. Cold weather does not cause ten or fifteen minutes of bad running, as in a gas car.

It is controlled entirely by the little throttle lever on the steering post and the brake pedal within easy reach of the right foot. There are no gears to shift, no spark lever to fuss with—nothing to do but turn a switch to ignite the fuel and move the throttle slightly to turn on the power.

The Doble-Detroit Steam Car is easier to operate than an electric and immeasurably more responsive owing to the tremendous power that is always available.

The two cylinder Doble-Detroit engine gives the same number of impulses per revolution as an eight cylinder gasoline motor, with the added elasticity and power derived from steam.

DOBLE-DETROIT STEAM POWER PLANT

THE steam power plant, designed by Abner Doble and used in the Doble-Detroit Steam Car, consists primarily of the steam and water system, the fuel and combustion system, and the engine or power transmission system.

The Doble-Detroit steam generator in point of construction is based on the water-tube type, and carries a water level in the evaporating zone.

It consists of 28 identical sections placed in an insulated casing. Each section consists of two horizontal headers connected by sixteen vertical tubes. They are made entirely of cold drawn seamless steel tubing of about one-half inch diameter. The vertical tubes are swaged at both ends to about three-eighths of an inch, and are welded to the headers by the autogenous acetylene process, thereby making the section in effect one piece of steel, and actually stronger at the welded joints than the tubing itself.

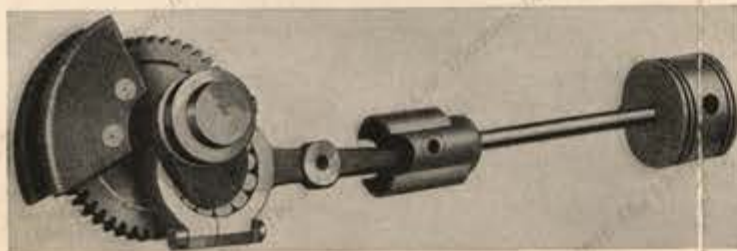
The combustion chamber is directly beneath the steam generating sections, while the exhaust for burned gases is below the economizer sections.

The intake water manifold delivers water simultaneously to the economizer sections through their lower headers, the water being forced in by a crank-driven plunger pump. When the economizer sections are completely filled, the water overflows from the upper headers into a manifold, which delivers it simultaneously to the lower headers of the evaporating sections.

Here the water level is maintained about half way up the generator by means of a by-pass valve, so arranged that when the regulator tube is filled with steam and consequently hot, the by-pass valve is closed by the expansion of this tube, forcing the water from the pumps to lift the check valve and enter the generator.

As the water level rises the regulator tube is filled with water from an exposed pipe. This water, not being in circulation in the generator, is quite cool, so that the relatively large change in temperature causes the regulator tube to contract, thereby opening the by-pass valve and allowing the water to return to the supply tank.

The hot gases rise from the combustion chamber, giving up their heat to the closely grouped vertical tubes, pass over the bridge wall, and a large number of their remaining heat units are absorbed by the relatively cool water flowing slowly up through the economizer sections.



Assembly of piston, crosshead, connecting rod with roller bearing at big end, and crank shaft showing counter-weights

From the foregoing description it should be noted that the Doble-Detroit steam generator possesses the most distinctive advantages of both the fire-tube and flash boilers.

The excellent heat transference conditions, and the large reserve of water heated to the steam temperature, are true of the former. The progressive flow of the water counter to that of the gases, with no circulatory flow, and the all steel construction with its consequent immunity from leaky joints due to low water, duplicate the most desirable features of the flash type.

The normal steam pressure in the generator, is 600 pounds, which means a terrific acceleration with the opening of the throttle. Pressure is maintained at this point by an automatic device which cuts off or renews the fuel supply according to the variation of the pressure from normal.

Every section of the generator is tested to withstand an hydraulic pressure many times greater than it will ever be subjected to in everyday use.

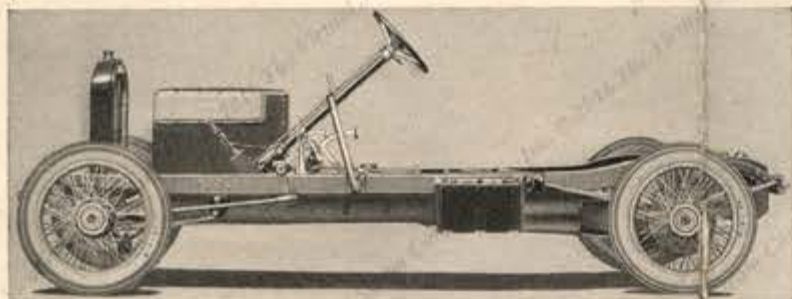
To prevent any possibility of an accident to the generator tubing a safety valve is also attached, which operates if the steam pressure reaches 1000 pounds.

The live steam is led from the upper headers of the generator into a manifold, passes through the throttle valve, and down to the steam chest of the engine.

The exhaust steam from the cylinders is carried to the top of the radiator, and is forced down through it by the pressure of following steam. A honeycomb type radiator is used, thereby obtaining approximately six times the radiating surface of the tube type which was formerly used on steam cars.

The water of condensation enters the water tank very near the bottom, so that any steam that might find its way to the tank, is at once condensed in bubbling up through the water. This will occur only when accelerating rapidly from a slow speed or pulling slowly on a heavy road. If the unfavorable condition of slow, heavy pulling continues for some time, a small part of the steam will remain uncondensed. To guard against any accumulation of such steam a vent is provided in the top of the water tank.

The lubrication of the throttle and cylinder valves, the cylinder walls, the interior of the generator, and the water pumps, is accomplished automatically by the addition of a small quantity of standard cylinder oil.



Doble-Detroit Chassis—weight 3000 lbs. The steam generator is located directly behind the radiator; the water tank is below the front foot boards; the rear end of the crank case is integral with the rear axle housing; the kerosene tank is between the rear springs



Doble-Detroit Steam Generator—Sectional view. Large arrows indicate flow of gases of combustion—small arrows indicate flow of water. Water enters the lower headers of the Economizer Sections, shown at the right. Steam leaves the upper headers of the Evaporating Sections, all those above the combustion chamber

The oil is pumped into the steam generator along with the water, and there performs several valuable functions. First it thoroughly coats every portion of the interior of the generator with a very thin coating of oil, which coating, at 485 degrees F., the approximate temperature of the steam at 600 pounds pressure, is reduced to a mere film, and thereby becomes negligible as a heat-retarding factor.

No scale will stick to a surface coated with oil, therefore the interior of the generator is protected from accumulations of scale, as well as from rusting.

A second function of the oil is to prevent particles of scale from adhering to one another and finally clogging some passage. This is effectually accomplished by the oil thoroughly coating each particle of scale as it is thrown out of solution and thus rendering it incapable of sticking to any other particle.

This action appears to be extremely thorough, and in several years' tests no accumulation of scale can be detected in any portion of the generator.

As the bubbles of steam break through the water surface, they take a certain amount of oil along with them, thus lubricating the throttle valve, and then the valves and pistons of the engine.

The condensing system, previously described, saves the oil along with the water, and as the oil is not exposed to a destructively high temperature, none is lost due to this cause.

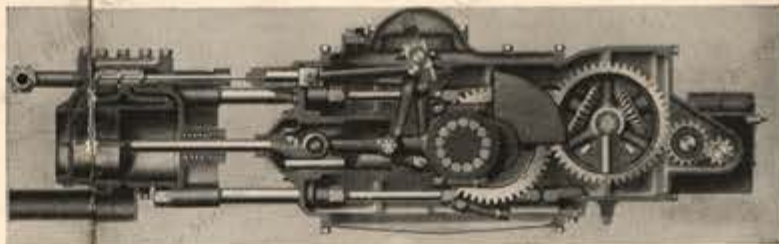
Lastly there is no contamination of the oil, by gasoline, carbon and dust as in an internal combustion motor.

The result of the foregoing conditions is that a Doble-Detroit Steam Car is capable of a mileage per pint of lubricant far in excess of the heretofore best known practice.

For the same reason that oil can be added to the water and kept in circulation, alcohol may be added in winter to prevent freezing, just as in the cooling system of a gas car.

THE engine used in the Doble-Detroit power plant is exceedingly simple and contains but eleven moving units. The dimensions of all the working parts are ample to insure uninterrupted service under maximum conditions of load.

It is a two-cylinder, single expansion, double action engine. The uni-flow principle is employed in order to provide the high expansion desirable, with a quiet valve gear and only one valve per cylinder. The valve takes care of the steam inlet, while the exhaust passes out through ports uncovered by the piston at the end of the stroke.



Doble-Detroit Steam Engine—Sectional View

KEROSENE is used both for starting and running; the fuel is electrically ignited. The combustion of the fuel is entirely confined to the combustion chamber; there is no pilot light or exposed flame. Combustion is practically complete, and is not affected by cold weather or changes in the altitude. Sufficient steam for running may be generated from cold water, within one and one-half minutes.

Air, drawn through the radiator by a small electrically driven multivane blower, passes the spray nozzle with a sufficient velocity to draw out the kerosene and atomize it. This velocity immediately decreases due to the widening of the venturi tube and the fuel mixture is ignited by an electric spark. As soon as the burner is lighted the spark ceases automatically. The combustion takes place in a chamber made of a highly refractory material, which attains a very high temperature, materially aiding and completing combustion.

The quickness with which steam may be generated in the Doble-Detroit plant requires a word of explanation. It is due in part to the high temperature attained by the complete combustion of the fuel and to the unusually large heating surface of the steam generator tubing, but most of the time saved in starting, as compared to other steam cars, is due to the elimination of the time formerly required for heating the vaporizer preparatory to lighting the main burner.

S P E C I F I C A T I O N S

- Engine* Two cylinder, uni-flow, double action, single expansion. Stroke 4"—Bore 5".
- Valves* Inlet — 2 piece slide valve. Exhaust-ports uncovered by piston.
- Valve Gear* Doble-Detroit type.
- Crank Shaft* One piece, drop forging, with crank-pins 2.4" in diameter. Balanced.
- Combustion System* Doble-Detroit type. Kerosene only fuel used. Electric ignition.
- Steam Generator* Doble-Detroit type — 75 h. p. — 123 sq. ft. heating surface.
- Ignition and Lighting System* Wagner.
- Axles* Front and Rear — Annular ball — Semi-floating rear. Steering knuckles equipped with ball bearings.
- Water Pump* Crank driven double plunger pump.
- Water Tank* 25 gallons.
- Radiator* Honeycomb.
- Kerosene Tank* 25-gallon tank, mounted at rear of chassis. Air pressure, 4 pounds.
- Bearings* Crank shaft, big end connecting rod and main bearings are annular roller. Front and Rear Axle — Annular ball.
- Wheelbase* 135".
- Tread* Standard — 56"
- Driving Gears* Spur type, engine to axle, 42 to 54 ratio.
- Wheels* Wood Artillery Type (Wire Wheels, extra).
- Tires* Cord 35" x 5".
- Steering Gear* Heavy duty type.
- Drive* Steering wheel and hand brake lever on left side.
- Brakes* Two sets of expanding brakes — 16" drums, completely enclosed.
- Springs* Semi-elliptic. Front 44" x 2" — Rear 60" x 2½".
- Frame* 8" deep. Heat treated alloy steel.
- Body* Seven passenger touring body.
- Price* \$3750.00 F. O. B. Detroit.



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