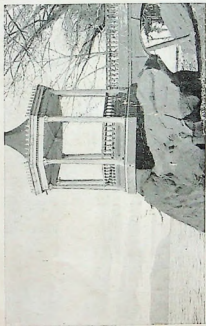


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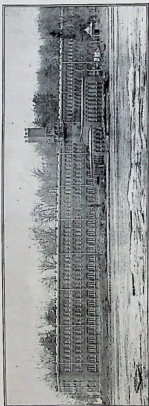
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VIEW OF TAPPAN ZEE AND PART OF "MOBILE" COMPANY'S FACTORY GROUNDS.



FACTORY OF THE "MOBILE" COMPANY OF AMERICA—VIEW LOOKING NORTH.

Instructions

for

Operating a Mobile.

Prepared with a view to
furnishing information likely
to be required in learning
to operate a steam-carriage.

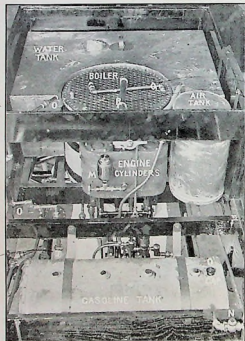
The "Mobile" Company of America.

JOHN BRISBEN WALKER, President.
WILLIAM A. BELL, Vice-President.

FACTORY AT
Kingsland Point, Phillips-Manor-on-the-Hudson, N. Y.

NEW YORK OFFICES:
180 Times Building.
Fifth Avenue and Forty-second Street.

Price, \$2.00.



10 SHOWING ARRANGEMENT OF BOILER, ENGINES AND TANKS.

Instructions For Operating a "Mobile."



THE "MOBILE" COMPANY prefer to have purchasers come in person to the factory at Kingsland Point, where instruction is given without charge by a corps of competent instructors. In every case where the owner of a "Mobile" has taken the trouble to familiarize himself with its operation the result has been satisfactory. There are circumstances, however, which make such attendance impossible and these instructions are intended for those compelled to teach themselves. If, however, the learner is entirely unfamiliar with machinery we advise securing the services of a local engineer, a man of good judgment, as an instructor.

1. Thoroughness the First Requisite.

Make up your mind to acquire a thorough knowledge of your machine. This is not difficult, and there must be thoroughness. In a couple of lessons you can learn to start and stop and back, and some beginners are apt to imagine that such knowledge is all-sufficient. On the contrary, that

is but the beginning. You should then set to work to master each detail of the machine, so that you will know how to act under all circumstances. You would not think yourself sufficiently prepared to drive a spirited team of horses if you had once or twice held the lines on a smooth road. Master thoroughly the art of driving a "Mobile," and every outing will be a pleasure. Acquire only a superficial knowledge of it, and you will be under constant annoyance through ignorance. Let it be understood, then, that the intelligent driver completely masters every detail of his machine, and practises driving until hand, eye, and brain are equal to every possible demand upon them.

II. Filling the Water-Tank.

After seeing that all the valves are closed, fill the water-tank until the water level is within one inch of the top.

III. Filling the Boiler.

Fill the boiler either by letting the water slowly enter from the water-tank by force of gravity (this requires ten to fifteen minutes), or by attaching a hose to valve "H," called the "blow-

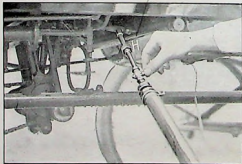


Fig. 2.

off" valve, in which case the boiler may be filled, if there is a fair head of water, in two or three minutes. Note



Fig. 1.

that in either case the safety or pop-valve "E," Fig. 10, must be opened to allow the air to be expelled, closing it after the water shows about four inches high in the water-glass.

IV. Filling the Gasoline-Tank.

and pour in gasoline convenient arrangement is that shown in Fig. 3, which may be made by any tinner. It consists of a copper measure, funnel-shaped at bottom, with small brass pipe closed by a cock. This cock is closed when the measure is being filled, and opened to let the gasoline flow into "Mobile" tank. Care must be taken to have no flame in the vicinity while the gasoline-tank is open or gasoline exposed.

While the boiler is being filled with water, unscrew the cap on the gasoline-tank through a funnel. A very



Fig. 3.

V. Air Pressure.

Now take off the cap at the air-gauge and screw on the hose of the air-pump exactly as in the case of blowing up the tire of a bicycle. Then after opening the valve between the air-tank and the gasoline-tank about two and a half turns, pump until the pressure on the air-gauge shows from thirty to forty pounds. The higher the air pressure the hotter the flame from combustion. Then open the gasoline cut-off valve on the left side of the carriage, remove the air-pump, screw on the cap, and replace the air-pump in tool box.



Fig. 4.

V.I. Estimating Gasoline in Tank.

The supply of fuel remaining in the gasoline-tank is fairly estimated by an experienced driver through noting the exhaustion of the air pressure. The six gallons carried in the "Mobile" tank, as a rule, require three fillings of the air-tank. After repumping and exhausting the air the second time, the probabilities are that about two-thirds of the fuel supply has been exhausted, and that before the pressure has entirely disappeared from the third pumping, all of the gasoline will have been consumed.

If on a long journey it becomes necessary to replenish the supply of fuel, it is of course essential that all fire should be extinguished before undertaking to handle gasoline in the open air.

V.II. The Process of Firing Up.

Perfect combustion under the boiler is secured by using the gasoline in the form of gas. The gasoline is converted into gas by heat. The tube conveying the gasoline from the tank passes along the left side of the carriage, up through the boiler, across the top of the boiler and then down again through the boiler to the burner. As long as steam under as much as twenty pounds pressure is maintained in the boiler, the process of converting gasoline into gas goes on, but before steam has been generated it is necessary to resort to other measures to convert the gasoline into gas and the auxilar vaporizer was invented for this purpose. The auxilar vaporizer is a bent tube filled with copper gauze as shown in Fig. 5.

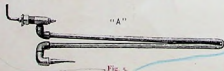


Fig. 5.

It should be heated to a "sizzling" heat over a gas jet or fire. If on the road, a fire may be quickly made by putting a piece of the cotton waste, carried for cleaning machinery, under the gasoline cock and then throwing it on the ground and setting fire to it. The auxilar vaporizer "A," as shown in Figs. 5 and 6, is then inserted in the opening in the fire-box and pushed in until the screw thread at the end can be inserted in the threaded



Fig. 6.

opening near the valve "C." After inserting the thread until it is securely fastened, turn on the gasoline by means of valve "C."—a very little at a time—and apply a match through the opening in the side of the fire-box, the lid covering this opening being pushed up before striking the match.

The gasoline passing through the length of the hot auxilar vaporizer is now converted into gas, and this gas, ignited as just described, quickly converts the water in the boiler into steam. When the steam reaches to forty or fifty pounds, the auxilar vaporizer is no longer required, the heat from the steam through which the gasoline supply pipe passes on its way to the burner being sufficient.



Fig. 7.

The vaporizer may now be removed in the following way: First, slightly open the valve "B," which admits gas to the burner. Second, turn off the gasoline by means of valve "C." Third, unscrew the thread connecting the vaporizer with the supply pipe at "C." Fourth, remove the vaporizer. Fifth, turn on full head of gas at valve "B."

The gasoline-tanks and air-tanks made of seamless drawn copper tubing used in the "Mobile" are the special design of The "Mobile" Company and patent has been applied for. One of them, under test, sustained a pressure of two hundred and fifty pounds before it began to leak. They are all tested to ninety pounds before they leave the factory. It is believed that no such strength

is combined in any other convenient form in use for this purpose—a very important fact in connection with the construction of a "Mobile." They hold double the amount of oil held by tank in original design and are so constructed on the latest forms of carriage as to be almost invisible and entirely removed from risk of striking the side bars.

VIII. Starting Up After a Wait.

In the event of the operator stopping to make a call of some duration, he should turn off his fuel supply by closing the valve "B," shown in Fig. 10. This saves his fuel and water and also avoids the use of the safety valve. Lighting up is a simple process, but one point must be carefully observed. The gasoline tube near "C" being exposed to the cool air, and there being no circulation, it follows that there will be some condensation of gas into liquid gasoline. It is, therefore, necessary to partly open valve "C," Fig. 10, and allow any gasoline there condensed to blow out. A partial turn of the valve quickly made and quickly closed—then again quickly opened and as quickly closed, and repeated, until no liquid is visible. The valve "B" may now be opened slightly, the lighted match being held in the opening in the side of the fire-box as before. The operator watches this a moment and gradually turns on the full head of gasoline, sees that his flame is burning clear, steady and blue, closes the shutter over the opening in the fire-box and is ready to start. These operations should be repeated by the beginner, cautiously and carefully, until he is thoroughly familiar with them. Remember that if your auxiliary vaporizer is insufficiently heated you may allow liquid gasoline to pass into the burner, and, on the other hand, if your heat is too great you may melt the copper gauze in the vaporizer.

The frontispiece is a photograph of boiler, water-tank, air-tank and gasoline-tank as erected in a "Mobile." It shows the oil-cup "M," and the check valve which would prevent gasoline flowing back to air-tank in case of accident, and check valves "OO," which prevent water and steam from escaping in case of breakage of water-glass. Also valve "T," which may be opened in cold weather to let water out of water-glass when "Mobile" is put out of use. The construction of the top of the boiler is clearly shown. "Q" shows the gasoline-tube in which gasoline is vaporized as it comes

up through the boiler across the top of the boiler and down through the boiler. "R" shows tube which carries the supply of steam from the boiler to the engine.

IX. Opening the Water Valve.

Now go round to the left side of the carriage and open the water valve "K" as shown in

Fig. 8. The opening of this valve allows the water to flow from the water-tank to the pump.

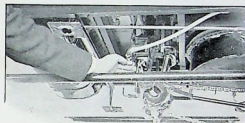


Fig. 8.

X. Directions for Oiling.

It is of the utmost importance, if the driver is unaccustomed to handling machinery, that he should remember that all moving parts, no matter of what shape, if in moving they rub on another part, should be oiled.

The lubricating of those parts requiring oil is most important in the economical operation of a "Mobile." Two cans of oil are used. The shorter one contains a high-test cylinder oil and the taller can the best machine oil for lubrication. In order that the driver may never overlook any part requiring lubrication, it is well to divide the "Mobile" into parts.

OILING THE ENGINE.

1st. *The Engine Cylinders.* These are lubricated from the oil cup "M" shown in frontispiece. Before filling this cup with the oil be careful to turn off the needle-valve between the steam chest and the oil cup; otherwise the steam will be allowed to escape. After filling the oil cup with the cylinder oil screw down the cap tightly enough to prevent leakage; then open the needle-valve so that the oil may pass into the cylinders.

2nd. *The Engine Slides.* It is good practice to

put lubricating oil on these slides every ten or fifteen miles.

3rd. *The Openings to Ball-Bearings.* The crank-shaft revolves on ball-bearings. Upon these comes the main work of the engine, the thrust when the engine is running rapidly being so great as to occasionally break the $\frac{3}{8}$ -inch ball which was formerly used for this purpose. The "Mobile" Company's engines all employ $\frac{1}{2}$ -inch balls, allowing a thrust nearly double that which could be sustained by the $\frac{3}{8}$ -inch ball. The main bearings are contained in the frame at the bottom of the engine. These should be oiled through

the hole on the outside of the frame on each side of engine. The crank-pin bearings are contained in the lower ends of the connecting rods. These are oiled through the hole in the steel plate or dust-washer. All dust should be carefully cleaned away from around the oil holes and the oil holes carefully cleaned before oiling, as it is not enough to know that you have poured oil all over the machinery; it must get through the oil hole and onto the working surfaces in order to do any good. It should be remembered that it is simply impossible for the oil to flow to the bearings if the oil hole is plugged with dirt.

4th. *The Oil Holes on the Eccentric Straps.* There are four of these shown on the front and near the top. Each of these should be carefully oiled in the manner already described.

5th. *The Eccentric Links.* Nearly at the

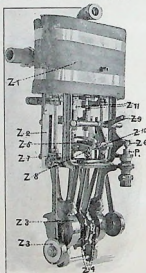


Fig. 9. ENGINE—FRONT VIEW.

KEY TO FIG. 9.

- Z-1—Cylinders.
- Z-2—Engine Slides.
- Z-3—Openings to Ball-bearings.
- Z-4—Oil Holes on Eccentric Straps.
- Z-5—Eccentric Links.
- Z-6—Connection which supports Pump Lever-Rod.
- Z-7—Cross-heads.
- Z-8—Upper end of Eccentric Rods.
- Z-9—Rocker Arm.
- Z-10—Levers connecting Links to Rocker Arm.
- Z-11—Guides for Valve Stems.

extreme rear of each eccentric-link is a small oil hole which should be treated as the others.

6th. *The Connection which Supports the Pump Lever Rod.* The oil hole is at the top and is very important. The slot in the rear end of the pump lever rod should be kept constantly oiled. The short or front end of the pump lever rod should be oiled where connection is made with the pump plunger.

7th. *The Wrist-Pin and Upper Ends of the Connecting Rods* are oiled through a hole on the outside of each cross-head just above the wrist-pin on each side of the engine.

8th. *The Upper Ends of the Eccentric Rods* are connected with the eccentric-links by a hardened steel stud. These are also working bearings and should be carefully oiled.

9th. *The Rocker Arm* extends across the front of the engine and is connected with the reversing-lever and moves whenever the reversing-lever is moved to change the direction in which the engine runs. This should have a drop of oil occasionally at either end where it is connected by the studs through the engine-frame.

10th. This rocker arm is connected with the eccentric-links by means of two small levers, these levers having a bearing at either end which should be oiled through the oil hole provided on the top of each bearing.

11th. Directly back of the rocker arm in the center of the engine frame are two upright bearings about 2 inches long. These are the guides for the valve stems and should be oiled on top.

After oiling, the oil holes should be carefully stuffed with cotton or cotton wool to prevent the dust following the oil. Always keep a little cotton wool in your tool-chest and after oiling put back only clean wool.

OILING THE RUNNING-GEAR.

1st. *The Front Wheels.* These are packed with vaseline and should run from 500 to 1,000 miles. These wheels are fitted with ball-bearings and in the hub of each wheel has been placed a dust-proof oil cup. By turning round the outside cover of this cup the oil hole will be exposed. This should be carefully closed after oiling to prevent the dust getting into the bearings.

2nd. Occasionally there should be a little oil put

on the movable joints of the steering connections, including the ball-bearings of the steering head and the four pivot screws which connect the front axles to the front frame.

M. In the rear frame the wheels are connected rigidly to the axles and the ball-bearings are in the frame. There are four of these bearings in the rear frame and all are fitted with the same oil cup that is furnished in the front wheel. These bearings are packed with vaseline when the carriage is assembled. These bearings, of course, should be oiled, but it should be remembered that in a ball-bearing a little oil used comparatively often gives much better results than a great deal at long intervals.

N. The compensating gear is located in the center of the rear frame. The three small gears have an oil hole drilled through the side of the hub. These run on hardened steel pins and should be carefully oiled. The large bevel-gears are fastened rigidly to the axles, and as both axles revolve in the ball-bearings contained in the frame, the large bevel-gears do not require oiling except on the teeth, which should be occasionally lubricated with some heavy oil or vaseline. The compensating-gear is so constructed as to enable the power to be applied to both axles, and through them to the wheels, all the time, even when moving in a circle, as in turning a corner. The object of this is to enable the outer wheel to describe a larger circle than the inner one in turning a corner without slipping, which would ruin the tire in a very short time.

XI. Automatic Fuel Regulator.

The operator is now ready to take the road. Probably while oiling the engine, his steam

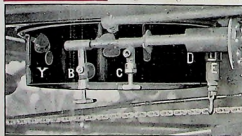


Fig. 10.

has risen to 160 pounds and the fuel supply has been cut off by the automatic regulator "D," shown in Fig. 10. This is automatically adjusted with a needle valve, so that when the steam reaches 160 pounds pressure the supply of gasoline is cut off, *excepting only a very small amount, which continues to furnish a flame*, so that when the steam falls and more fuel is required this "pilot" provides the necessary light. The automatic regulator is delicately adjusted and should not be tampered with by the operator. "Y" shows the opening through which match is applied.

XII. Driving. Use of Brake.

In taking his place in the carriage the operator places his foot lightly above the brake so as to be able at all times to stop the carriage with the least possible delay. This brake should be used with great care and regulated with not too great tension. A too powerful brake may not only strain the carriage, but pitch the driver over the dashboard if too suddenly applied.

XIII. Driving. Use of Lever.

In Fig. 11 are shown the two levers by which a forward or backward movement is given to the carriage. When lever No. 2 is to the front, as in the illustration, and the steam turned on by pushing the lever No. 1 to the front, the engine revolves so as to drive the carriage forward. If, however, the lever No. 2 be pushed backward and downward gently as far as it will move and steam turned on by moving the lever No. 1 to the front, the motion is reversed and the carriage is moved to the rear.

Before proceeding, a word of caution must be given to the driver. He must remember that he holds under his hand a very great power. A lever moved three inches to the front may mean thirty miles an hour—a veritable battering-ram let loose on a public highway, if not used with discretion.

When moving off, the experienced driver opens his throttle with extremest care. He starts his carriage very, very slowly, gradually increasing his speed as he discovers everything to be in good condition. The driver who throws forward his throttle and goes off with a jump is like unto the man who in starting would bring his whip down fiercely on a horse's back. If,



Fig. 11.

In a little while the steady hand on the throttle, moving to gauge the requirements of the road, becomes a second nature and the mind can be kept actively engaged elsewhere if need be.

XIV. Water in the Boiler.

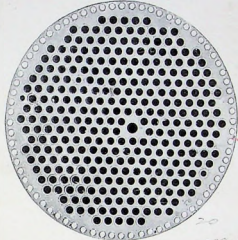
The "Mobile" has been likened to a patient, gentle animal which never kicks up nor scares and runs away; but requiring to be regularly fed and watered. The small mirror near the driver's right foot reflects back the condition of the water-glass. The careful driver keeps his water-glass about three-quarters full. He can get more speed with less water in the boiler, but the "Mobile" has speed to spare and the main thing is to take no risk of letting the bottom of the boiler be bare of water. The fierce flame which rises against the boiler-plate is sufficient to expand the tubes if the boiler-plate is uncovered but for a moment. A twenty-five per cent. grade or a lurch over into a deep gutter may make a difference of three and one-half inches between the depth of water on the one side and the other. Safe driving, therefore, means a three-quarter full boiler. On the contrary if the water is allowed to fill the water-glass full the water may become so high in the boiler as to be drawn out with the steam into the cylinder.

XV. When a Water-Glass Does Not Indicate.

Just inside the wagon body from the water-glass are two check valves so arranged that if the water-glass should break, these valves would immediately close the steam pipes and prevent the escape of steam. A fragment of brass from the inside of a pipe or a bit of graphite may get under a valve seat and prevent its operating as intended. The experienced

upon starting up, the operator finds any sign of water in his cylinder he puts down the reversing gear and moves the carriage back a couple of feet to clear his cylinder.

For many weeks the beginner will confine himself to four or five miles an hour until he has accustomed his eye and hand to automatically gauge with precision the difficulties of the road.



driver would, upon noticing that the water did not rise or fall, at once test his valve by turning off the water regulated at the valve "X" as shown in Fig. 11, at the right side of the carriage near the throttle levers. This valve opens the pipe through which the water passes from the pump to the water-tank so that instead of the water entering the boiler it passes back into the water-tank.

XVI. The Pump and Its Operation.

The pump operates continuously. With every stroke of the piston, there is a corresponding stroke of the pump. The quantity of water used in the boiler depends entirely upon the character of the ground being traversed. A steep hill or rough or sandy road will consume much steam and consequently much water. Level ground and a smooth road, on the contrary, takes comparatively little steam and water, while on a down grade no steam whatever is consumed, the carriage coasting by gravity.

A small wheel "X" in Fig. 11 just at the junction of the throttle and reverse levers controls a rod opening a by-pass situated between the pump and the water-tank. The wheel is marked with an arrow pointing to the left, indicating the word "open"; an arrow pointing to

the right, the reverse, indicating "closed." When the wheel is closed to the right, the pump is forcing water into the boiler; when the wheel is turned to the left, the by-pass is opened and the water is pumped back into the water-tank instead of into the boiler.

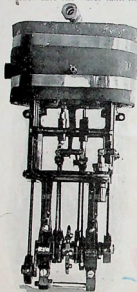


Fig. 13.

showing about two-thirds up in the water-glass. The best results in racing are secured by maintaining the water at a lower height; but for general convenience the water should be near the top of the glass. Should the water be allowed to rise in the boiler so that the entire glass is filled, it is apt to get into the cylinders of the engine. Moreover, it leaves the eye in doubt as to whether the glass contains any water or not. Should the water be allowed, through oversight, to rise too high, its real height may be determined by throwing the weight on the opposite side of the carriage so as to tip the boiler to the side opposite to the water-glass.

Always have in the tool box ring packing for

If the driver has closed the by-pass and the pump continues to operate, yet no increase is shown in the water-glass, it may be well to open the by-pass and allow the water to flow back into the water-tank, observing the water-glass carefully. If, after closing the by-pass, again there is no rise in the water-glass, the careful driver will come to the conclusion that some of the check-valves are failing to operate.

The check-valves on the water-glass connections must not be opened while there is any pressure on the boiler.

The water in the boiler is shown on the water-glass, this being reflected in a mirror beneath the driver's eye. The water in the boiler should be maintained at a height

pump, valve stems and piston rods. If pump does not pump enough water, tighten nut, and if this does not help, put in a ring of pump packing, but in no case must the packing nut on the pump be tightened down so hard that the plunger does not work freely. This packing should be adjusted so that the pump plunger moves as freely as it can possibly without leaking water. This is of the utmost importance, as it is possible to set the pump packing up tight enough so that the friction would hold it and break off either the pump-lever or the pin that drives it; or, if not carefully adjusted, while not tight enough to break anything, still it would cause excessive wear on the pin or slot in the back end of the pump-lever.

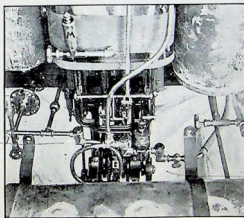


Fig. 14.

XVII. Controlling the Pump.

The valve "X" by operating the connection determines whether water, after passing through the pump, goes into the boiler or back into the water-tank. Valve "X" being open and the "Mobile" moving over a road requiring steam, the water in the boiler would be used and the water in the glass fall. That it should remain stationary would indicate something wrong. The driver should then immediately descend and turn out his fire—and it should be borne in mind that this turning out of the fire should be done whenever anything may be wrong

or seem to be wrong. Steam can then be blown off, the caps of the check valves unscrewed and the valves cleaned.

Remember that steam pipes must never be unscrewed while pressure is on.

XVIII. Failure of Pump to Work.

If at any time, with the pump working, the water should continue to fall in the water-glass (unless in ascending a very steep hill) the driver may suspect that his pump is out of order. Without waiting for the water to entirely disappear from his glass, the fire should be turned out and the pump check valves taken apart and examined. The aim in this pamphlet is not to state merely what may occur occasionally but what may occur even at the rarest intervals.

XIX. Regarding the Boiler.

The boiler is vertical with copper fire tubes and copper shell wound with twenty-seven hundred feet of piano-wire. It is tested repeatedly in the factory to over six hundred pounds cold water pressure, and a boiler of this description has been tested up to twelve hundred and fifty pounds steam pressure by being filled with water and having the fire turned on full head. It was found that the steam could not rise above twelve hundred and fifty pounds pressure owing to the expansion of the heads of the copper tubes and the consequent leakage of steam. The estimated strength of the boiler is thirty-five hundred pounds. The fuel regulator cuts off the supply when the steam rises to one hundred and sixty pounds and the boiler is further protected by a pop safety-valve which may be set at two hundred pounds.

XX. Burning Out the Boiler.

Should the water be allowed to run down through over-sight so as to burn out the boiler, the copper tubes will be first expanded, then contracted, and the boiler cannot be used without being repaired. If sent to the factory, a capable engineer should be employed to remove the boiler from the carriage, carefully marking all the connections and putting them aside in order, so that they may be restored when the boiler is returned. The boiler should be surrounded by cotton, excelsior, or some soft substance so as to prevent it from receiving any external injury in transit, and carefully packed in a box.

XXI. How to Put Water in the Boiler if by Oversight the Water has been Allowed to Run Down.

If traveling on a level road or on a descending grade, water may be pumped into the boiler in sufficient quantities to rapidly raise the water in the glass; but if the carriage is about to ascend a long grade requiring much steam, it is safer to fill the boiler before starting up. This may be done in one of two ways:

First, close the by-pass. Then open the blow-off and let the steam out of the boiler. When the force of the steam begins to weaken, showing that nearly all of the steam is out of the boiler, close the blow-off valve "II," Fig. 2, raise the pump piston, and open valve "K," Fig. 8, which admits water to the pump. As steam in the boiler condenses, a partial vacuum is formed, drawing the water through the check-valves from the tank into the boiler.

Or, rests of any kind may be put under the rear axle-frame, close to the wheels, so as to raise it from the ground, a very little steam turned on, and the pump allowed to work until the glass is reasonably well filled.

XXII. Priming.

Priming, or foaming, of the boiler is caused by impurities in the water, chiefly oil, and is indicated by a quickly fluctuating water level in the gauge-glass. The glass, under these circumstances, may seem to be full of water when in reality the water is low. The first step in this case is to stop the carriage and note the height of the water after the carriage has been brought to a standstill. If the priming, or foaming, is very noticeable, the water and steam should be blown out of the boiler and clean water put in.

XXIII. Regarding Use of an Injector.

It is believed that the boiler, as furnished with the Mobile, is absolutely beyond the reach of explosion, even by the action of an inexperienced operator. When in operation water can only be pumped into the boiler by steam from the boiler. As the water is on the point of being exhausted the steam pressure decreases, and it is impossible to pump sufficient water into the boiler to explode it; on the contrary, if an injector or other apparatus be used, the steam might be sufficient to throw a considerable stream of water into the boiler at a time when it would be dangerous. The use of an

injector is, therefore, not advised. The pump used on the "Mobile" is always sufficient when carefully operated.

XXIV. In Case of an Accident to Water Glass. Should the water-glass break, the steam will ordinarily be stopped by the check-valves.

Occasionally through substances getting into the water, these valves may be prevented from working. In that case the steam will escape. But by tapping with a wrench on the valve, it may seat itself and the action be restored. In the event of a broken glass the driver should immediately shut off the fire and open his safety valve, allowing the steam in the boiler to escape. To insert a new glass, first carefully remove all particles of broken glass; then take out the brass bushings, put them on a new glass, and replace in position after putting in new packing.

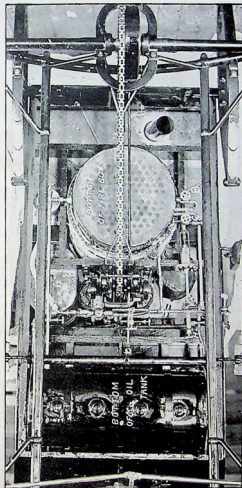
When this accident occurs, the glass breaks with a sharp crack or "pop." If the check valves do not work, steam will, of course, escape, in which case immediately get out and shut off fire. Then open safety-valve.

Rap gently with wrench on the bottom of both checks leading to glass so as to free them before refilling boiler.



Fig. 15

Should water-glass leak and it appear that there is danger of breaking—especially when you have high steam pressure—get out of the "Mobile" on the opposite side from that on which the water-glass is, go around, shut off fuel, and then after opening safety-valve and letting down steam



PHOTOGRAPH OF BOTTOM SIDE, SHOWING DETAILS OF CHAIN, SPROCKET WHEELS, SIDE BARS, BRAKE BAND WHEEL, EXHAUST, ET CETERA.

pressure, tighten up nuts on glass. If this does not stop leaking put in new packing.

Fig. 17 is a photograph of the bottom side of a "Mobile" showing fire-box, exhaust-opening, the chain, the differential gear and hand brake, the side bars, the automatic fuel regulator and lower side of the tanks, engine, et cetera, and will be found useful for study and reference.

XXV. Contingencies Which May Arise Through Oversight of the Driver or Through Injury to a Valve.

Water becoming too low in the boiler. This is entirely within the control of the driver except in the one case of a

valve being stopped by dirt. Although the water supply is most carefully protected by a fine copper-wire screen and every precaution is taken in putting the machinery together, yet it is part of the experience of operating these carriages that a grain of foreign matter has formed and lodged under a valve seat so as to prevent its operation. This is a very rare occurrence, but it is well that the driver of a "Mobile" should understand fully and entirely every difficulty that is liable to arise. In the event that a valve should be out of order, it should be cleaned as follows: First. Turn out the fire. Second. Remove the pressure from the boiler by opening the safety-valve "E," Fig. 10, or the same result may be accomplished by opening the blow-off cock "H," Fig. 2. In this latter case, the water will be blown out of the boiler and must syphon back.

In cleaning check-valves, after the pressure has been relieved from the boiler, unscrew cap of check. The valve itself may then be taken out by inserting a match or small stick of wood. Then the valve can be lifted out, carefully rubbed, and the valve seat carefully cleaned. Then put back and tighten up again. The operator may take this apart and find no sign of dirt of any kind, the little flow of water which has ensued upon opening the valve seat being sufficient to wash the foreign matter away before it is perceived by the eye.

There are on the carriage five check-valves. Two of these are for the purpose of stopping the supply of water and steam to the gauge-glass in the event that the gauge-glass should be broken. One of these, "O," frontpiece, is near the top of the boiler on the pipe supplying steam to the top of the gauge-glass. The

other, check-valve "O," frontpiece, is near the gauge-glass on the pipe which runs from the gauge-glass up into the boiler at the bottom.

There are two check-valves on the pump, the first between the water-tank and the pump, check-valve "S," Fig. 14. This is for the purpose of preventing the water from flowing back into the tank when the piston pressure is forcing water into the boiler on the downward stroke of the piston. Check-valve "Z," Fig. 14, is for the purpose of preventing the water from flowing back from the boiler into the pump when the piston is drawing water from the tank on the upward stroke.

Check valve "T," Fig. 14, is for the purpose of preventing the water from flowing through the by-pass into the tank from the boiler, and this check-valve must not be opened while there is any pressure on the boiler.

XXVI. Blowing Out of Pilot Light.

When the wind is very high and the carriage is moving in the direction of the wind or

quarterming to it, moving down hill and using no fuel, the pilot light may be blown out. This leaves the gas escaping and when presently the engine begins to use steam and the automatic valve is open, there remains nothing to relight the fire. This may be almost immediately discovered by the steam beginning to descend in the steam-gauge or by a smell of gas. It is merely necessary to stop the carriage, descend and turn off the fuel supply, "B," Fig. 10, then, after waiting a minute to let the gas escape, open it again and apply a match. This, however, is an occurrence not likely to happen except in case of traveling in extremely high wind with the wind blowing from the rear.

XXVII. "Burning Back."

If by reason of back draft or other cause, the flame, instead of burning in fire chamber,

should burn back to gas-chamber, immediately close valve "Z" and wait two or three minutes. Then light. "Burning back" may be detected by the falling of the steam pressure as shown on the gauge. If allowed to go on for some time, it will result in melting the copper tubes in the burner.

XXVIII. Breakage of Chain.

An examination of the chain will show that a link may be easily removed by making use of the larger holes near the center of the link. In this way a broken chain may be easily repaired from the reserve of ten links which is carried in the toolbox. But the chains used on the "Mobile" are of an unusually strong pattern, and may be depended on for the very best service. The chain may be tightened by increasing the length of the strut by operating the nuts provided for that purpose. The strut is the piece of steel with a fork which runs between the rear axle and the engine frame.

XXIX. General Remarks.

Should there be a slight escape of steam, attend to it at once. If taken in time, the tightening of valve or piston packings will stop the trouble. Keep all nuts tight.

Do not tighten engine-bearings too much, but do not leave any play. All bearings must run freely.

The same thing applies to the chain, but the chain must never be allowed to become loose, as if loose it is liable to come off and cause an accident. It should not be run as loose as on a bicycle, but, of course, should not be set up so tightly as to cause undue friction on the bearings.

There is a right and a wrong way to hold levers. See cuts.

To be sure that the checks to water-glass are free and in working order, put your weight on right step and notice water rise and fall in the glass. The swinging of the boiler will cause a rise and fall of water in the glass if the checks are free. If the checks have caught, the rise and fall of water in the glass is hardly noticeable.

When you become accustomed to the "Mobile" you can, under ordinary circumstances and on average roads, set the by-pass so that it will hold the water at the same point. This will be found an advantage in night riding.

When it is wished to stop and leave the "Mobile," there is nothing to do except to see that it is in a safe place. The fuel is automatically shut off except for the pilot-light, and the "Mobile" will be ready to start again instantly as soon as the throttle is opened again.

The "Mobile" contains more than six hundred parts. Purchasers should bear in mind that the inventors and other competent engineers have considered and discussed every one of the details involved by these parts many hundreds of times. Not a piece has been so trifling as to escape the most minute study and care. Very often suggestions are made by purchasers as being in the line of improvement which would be quickly abandoned if those suggesting them could go over but a small part of the work which has been done in the elaboration of these parts. Applications have been made for different forms of wheels, of rims, of tires, and many other changes and for the application of special parts. If the purchaser will wait quietly until he is fully experienced in operating his machine, he will, it is believed, learn to appreciate the reasons which have led to the construction of the "Mobile" on its present lines.

And we would strongly advise the purchaser to make no change in his carriage without submitting his reasons therefor to the company's engineers. Very often a few words will be sufficient to show that the proposed improvement is impracticable or dangerous. Especially do these remarks apply to the matter of wheels and tires and injectors.

Bear in mind that accidents are the result of carelessness. Driving an automobile, as has been said before, is like driving a pair of high-spirited horses. The driver must be alert. This alertness, as in the case of a good driver of horses, becomes second nature after some practice. Bear this one instruction carefully in mind, that if any accident happens of any kind, or if you think there is something the matter and cannot discover it, the first thing to do always is to shut off the supply of fuel—

First from valve "B," on the right side of the "Mobile," which, as has been said before, supplies fuel to the burner, and

Second, shut off valve "B," on the left side of the "Mobile," which cuts off the fuel before it passes into the boiler.

XXX. Wheels.

The wearing out of any vehicle is caused by the constant jar and intermittent shock imparted to it while in motion by the uneven surface of even the best of roads. To reduce this to

a minimum becomes a very important consideration when the propelling machinery as well as the vehicle itself is involved. Wire wheels, suspended hubs and pneumatic tires accomplish this in the "Mobile," and it is more than probable that even on the worst roads this combination is the most economical.

XXXI. Regarding Tools.

Before starting out inspect your carriage and be sure that you have in stock on the carriage—

First. Three water glasses. You may not break a water glass in two months, or, through some flaw in the glass or from improper packing, you may break several. They are light, inexpensive and easily carried. It is safe, therefore, always to have three in stock in your carriage.

Second. Auxiliar vaporizer.

Third. Two oil cans.

Fourth. Stilson wrench.

Fifth. Monkey wrench.

Sixth. Screwdriver.

Seventh. Pump.

Eighth. Cotton-waste for cleaning.

Ninth. Packing for water-glass.

Tenth. Packing for pump.

Eleventh. Packing for engines.

Have but one place for each tool. Never fail to put the tool back in its proper place. Under no circumstances keep tools under the cushion of your seat, but always in the tool chest. The "Mobile" Company has provided a new design in the shape of an additional pocket over the water-tank, so that there is ample room for necessary supplies.

XXXII. Economy in Operating.

In ascending a steep or long hill start slowly and keep your steam well up. Should

it fall for any reason below 145 pounds, stop, by turning your "Mobile" at a slight angle across the road, and wait a few moments until steam reaches its full height. Then proceed slowly. If the hill is so steep and long as to consume water in boiler until it falls to bottom of glass, stop, raise the rear wheels and pump until glass is full.

Over ordinary average roads it is good practice to let the pump work when carriage is coasting down

hill, and refrain from pumping in ascending a grade. Remember that while coasting gravity does the pumping, thus saving fuel and water.

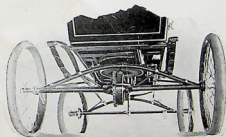
XXXIII. Putting Your "Mobile" Away for the Day.

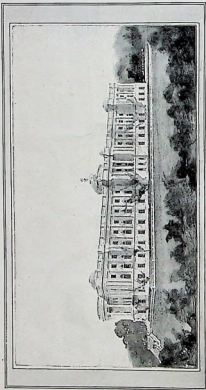
After descending from the carriage, shut off your supply of fuel. Then open the blow-off valve "H," and exhaust the steam in the boiler.

This is a cleansing process which should be practised once a day, preferably when the carriage is put away for the night. While steam is being exhausted, go around to the other side of the carriage and shut off the water supply and gasoline supply valves. Lastly, if the weather is cold, open the drip valves. The machine should be carefully cleaned before being put away—dust and oil rubbed off metal parts, the oil holes refilled and the woodwork cleansed as in the case of an ordinary buggy, with a sponge and chamois, but not with a hose.

XXXIV. In Conclusion.

Too much stress cannot be laid on the importance of thoroughly learning the art of operating a motor carriage. It is simple and easy to comprehend, but must be thoroughly mastered. The driver of a motor carriage who has taken pains to comprehend each detail of his carriage sits with perfect comfort while on the road. He knows what he is doing, and what his carriage is doing, and his mind is not worried by the fear that perhaps some detail has not been properly attended to.





THE COSMOPOLITAN BUILDING, IRVINGTON-ON-THE-HUDSON, NEW YORK.

THE COSMOPOLITAN MAGAZINE.

JOHN BRISBEN WALKER,
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