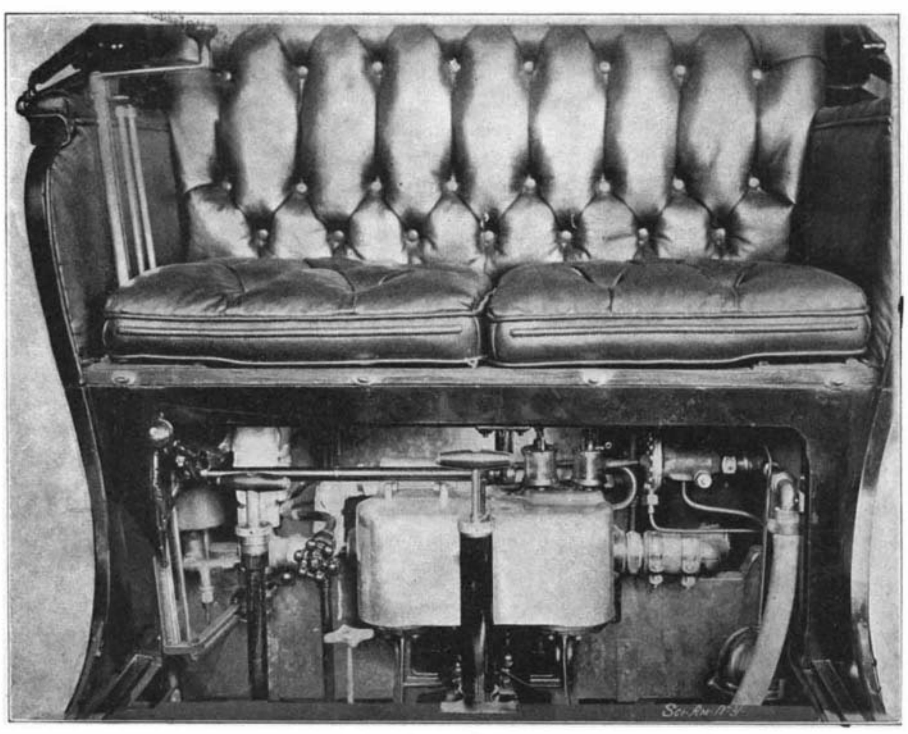
Steam Carriages

THE WHITE STEAM CARRIAGE.

The 1902 model of this now famous steam carriage, together with some details of the principal parts of its mechanism, are shown in the annexed illustrations. Prior to the New York-Rochester endurance contest of last September the White Sewing Machine Company's carriage was almost unknown to the automobiling public, but when four of this company's machines successfully accomplished that difficult journey and returned with first-class certificates, interest in this machine was aroused. Its construction today remains the same as when it made this record, which speaks well for the work of those who planned and built it.

THE WHITE STEAM CARRIAGE.



THE MECHANISM OF THE WHITE STEAM CARRIAGE.

The heart of all steam machines is the boiler; and the White differs from all other steam carriages principally in the construction of its boiler. This is in reality not a boiler, but a series of superposed generating coils, twelve in number, with the outer end of each coil rising to the top of the stack and there being connected to the inner end of the next lower coil. The outer end of the bottom coil passes straight across over the burner before rising to the top of the generator, and in this straight section of pipe is situated a thermostat for regulating the fuel supply to the burner. The four bottom coils are made of steel tubing, while all the others are of copper. The total length of tubing in the generator is 216 feet, and the total heating surface 30 square feet.

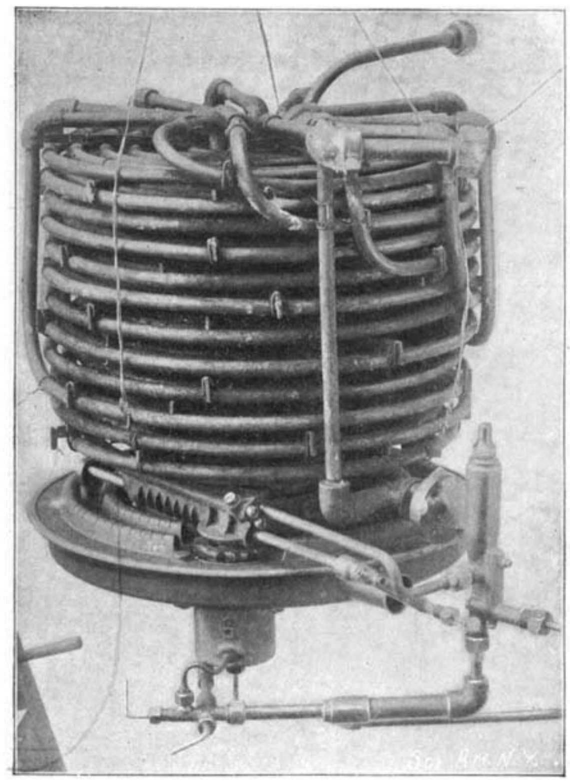
From the manner in which the generating coils are connected it will be seen that water must be forced into them, as it will not of its own accord gravitate from one to the other on account of the connection of each coil rising to the top. The water is pumped into the coils at the start by the hand pump shown at the left in Fig. 1, after which the machine is ready to fire up.

In order to start the fire the needle valve of pipe, *B*, Fig. 1, is opened, thus allowing gasoline to flow into the trough, *C*, and saturate absorbent material contained therein. This gasoline is lighted and allowed to burn itself out. In about a minute it heats the conical vaporizing chamber, *H*, sufficiently to vaporize gasoline for the pilot light. This fluid is then turned on at the valve, *D*, and allowed to pass through the pipe, *E*, to the vaporizing chamber, from which it makes its exit by the pipe, *F*, and issues from the needle valve, *G*, in a jet, which is ignited by the burning gasoline in the trough. Once the pilot light is started it is a matter of but a couple of minutes to heat the main vaporizing coil, *J*, when the main feed valve, *N*, may be opened and the gas let into the burner, whence it issues through narrow transverse slits in the circular coils shown in cross-section in Fig. 1. The needle valve, *N*, controlling the admission of gas to the burner, can also be operated from the seat by turning the wheel of the middle spindle that projects upward at the side.

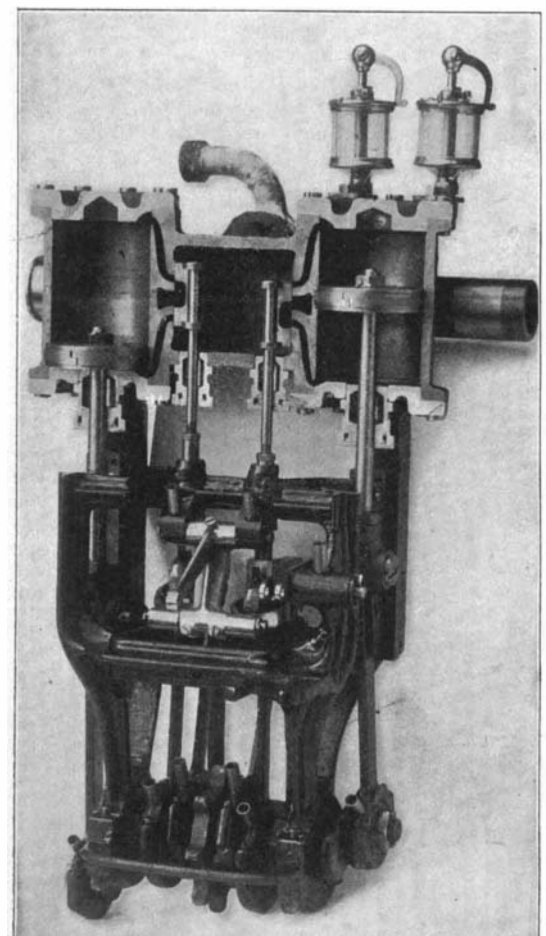
Shortly after the burner is lighted the steam pressure will show in the gage and will be seen to rise rapidly. The fire is then checked by turning the needle valve slightly, as the thermostatic regulator does not operate till the steam has had a chance to become superheated. It is not known definitely where the water flashes into steam, but this happens probably in the third or fourth coil from the bottom, and the other coils are merely superheaters. The temperature obtained in these is said to reach 800 deg. F.

The carriage is now ready for operation. The burner valve is opened further again and the steam pressure allowed to run up. If the throttle is then opened, the pressure will be seen to fall back to about 100 pounds, but to recover quickly its normal working point. From now on this pressure will be kept down by the thermostatic regulator, which acts to shut off the fire if the temperature of the superheated steam rises above a certain point, or, in other words, if the flame supplies too much heat and generates steam too rapidly. The regulator is shown in cross-section in Fig. 2, and may be described in but a few words. It is placed in the straight steam pipe, *E*, that passes across the generator below its lowest coil, and consists of an outer tube of expansible metal such as brass or copper inclosing and having fastened to one end a rod, *A*, of non-expansible metal like steel, suitably connected with a bell-crank, *B*, by means of which it can raise or lower the feed valve, *C*. A rise of temperature causes the tube inclosing rod, *A*, to expand and carry *A* to the left, which results in lowering the horizontal arm of bell-crank, *B*, thus closing the needle valve, *C*, and shutting off the fire. This method of fuel regulation by a thermostat is peculiar to the White carriage, as in all other steam machines the boiler pressure is used to operate the needle valve. In the case of the White generator, however, the fluctuations in pressure are so sudden and rapid that a pressure regulator on the fire would make too great fluctuations of the latter, so the thermostatic regulation was doubtless chosen because it would operate more slowly and gradually.

There is only one more important feature in the description of this generating system, and that is the feed water control. The water is forced by a small pump connected to the crosshead of the engine through the hose seen at the right of the view of the mechanism, directly into the top coil. The feed water regulator branches off from this pipe as it passes back to the generator and can be plainly seen in the illustration. Referring to the diagrammatic view of this regulator shown in Fig. 3, *J* represents the main feed pipe, and *K* a bypass to pipe, *L*, which leads into the tank. *C* is the by-pass valve connected by its triangular spindle, *B*, with the plug, *A*, that abuts against a pressure diaphragm, *H*, and is backed by a stiff spring, *D*. The tension on *D* may be varied by means of the worm, *G*, which turns small gear, *F*, and since *F* is threaded on plug, *E*, and *E* held from turning by a pin set in a groove running lengthwise on its surface, *E* is made to advance and compress *D* till it gives the proper pressure. This adjustment, when once made, never has to be altered. The spring is generally set for 210 pounds' pressure.



THE WHITE TUBULAR STEAM GENERATOR.



CROSS SECTION OF THE WHITE STEAM ENGINE.

The operation of the regulator is very simple. When too much water is being pumped into the generating coils the steam pressure rises and, overcoming the spring, *D*, in the regulator, forces open the by-pass valve, *C*. The water is then sent back to the main suction pipe, *L*, instead of being forced into the generator, while a check valve in the supply pipe to the latter between it and the by-pass branch holds the steam pressure and keeps it from escaping through the by-pass to the tank. Thus no water is sent into the coils till the pressure falls again, when the by-pass immediately closes and allows it to be pumped in. The size of the stream of water that is regularly thrown by the pump may be judged from the fact that the by-pass valve is only ⅜ of an inch in diameter and opens but about 1-64 of an inch. If the carriage is being run very slowly in a crowded street the pressure will sometimes fall as low as 100 or 75 pounds, and this will have to be raised by gradually speeding up the machine, when more water will be pumped into the generator and the pressure will slowly rise. One always has the alternative of a few strokes of the hand pump in such a case also, but by careful operating this will scarcely ever have to be used. Should all the water in the coils become evaporated from any cause, no harm would be done to the coils, and the only result would be that the thermostat would shut off the fire. The generator is equipped with a safety valve set to blow off at 500 pounds, but ordinarily the thermostatic regulator will shut off the fire before the pressure reaches this point. In a ride which one of the SCIENTIFIC AMERICAN staff took recently up Riverside Drive to Grant's Tomb in one of the identical machines used in the endurance test of last September, the steam pressure at no time rose above 450 pounds or fell below 100, even in ascending some of the steep pitches when going east from Riverside and on West End Avenue. The air pressure in the gasoline tank had to be raised once by forty-five strokes of the air pump, and the engine cylinders oiled a couple of times by a stroke or two of the oiler (the third rod on left side of seat) in the run of an hour and a half. Otherwise the carriage needed no attention. The pressure was maintained on an average at between 200 and 250 pounds, and would only rise to 450 when coasting or fall to 100 when heavy demands were made for steam.

A description of the White carriage would not be complete without a few words about the engine, a fine cross-sectional view of which will be had from the illustration. The engine is of the usual double-acting slide-valve type, the slides being oiled by two oil cups on top of the cylinders, which are 3 inches bore by 3½ stroke. It has a ball-bearing crankshaft and is mounted on trunnions so that the lower end can be swung forward to tighten the chain. The cut-off and reverse are operated by the lever moving over the notched segment on left side of body below the seat, which is joined by a horizontal rod to another lever suitably connected direct to the links of the engine. The throttle is of the gridiron type and is operated by the small crank on top of foremost spindle on left hand side of seat.

The above description will be found to give a good idea of the principal parts of the White mechanism, and it is easy to see that simplicity was the chief quality aimed at in designing the machine. This has not been attained by supplementing the usual water-tube boiler with numerous safety devices, but rather by making a radical departure from the old, well-established methods of steam generation, which have been supplanted by a safer generator of a new type. Let us hope that the next step toward the improvement of steam carriages will soon be taken, namely, the employment of some form of solid fuel in place of volatile gasoline. Then this universal power will become as safe as it is useful for propelling the business and pleasure vehicles of the world.

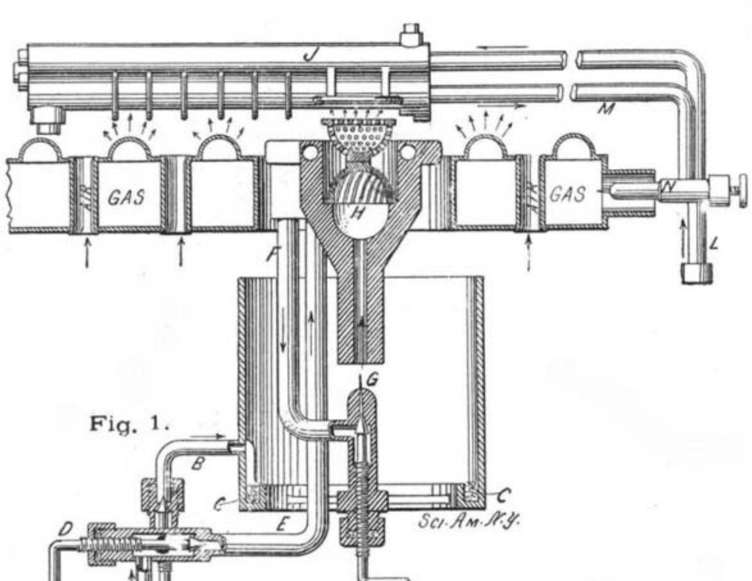


Fig. 1.

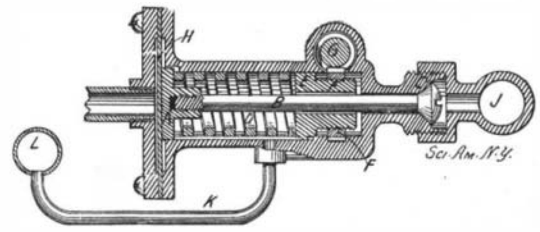


Fig. 3.

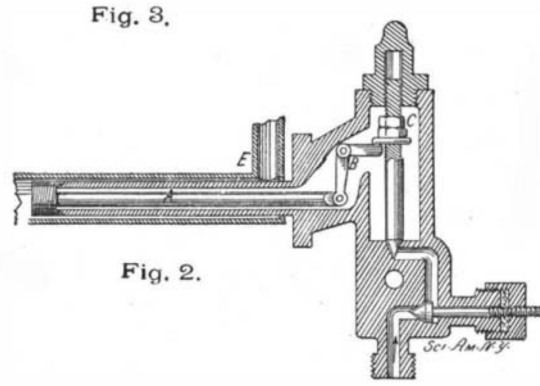


Fig. 2.

DETAILS OF THE WHITE STEAM CARRIAGE.

Wear of Roads by Automobiles.

The influence of automobiles upon the public roads is a question that is likely to become prominent before long, especially where, as in France, the use of heavy vehicles for passenger and baggage transportation is on the increase. According to the Bulletin of the Société des Ingenieurs Civils, the local councils throughout the country have been occupied lately with the application of automobiles for passenger and freight service, and in some cases such systems are already in running order. Some examples are given which show the condition of affairs. According to the report of a special committee to the General Council of Vienne (south of France) it is shown that at that period, which is some time ago, as many as 14 departments had commenced to study the question, but had not begun to organize a service; 4 others had made rather unsuccessful attempts, and 9 others had commenced operations, but the data were too recent to draw a conclusion. They were almost unanimous upon one point, namely, that the roads in their present state are not in a condition to support the excess of wear which will result from the new mode of traffic, and that they must be reinforced and enlarged. This will necessarily lead to an increased cost of maintenance, and this increase is estimated (by two departments) at $70 per mile, and thus it appears that the extension of the automobile service will bring about a considerable increase in the charges for the public roads. The report presented to the General Council of Charente gives some useful figures in this connection. The national and departmental routes and those of general communication in this department can well support loads of 18,000 pounds at a speed of 2½ miles an hour; if the speed of traction is increased under the present conditions the wear will increase in proportion, and for a road of given resistance the load must be correspondingly reduced. The engineers of the Charente Department estimate that if the speed is increased to 9 miles an hour the load should be reduced to 6,000 pounds per axle; two other departments give for the same case 5,000 and 4,800 pounds. It is the general opinion that the wear upon the road caused by transporting a given load increases with the speed of transport, and if it is admitted that the automobiles are to travel at higher speeds than in the case of animal traction, it will be necessary, in order to avoid spoiling the roads altogether, to give them increased resistance and also to dispose the automobiles so that the wear will be reduced to a minimum. As to the first point, the Board of Engineers estimates that it would cost from $600 to $3,000 per mile to transform the roads so as to enable them to resist the wear caused by the heavy automobiles. As to changing the automobiles, nothing definite has as yet been established, but it is considered that according to the experiments of Gen. Morin it will be best to discard the narrow tires in all cases and use tires sufficiently wide to diminish the wear. Experiments have also shown the superiority of wheels of large diameter over the smaller wheels, and the future regulations for automobile service should encourage the use of automobiles with large wheels.

THE STEARNS STEAM STATION WAGON.

This steam carriage is constructed on the lines of the popular Brockways, commonly known as station wagons. It has a seating capacity of four passengers. The wagon is constructed so as to protect the passengers in unpleasant weather; side and back curtains, glass panels in the doors and a glass panel front being part of the equipment. The front portion of the carriage is upholstered in leather; the rear seat and inside of wagon is upholstered in green broadcloth, making a decidedly handsome job. The gasoline tanks hold 14 gallons of fuel, sufficient for a run of 125 miles. Water tank capacity, 35 miles. The engine used in this carriage is an 8 horse power, simple slide valve engine with a Stevenson link motion. The carriage also has a boiler of ample capacity. The running gear is constructed on the same general lines as used in the regular Stearns carriages, tubular front and rear frames and hickory sidebars. The wheels are of tubular steel, fitted with 3-inch pneumatic tires. This carriage is attractive in appearance and is most serviceable for station and family use.

THE STEARNS STEAM STATION WAGON.

Novel Automobile Passenger Service.

An automobile service has been recently inaugurated in the city of Hamilton, Ohio. Three omnibuses, with a capacity of twenty passengers each, are in operation running through the city and making connection with the line of the Mill Creek Electric Railway Company, which corporation has never been able to secure permission to enter the city with tracks. The latter line operates between Hamilton and Cincinnati, and it was compelled to put the automobiles in operation in order to accommodate its patrons between these two points.