

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 $\frac{3}{8}$ 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 $3\frac{1}{2}$ 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.

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

support loads of 18,000 pounds at a speed of $2\frac{1}{2}$ 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

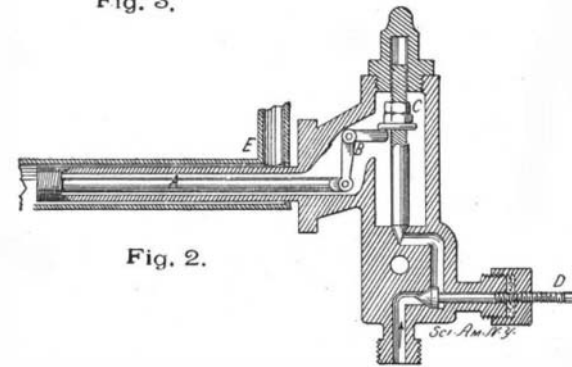
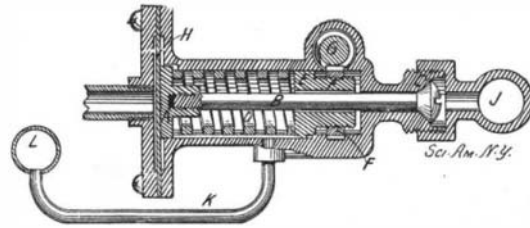
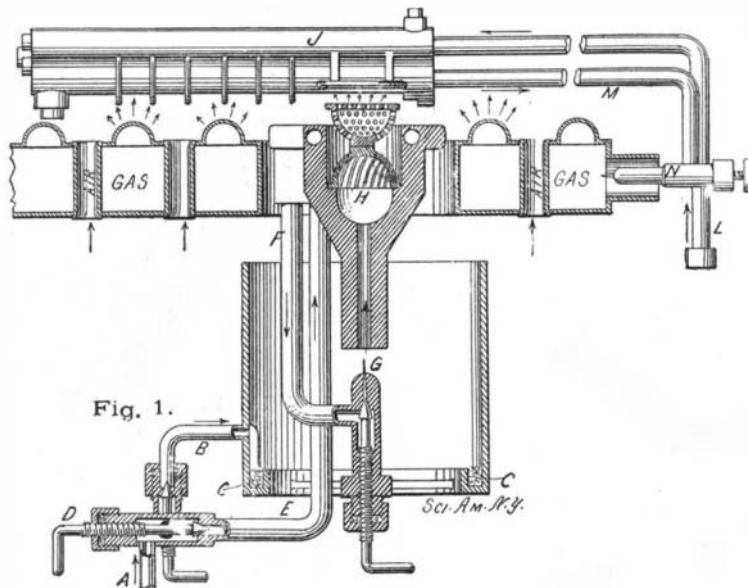
yet been established, but it is considered that according to the experiments of Gen. Morin it will be best to discard the narrow tires in all cases and use tires sufficiently wide to diminish the wear. Experiments have also shown the superiority of wheels of large diameter over the smaller wheels, and 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.

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.



DETAILS OF THE WHITE STEAM CARRIAGE.

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



THE STEARNS STEAM STATION WAGON.