

copper, 14 inch diameter by 13 inch high; No. 20 B. & S. sheet metal gauge in thickness; 306 tubes, copper, $\frac{1}{2}$ -inch diameter, 13 inches long, No. 20 B. & S.; fuel, gasolene; cylinders, a pair of simple engines, $2\frac{1}{2}$ -inch bore by $3\frac{1}{2}$ -inch stroke, plain eccentric valve motion, plain slide valves, no link, fixed cut-off at about 9-16 stroke. The speed reduction from the engine shaft to the compensating gear box is $2\frac{1}{2}$ to 7, 12 tooth sprocket on engine shaft, and Baldwin separable chain to a 30 tooth sprocket on the gear box. Driving wheels, 28 inch diameter, with suspension, laminated wood rims and 2-inch Hartford single tube tires. Running a mile in 2.11, the engines made 720 by $2\frac{1}{2}$, or 1,800 revolutions, and the number of exhaust was 7,200. The engines made a little under 837 turns per minute. The boiler pressure was probably about 140 lbs., and as all the connections are very direct and short, it seems that the mean effective pressure on the pistons should be little short of 80 lbs. However, the combined piston area is 9.8 square inches, and the piston travel was 487 feet per minute, going something like 11 h.p. nominal. This seems incredible for a boiler of the dimensions given, and it seems therefore probable that the mean effective pressure must have been below the 80 lbs. assumed."

In speaking of the conduct of the Stanley wagon during the exhibition mile run, Mr. Dolnar states that there was a perfect absence of odor, ease and celerity of movement, and almost total silence. At Stanley's top speed the connecting rods and cranks were invisible, and the noise of the exhaust was an agreeable hum, almost a musical note, there being 3,348 puffs per minute. The exhaust steam spread out in a thin gray veil, and extended about six feet in rear of the wagon. Stanley and Whitney had practically the same boiler, and the only practical difference between them was that Stanley had a perfect burner under his boiler, while Whitney's was by no means so good.

The Victor Automobile—the name of the steam carriage

built steam wagons before them, but they did not adopt Whitney's boiler construction, but originated an entirely new form of boiler shell, which makes the tube expansion and shell expansion always the same, and hence makes such a thing as a leaky tube unknown in their boilers. They also originated a gasolene burner for firing this boiler, which uses no forced draught or air pressure, and produces a silent fire without any of that roaring which had hitherto marked all oil-burning steam generators of rapid action.

There is just one bit of data that is lacking in the various accounts of the exploits of steam wagons which we have read, that is, the clogging of the tubes with lime deposit. If "scale" proves such a detriment to ordinary steam boilers, what may be expected of a multitude of minute tubes when limestone water is taken from the wayside pump, or dipped from the side-road ditch? How long would a traveler be safe from explosion if his runs should be made in a locality such as Guelph or Limehouse?

THE PROPER EFFICIENCY OF INCANDESCENT LAMPS FOR CENTRAL STATIONS, INCLUDING A DESCRIPTION OF THE NERNST LAMP.*

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Few questions in the field of electric lighting are of greater importance to central station managers than that of the efficiency of incandescent lamps, and few questions seem so thoroughly misunderstood, and yet the fault is not entirely with the central station. In the first place, only the larger companies will invest in the necessary apparatus, and surprisingly few of these will purchase enough apparatus to determine the efficiency of their lamps. The initial outlay, including photometers and instruments, will more than pay for itself in the first year. In the absence of the proper outfit, the managers have to depend upon



HORSELESS VEHICLE PARADE AT COLUMBIA COLLEGE, NEW YORK.

just put on the market by the Overman Wheel Company—is introduced as marking a new era in the use of steam, "pre-eminently the power to use on automobiles." The makers claim they "have solved the problems which heretofore prevented the use of steam in the hands of the general public. With a Victor Automobile," they say, "it is possible to go for 25 miles and do absolutely nothing except to put the power on by opening the throttle and to steer." The height of water in the boiler and the pressure on the fuel tank are maintained automatically, and guaranteed not to vary beyond an inch of water or a pound of pressure. The wagon to seat two persons has 4 h.p., and is geared according to the hill-climbing or speeding necessities of the purchaser.

A curious feature of the development of the steam carriage in the United States is that the Stanley Brothers are neither of them engineers, and neither of them is to-day familiar with the ordinary details of steam engine construction; yet they have produced what Mr. Dolnar—an engineer of forty years' experience—regards as the closest approach to a practicable mechanically-propelled road wagon yet shown. They are men of unique personality, accepting nothing as authoritative, except the result of their own independent investigation and researches, and are utterly scornful of all practice and precedent. Whitney had

the statements of manufacturers or more often upon those of their representatives, and what is the result? Dissatisfaction. One maker will supply lamps guaranteeing them to be of a stated efficiency, and these lamps will give satisfaction. Should the next order be placed with another company and the same efficiency guaranteed, chances are strongly in favor of the second consignment not giving satisfaction, assuming the specifications call for efficient lamps. Both lots of lamps may consume the same current at the stated voltage and in reality be intrinsically equal, yet one will be thought well of and the other condemned. A situation such as this, upon the face of it, seems incredible, yet such is the daily experience of every lamp manufacturer until by long and often costly experience he becomes thoroughly acquainted with the actual state of affairs upon the lines of all his customers.

For many years generators, and later transformers, have been rated in light capacity upon the basis of fifty watt lamps. It has been unfortunate that 3.1 watt lamps have become such a household term, as their use has often proven very costly to companies before experience made them alter first ideas. Everyone will probably agree that it is desirable to use the most efficient lamps possible, consistent with fair life where current

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