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THE IDEAL AUTOMOBILE.

The automobile has been sufficiently long in our midst to enable us to define the essential qualities which go to make up an ideal machine. Naming them in their order they are as follows: low cost, durability, endurance (large fuel supply), ability to climb hills, and speed.

Low cost is given the first place for the reason that the present price of the automobile places it altogether beyond the means of the average individual, and renders it a very decided luxury. It is certain that cheapening the cost will produce a proportionate increase in the demand, and the increased demand will lead in its turn to a reduction in the price. This was conclusively proved in the history of the bicycle, the cost of a first-class machine to-day being about one-quarter what it was a few years ago, when the number of riders was limited.

But while the ideal automobile must be cheap the reduction in price must not be gained at the expense of sound materials and good workmanship. However great may be the demand for a low-priced machine, our manufacturers must never attempt to meet it by making a short cut by the way of showy but inferior construction. The folly of such a method was demonstrated very conclusively when the bicycle was at the height of its popularity.

Next to its low cost and durability we place the endurance of the automobile; by which we mean its capacity to cover a large mileage without having to refill its fuel tanks. Liberal fuel capacity will be a very strong recommendation to the bicyclist, who has been accustomed to rove all day on long-distance excursion with the knowledge that he is not tied to particular stopping places, or liable to be hopelessly "stalled" by a collapse of his motive power in out-of-the-way or unexpected places.

In view of the fact that the steam-driven automobile has shown such superior hill-climbing powers, it is certain that the appetite of the public, being thus whetted, will demand that the ideal automobile shall be able to negotiate any hill that it may encounter in the course of an extended tour. It must be able to carry its occupant through, if need be, a mountainous country; for we have a precedent in the successful trip up Mount Washington recently accomplished by a builder in one of his own machines. The records for hill-climbing are at present held by steam-driven motors; and it will be a fortunate day for the automobilists when builders succeed in combining with the cheap cost of operation of the gas-propelled type, the hill-climbing powers of its strongest competitor.

In placing speed at the bottom of the list we may seem to be making too little of a feature of the automobile which many of the riding public believe should receive the first consideration; but as a matter of fact, every type of automobile that is now on the market is capable of running at a higher speed than the law allows. Although a rate of twenty miles an hour or more is no doubt frequently accomplished on the public roads, there is no question that the rapid increase in the number of riders in the future will lead to a restriction of speed to a maximum of twelve or fourteen miles an hour.

PROSPECTS OF THE PEARY RELIEF EXPEDITION.

The outlook for Peary's Polar expedition does not seem very bright, as great difficulty is experienced in finding a steamer and a crew suitable for a three years' sojourn in the Arctic regions. The "Windward" was a slow boat and was hardly adapted for the purpose. She was sent back last August to the Peary Arctic Club which has already spent $64.000 on the expedition, and it is evident that they will have to raise a large sum of money to enable the plans to be satisfactorily carried out. Either a Newfoundland sealing steamer will have to be purchased, or the "Windward" will have to be repaired. It is almost impossible to lease a steamer owing to the fact that they are all needed in seal fishery. It was hoped that a second-hand set of engines and boilers could be obtained for the "Windward," but up to the present time nothing of the kind seems available, and the engines will probably have to be patched up to answer. It is found very difficult to get twelve men to venture north this year with the prospect of not returning for three years. It is to be hoped that the explorer will not be balked in his plans, as his disappointment will be a bitter one.

ELECTRIC TRAIN LIGHTING.

BY ALTAN D. ADAMS.

The very general use and appreciation of the incandescent electric lamp for stationary lighting has suggested its adoption on railway trains. A number of more or less satisfactory attempts at electric train lighting have been made and cars are thus lighted on several regular trains in different parts of the country. The methods of electric train lighting thus far tried with success may be divided, as to their sources of power, into three classes. On one plan an engine, served with steam from the locomotive boiler, is used to drive a dynamo in the baggage car, and suitable conductors are supplied to connect the dynamo with electric lamps in all the cars of a train. As lamps can only be operated by dynamo current in the several cars, so long as they are coupled to the baggage car and locomotive, a storage battery on each car, or at least on the baggage car, is necessary to make the steam-driven engine and dynamo at all satisfactory. With a storage battery of suitable capacity on each car, enough energy from the dynamo may be stored during the times when the train is connected up to light the several cars when they are being switched or a change of engines is being made. If the battery is placed entirely in the baggage car, the change of engines may be made without putting out the lamps, but if the train is uncoupled, or the baggage car removed, darkness ensues.

One objection to the use of steam from the locomotive boiler for electric lighting, is that all the power possible is usually wanted for train propulsion. It is also objectionable to pipe steam from the locomotive to the baggage car, because of the tendency to condensation losses. Another source of power for electric lighting on trains is found at the car axle. In order to deliver energy at constant pressure, as is necessary for incandescent lighting, the ordinary dynamo must be driven at a uniform speed, but by special and somewhat complicated construction dynamos are made to produce a nearly constant electric pressure when driven at a variable speed by the car axle. The speed of the dynamo armature must not, however, vary outside of certain limits or the automatic regulation of pressure cannot be maintained. The dynamo to be driven from the car axle is usually placed in or under the baggage car, and the necessary mechanical connections made.

It is at once evident that when a dynamo is driven from the car axle, not only must the locomotive remain connected with the train, but it must also remain in motion so long as light is to be had, unless a storage battery is provided. As it would never do to have electric lamps go out every time the train stops, a storage battery is usually provided when the power for dynamo is taken from the car axle. The battery may be all together in the baggage car, but the ideal place for it is under each car, in sections. A third method of lighting railway cars is that entirely with storage batteries. The batteries are usually charged at terminal points for all-night runs and are carried in suitable compartments beneath each car. This last arrangement makes each car independent of the train or locomotive, as to light.

So far as the quality of service is concerned, train lighting with storage batteries is ideal, but the first cost of batteries is comparatively high, the shake and jar of travel hastens their deterioration, and their weight has to be considered. The total weight of battery necessary per car is, of course, much greater when they are used alone than when in conjunction with a dynamo on the train. When used with a dynamo on the train, the capacity of the battery need be only sufficient to operate the car lamps during times when the dynamo cannot be used, say for not more than one hour per night, or at any one charge. When, however, the battery is used alone, it must have capacity for an entire night, or say ten hours, and will, therefore, be much heavier, since weight increases directly with the capacity. The first cost and rapid depreciation of storage batteries, together with their expense of operation are such that their general and exclusive adoption in the lighting of railway trains seem very doubtful. If electric lights are to come into common use on cars drawn by the steam locomotive, they will probably be supplied from dynamos carried on the trains and supplemented by a small storage battery on each car.

In first-class train service the system of lighting by compressed gas is no doubt more generally used than any other at this time. The compressed gas is carried beneath each car in steel tanks, and flows to the burners under the tank pressure, which, of course, decreases as the gas is used. A supply of gas being thus carried with the train, it is pertinent to inquire whether means exist by which more light can be had per cubic foot of gas than is now obtained from the burners. Instead of consuming gas at the burners it may be used in a gas engine and the power thus developed, expended to drive a dynamo. A good coal-gas, of about 600 heat units per cubic foot, will yield one brake horse power hour for each twenty cubic feet of gas consumed in the cylinder of a modern gas engine. This brake horse power hour represents 746 watt hours applied to the armature shaft, and allowing the low average efficiencies of 85 per cent for the dynamo and 95 per cent for the line and connections, the lamps will receive $746 \times \cdot 95 \times \cdot 85 = 600$ watt hours for every cubic foot of gas consumed by the engine.

Incandescent lamps of nominal sixteen-candle power are now largely used, that require but fifty watts each, and twelve of these lamps may obviously be maintained per hour for each cubic foot of gas burned in the engine. Even if an incandescent lamp that requires sixty watts is used, ten may be operated per hour for each cubic foot of gas consumed. Incandescent lamps of other candle powers can be had at about the same efficiency as that just stated, the watts per candle increasing slightly in very small lamps and decreasing for very large ones. The candle power of gases vary somewhat, but four to five cubic feet of good coal gas, at the burner per hour, are commonly considered about the equal of one sixteen-candle incandescent lamp. On the basis of five cubic feet of gas per hour, twenty cubic feet supply but four burners, and with only four cubic feet the burners maintained per hour is only five. As ten to twelve sixteen-candle incandescent lamps are maintained per hour, per twenty cubic feet of gas expended at the engine, from two to three times the amount of illumination can be obtained when the gas is exploded in the engine cylinder that is given off by the same quantity when consumed at the burners. This difference in operative efficiency is more than enough to offset the higher first cost of the electric equipment. The best location for the gas engine and its driven dynamo is probably in the baggage car, and this would bring the gas reservoirs to the same point. Power for the electric light is then independent of both the motion of the train and the presence of the locomotive, but if storage batteries are not used on each car, light can only be had so long as the baggage car is connected with the train. The cost of sufficient batteries on each car to supplement the service from the dynamo, being charged by it and used only when the baggage car is disconnected, is not large, and their use makes the system ideal in service as in cost of operation.

AIR PIPES FOR MINES, MADE OF CLOTH.

A Dusseldorf firm is making cloth air pipes for mines. They are made of strong sail cloth impregnated with India rubber so that they are both air and water tight. They are much cheaper and lighter than those made of zinc and wood and they can be easily transported and secured. The galvanized iron rings are provided with the pipes. They are spaced at certain distances for suspension. Steel rings are also inserted at places and prevent the pipes from kinking. Several hundred feet can be put up in a few minutes and the transportation of the pipes around the mine is easy. One great advantage is, according to The Colliery Guardian, that when shots have to be fired the cloth pipes can be folded together and put out of the way, whereas zinc pipes are not easily removable and if they are left would be much damaged.

"HALL I' TH' WOOD," BOLTON.

Mr. W. H. Lever has presented "Hall i' th' Wood" to Bolton, England, together with the sum of $6,000 for its maintenance. It was the home during some years of Samuel Crompton whose father rented here two or three rooms of the house, and who devoted five years from 1774 to 1779 in secret to the invention of the spinning mule, a machine which was long known as the "Hall i' th' Wood wheels." This machine was sold to a body of eighty manufacturers for $300, about 1785. The woods around it have long since been cut down, says The Builder from which we obtain our information.

THE FATHER OF PHOTOGRAPHY.

February 11 was the one hundredth anniversary of the birth of Henry Fox Talbot, for whom is claimed by many the place which has long been held by Daguerre in the estimation of the world. Those in favor of the claim say that Fox Talbot deserves this position because by his public announcement of a successful photographic process he anticipated Daguerre by some months, and secondly, present day photography is a direct descendent and modification of the Fox Talbot method, and has no connection with that of Daguerre which process is now archaic. Daguerre has many public memorials both in France, England and America, but Fox Talbot, who died in 1877, has never been honored. A committee has been formed at his own home, Lacock Abbey, near Chippenham, England, to raise a memorial fund for the restoration of the chancel of Lacock Church. As he was lay rector of the church this seems to be a memorial which he would have de-