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AVERAGE LIFE OF AN IRON OR STEEL BRIDGE.

A correspondent writes from one of the smaller New England towns to say that a proposed improvement in the shape of a $50,000 steel bridge is meeting with opposition from many of the citizens on the ground that the average life of such a structure is limited to twenty-five years, and, therefore, the benefits derived would not justify the expenditure. He wishes to know whether the stated term of life is correct. Without pausing to comment on the admirable and all too rare regard for the interests of posterity shown by the obstructionists in question, we hasten to assure our correspondent that their estimate of the length of life of steel bridges is altogether too limited. The permanence of a steel bridge will depend upon three conditions: the design, the loading, and the maintenance. If it be properly designed for a specified maximum loading; if oversight be exercised that this loading is never exceeded; and if the steel work is thoroughly accessible and painted at regular intervals, there is no reason why a bridge should not last for centuries. As a matter of fact, however, these conditions are too often ignored or imperfectly fulfilled. In the first place, although bridge designing should always be intrusted to a specialist, even if the structure is to cost no more than the sum named above, many of the county bridges and those constructed in the smaller towns are built from the designs (so-called) of the local surveyor, who may have the vaguest ideas as to the strains to which the various parts are to be subjected and the best way to proportion the different members and connect them into a finished structure. The construction also should always be carried out by a recognized bridge firm, for the local blacksmith or machinist's shop is usually no more fitted for building good bridges than it is for building lathes and locomotives. It is questionable whether amateur bridge building can produce a structure with a useful life of twenty-five years.

To secure the best results the county officers, Board of Aldermen, or whoever it is that has the matter in hand, should first determine exactly what uses the bridge is to be put to and the greatest possible loading to which it will ever be subjected. This information, together with the location and other data, should then be published for the benefit of the competing bridge companies, who should be given a free hand as to the style of structure best adapted to the case. In this way a better bridge, and a cheaper, will be secured, even in the case of insignificant structures, whose construction it might be supposed the bridge companies would not be at the trouble to undertake. When such a bridge is completed, the question of its life will be one of care and maintenance. If every inch of the steel work receives a periodical coat of the best non-corrosive paint, and care is taken that the bridge is not strained beyond the limit agreed upon when it was designed, it will probably outlast its usefulness. The popular belief that a subtile process of crystallization is slowly weakening the metal of all the bridges is a fiction, pure and simple. The metal can only lose its life when it is strained beyond its elastic limit, and so long as the designed loading is not exceeded, this contingency can never happen.

AUTOMOBILE MOTORS.

The motor car has now been so thoroughly tested under different conditions of work that the public is able to judge for itself of the comparative value of the different forms of competing motors which are in the field for recognition. The requirements of a practical automobile are so numerous and differ so widely, according to the service to which it is to be put, that it is at present impossible to pick out any particular type of motor and say that it is the best for every type of work. Not only does the service differ, but there is now, and will be yet more markedly in the future, a wide difference in the requirements of the user. The present indications are that certain types of motors will become identified with particular forms of service.

To-day the motors which are most in evidence and give the best promise of permanence are the electric, oil spirit, and steam motors, and those which are driven by compressed air. There seems to be a general impression that for passenger transportation in and around our cities the electric automobile is the best; although for private use its high cost is likely to restrict its use for some time to the wealthy. It has the great advantages of being silent, free from odor, simple in construction and gearing, capable of ready control, and having a considerable range of speed. Its objectionable features are its great first cost, the limited distance which it can run without recharging, and the necessity of operating it within easy reach of a charging station. At present it holds the record for speed. In a recent trial in France an electric automobile covered a distance of two kilometers at the speed of 65·6 miles per hour.

Rivaling the electric motor is the oil or vapor driven motor. As compared with the electrical automobile the first cost is less and the running expenses are very much lighter. The weight is moderate, and there is the advantage that a much longer distance can be covered for one charging. While the speed for short distances has never on trial equaled that of the electric motor, in long distance runs it has naturally out-distanced its rival. Thus, in the motor car race from Bordeaux to Paris of last May, the distance of 351 miles was covered at an average speed of 30 miles an hour; and in another race over the Orleans-Vierzu road, a distance of 60·2 miles was covered at an average rate of 35 miles an hour. In both of these competitions the winning machine was driven by an oil motor. The chief objections to the oil or vapor type of automobile are the vibration and the odor. The vibration, due to the explosions in the cylinders, is a serious objection and it is engaging the earnest attention of all makers of this type. It ought to be possible to moderate, if not entirely control, the noise of the exhaust by some muffler, such as has been used to good effect on stationary engines.

The steam motor car will probably show its best results in the heavier classes of work, for which it is admirably adapted. As compared with the oil motor it is necessarily, on account of the large amount of cooling water that has to be carried, the boiler weights, etc., heavier in proportion to its power. Steam motor cycles are being used for pacing some of the fastest riders in the United States, but their performance would indicate that as at present constructed they are not thoroughly reliable.

There remains the automobile driven by compressed air, of which we have heard so much recently in New York. Compressed air undoubtedly possesses some very attractive features, such as its cleanliness, the absence of noise, odor, and dirt of any kind. Where it is used in connection with a large central power station, we know of no reason why it should not hold its own, in the matter of cost and convenience, with electricity, and in respect of large horse power as applied to individual trucks for use in heavy hauling we think it ought to more than hold its own with the steam motor.

At the present time France is easily maintaining the premier position which is hers by right as having first seriously started the automobile industry. Germany and England were later in the field, and we have been the last country to take up this new industry in earnest. Judging from the large amount of capital which is being interested, we may look for very rapid developments in the next two years in this country, and we think it will not be long before our American machines equal and surpass those of French manufacture in the important features of appearance, running qualities, and cost.

AN AMERICAN RAILWAY IN CHINA.

If existing arrangements are carried out, the proposed American railway line in China will prove an important link in a system connecting all of China with the outside world. Railway lines now actually built or under construction as well as those which are only projected form a great circle, sweeping across Europe and Siberia to the Pacific, thence southwardly to China, skirting the Pacific coast, thence eastwardly to Burma and India to the Indian Ocean and the Arabian Sea, and pushing thence through Persia, will complete the grand circle of all the continental mass of Europe and Asia. The Canton-Hankow line which the American syndicate has agreed to construct and for which it is expected that the Chinese government will confirm the concession stretches northward from Canton to Hankow, where a Belgian syndicate has a concession for the construction of a road northward to connect with the existing line now reaching Pekin, the capital of China. Should the Belgian syndicate omit to take advantage of its concession, the American syndicate has an option for the right to construct the Hankow-Pekin line also. From Pekin a road will connect with the Trans-Siberian Railway, which is now under construction to Port Arthur, thus making the American line an important link in the great system which will stretch from St. Petersburg by way of Siberia and Port Arthur through China to Canton on the coast, immediately opposite the Philippine Islands, which are only 600 miles away.

From Canton westward to Southern China, British interests have projected railway lines to the southwestern extremity of China, where they will connect with the present railway system of Burma, and in turn with that of India, which already has more than 20,000 miles of railway in operation. It is only a few hundred miles from the western terminus of the Indian railway lines to the point in Persia toward which Russian engineers are now pushing surveys for railway lines. This is a gap which can be easily filled whenever British interests deem it desirable to have direct railway intercourse between India and the railway systems of Southeastern Europe. From this it will be seen that the proposed railway line in China will form an important link in what promises to be, in the comparatively near future, a great railway system, bringing the Orient into direct railway communication with all Europe both by the northerly and the southerly route.

A COMMERCIAL NEED.

Three of our consuls stationed in South America have thus far this year called the attention of the State Department to the advantage Europe holds over the United States in the commerce of all that region. Perhaps not unnaturally each one suggests the stereotyped and threadbare idea or remedy of the establishment of direct lines of transport between the leading ports of the United States and of South America. It has so often been pointed out that such subsidized lines can only carry goods, but not sell them, and that goods so transported must be in every respect as salable as those with which they come in competition, that it is a rather serious commentary on the brief duration of the average consular incumbency, and consequent inexperience, that such reports should continue to appear with remarkable regularity.

Any observant commercial traveler in Latin America must be impressed with the presence of two prime factors that mainly account for our trade inferiority in those regions. The first of these is the greater intimacy with the life, social and political, of the people from whom they are seeking trade privileges that is maintained by European representatives in those regions. Your German manufacturer's agent, for example, will be found, quite seven times in ten, to have married into a native family and to have thoroughly cultivated those social side issues which are so effective in increasing influence. On the other hand, the American representative too often is "right from New York," making a flying trip from port to port, spending less time along the entire mighty stretch of the Atlantic seaboard, from Maracaibo to Buenos Ayres, than it should take him to become intimately acquainted with the trade needs and peculiarities of one of the many ports entered. Hence, it very naturally follows that in too many cases the American manufacturers never get a fair idea of the intense Latin conservatism of those markets, and of the fact that it is not "Yankee notions" that are wanted, but South American notions made with Yankee thoroughness and at prices made possible by our ingenuity.

The other factor in the problem is one of credits. Europe gives six, nine and even twelve months; America, the complaint is often made, seeks to collect the bill almost before the goods have been unpacked.

Both these prime difficulties in the way of our taking our natural position as first in the South American trade are to be overcome in one way. Let the manufacturer or the commission house intending to conquer a given trade territory appoint as representative a man resident in that territory, preferably one who is of the people or, at least, married into and socially identified with them. Such a man will be useful in proportion as he reverses the present American procedure; i. e., he will take flying trips to America to personally acquaint his employers with what he knows, rather than, as now, take them from America, to return to his chiefs to tell them what he guesses.

FIRING HIGH EXPLOSIVES.

The test which was recently carried out at Sandy Hook of the firing qualities of a new type of high-explosive shell which is designed to be used in service guns, using smokeless or other powder, is by far the most successful as yet attempted. The Isham shell, which is named after the inventor, is divided in its explosive chamber into many smaller compartments by transverse diaphragms. The designer's object is to so far reduce the shock of firing that the most sensitive of high explosives may safely be used as a bursting charge. The shell which was used in the test was of 12 inches caliber and was both longer and heavier than the 12-inch projectiles used in the new army 12-inch rifle, its exact weight being 1,036 pounds. The Isham shell was loaded with 113 pounds of explosive gelatine, one of the most powerful of known high explosives; a firing charge of 450 pounds of brown powder, which is the regular service charge of the gun, was used. The gun was fired with a slight elevation in order to bring the point of contact with the water well