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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE BEHRING SEA TUNNEL.

It is unfortunate that a project for the construction of a railroad in Siberia, to run from Behring Sea to a junction with the Siberian Railroad, should be handicapped at its very outset by identifying it with the absurd and impossible proposal to build the railroad tunnel beneath Behring Strait. Like the English Channel tunnel, the Behring Sea suggestion is one that seems to have taken a firm hold on the mind of what might be called the engineering romanticists, and it takes only a very slight occasion to open the flood gates to a whole mass of rhapsodical outpourings about these "engineering triumphs" and "masterpieces of modern construction," which are to bring "unlimited benefits to commerce." As a matter of fact, not even the English Channel tunnel, which would certainly command from the very day of its opening a heavy traffic, if not profitable financial returns, is likely to be built for several decades to come, if ever. As to the Behring Sea tunnel, it would be located at a distance of 3,000 miles from the Siberian Railroad, and about 2,000 miles from the nearest point on the most northerly of the transcontinental railroads in America.

Undoubtedly the activity in railroad construction which is evident to-day in Alaska will be permanent; and if the country fulfills its great promise of unexplored mineral wealth, no doubt the Alaskan railroads will be carried well up to Behring Strait. It is also certain that Alaska will ultimately be connected by an all-rail route with the railroad system of the rest of the United States. The prospects of a connecting railroad in Russian territory are at present apparently dependent upon the success of an American company, which has been seeking concessions from the Russian government. Their efforts, according to recent cable dispatches, have been successful, the Czar being favorably disposed toward the enterprise. This company, which believes that Siberia is as rich in gold as Alaska, offers to construct a tunnel and build a road 3,000 miles long from East Cape to Kansk, in the government of Yeniseisk, where it will join the Siberian railroad; and in consideration of this, the company is to receive alternate sections of eight miles on either side of the line, together with valuable mining concessions. Should this road be built, its source of revenue would be entirely local, and any returns must necessarily wait upon its settlement by immigration and the development of the supposed mineral wealth.

That there will ever be a considerable amount of through travel by way of Behring Sea is very unlikely, or that a Siberian-Alaskan route would ever become, even in the event of the construction of a tunnel, a popular route between the United States and Europe. The construction of the tunnel would be an enormously costly undertaking. With its approaches it would be not far from forty miles in length, and because of the extremely high cost of labor in that inhospitable region, the total cost would probably exceed one hundred million dollars. But the most serious question of all, as showing the impracticability of a tunnel, is that of the great depth to which it would have to be carried. The depth of water is variously stated at from 160 to 170 feet, which means that the sub-grade of the tunnel would have to be at minus 200 feet, in order to secure firm overlying material, and a rock which was impervious to water. Should any fissures be encountered at this depth, the tunnel would have to be abandoned; for the use of the pneumatic process would be out of the question, the corresponding air pressure of about 90 pounds to the square inch being, of course, fatal to life.

SEVEN-HUNDRED-MILE ELECTRIC TRANSMISSION.

It is gratifying to note that the technical press has sounded a note of warning against the preposterous proposal to generate hydraulic-electric power at the Victoria Falls of the Zambesi River, and transmit it over a distance of 745 miles for use in the gold mines at Johannesburg. But, although the proposal to deliver this power at a figure that would be at once economical to the consumer and profitable to the company has been ridiculed by the technical press, the lay public is liable to be misled by a scheme which, on the face of it, would seem to hold out flattering prospects of success. At the present time the most important transmission of energy for commercial purposes is that from Niagara to Buffalo, where the distance covered does not exceed about 20 miles. The longest transmission, according to present information, is that which is in successful operation in California over a distance of about 220 miles, so that the proposed transmission line in South Africa will be 340 per cent longer than anything that has yet been attempted. According to Prof. William E. Ayrton, who not long ago made a severe criticism of the scheme in the London Times, the Johannesburg mining district consumes about 150,000 horse-power, at an average cost of $100 per horse-power per year. Niagara sends 24,000 horse-power to Buffalo, where it is sold at about $125 per horse-power per year, and Buffalo, as we have noted, is distant from Niagara only 20 miles. Furthermore, in the neighborhood of Johannesburg are abundant supplies of coal, of which an excellent quality can be delivered on the Rand for from $2.60 to $2.00 per ton. Even if the Victoria Falls plant were to be built, and a great transmission line constructed, it is not likely that the important mining industries in Johannesburg would be willing to trust the operation of their costly plants to the integrity of a few copper cables extending for over 700 miles through the wilds of a savage country.

CHEAP ALCOHOL FOR MOTORS.

Alcohol is so important a fuel that its industrial use should not be restricted by heavy taxation. No doubt the laws which render its use burdensome to those who would employ it as an engine fuel have been enacted in the interests of the common good, and yet some legislative encouragement should be given to the employment of low-grade industrial alcohol which is unfit for consumption without in any way removing existing limitations to the sale of wines and liquors. The benefits to be derived from a free use of alcohol in the arts have been clearly set forth by Prof. Elihu Thomson in a statement made before the Ways and Means Committee of the House of Representatives, which statement will be found summarized in the following:

At the works of the General Electric Company in Lynn a Deutz alcohol engine—a type of engine made in Germany especially for use with alcohol—was recently tested and the results have been such as to prove without doubt the entire suitability of alcohol, if cheap enough, as a fuel for internal-combustion engines. This particular engine is to be sent to the Island of Cuba and coupled to a dynamo for lighting. It will be operated with the cheap Cuban alcohol, which is sold there at about 12 or 15 cents a gallon. A few gallons of this alcohol was obtained and used in the tests and it was found to be a high-grade spirit containing 94 per cent alcohol by volume and 6 per cent water, or about 90 per cent alcohol by weight. While it is not methylated or denatured, there is no question that the behavior in the engine of denaturated or methylated spirit would be identically the same as with the pure-grain alcohol.

To obtain this sample of Cuban alcohol it was necessary that an import tax of $4 a gallon be paid with other charges, which increase the cost of material enormously as compared with its actual value in Cuba.

The experiments developed the fact that alcohol is suitable as a motor fuel even when it contains as high a percentage as 15 per cent of water. Notwithstanding the fact that the heating value of alcohol, or the number of heat units contained, is much less than that in gasoline, it is found by actual experiment that a gallon of alcohol will develop substantially the same power in an internal-combustion engine as a gallon of gasoline. This is due to the superior efficiency of operation when alcohol is used. Less heat is thrown away in waste gases and in the water jacket.

The mixture of alcohol vapor with air stands a much higher compression than does gasoline and air without premature explosion, and this is one of the main factors in giving a greater efficiency. It follows from this that, with alcohol at the same price as gasoline, the amount of power developed and the cost of the power will be relatively the same so far as the fuel itself is concerned, but on account of the higher efficiency of the alcohol, less cooling water is required, or a less percentage of the heat of combustion is communicated to the cylinder walls of the engine. The exhaust gases from an alcohol engine carry off less heat. They are cooler gases.

Exhaust gases from a gasoline or kerosene engine are objectionable on account of the odor. In the tests of the Deutz alcohol engine there was absolutely no such objection with the alcohol fuel, the exhaust gases being but slightly odorous, or nearly inodorous. Alcohol possesses a considerable tolerance as to richness or poorness of the mixture in the engine, and even when there is considerable excess of alcohol for the air the exhaust is not disagreeable in odor, a condition which with either gasoline or kerosene leads to a smoky, bad-smelling exhaust. The importance of a fuel which does not produce disagreeable exhaust gas is greatest in the case of stationary engines of considerable power, as in that case the exhaust is emitted in one locality and may become a source of nuisance. This has often been experienced with gasoline or kerosene engines and has tended greatly to limit their application, particularly in densely built-up sections.

A large number of agricultural products are easily capable of being converted into alcohol, and such products as are unmarketable, either from overabundance of crops or defective growth or damage, are still available as sources of supply. Hence each agricultural district would be able to supply itself with all the motor fuel needed and at the same time produce for other districts. Inasmuch as alcohol can be stored in tanks for an indefinite period without change in its nature, any surplus production of alcohol can easily be taken care of. A prominent beet-root sugar manufacturer gave it as his opinion that from the waste of the beet-root sugar industry alcohol could be produced at a cost of about 10 or 12 cents per gallon. It is probably true that from other agricultural wastes, such as fruit parings, fruit partly decayed, surplus corn, etc., a cost equally low might be realized.

It is reasonable to infer that, freed from tax, there is no possible substitute for this valuable fuel which could be supplied at such a low cost. It may be mentioned in conclusion that the efficiency—that is, the ratio of the conversion of the heat units contained in the fuel into power—is probably higher in the alcohol engine than in engines operated with any other combustible, and doubtless, on account of the comparative newness of the alcohol engines, there is still room for some improvement in that respect.

A PRACTICAL APPLICATION OF THE AVERSION OF EELS FROM LIGHT.

According to the Biological Society of Copenhagen a very interesting and novel experiment is shortly to be made in the northern portion of the narrow straits called the "Little Belt." Electric lamps are to be fixed at the bottom of the sea, with a view to preventing the conger eels from making their way out into the open sea, to the great detriment of the coast fishing industry. Eels belong to the Murænidæ, a family of physostomous fishes distributed in almost all fresh waters and seas of the temperate and tropical zones. The two British forms are the conger (*Conger vulgaris*) and the common eel (*Anguilla vulgaris*). The conger is scaleless, and has a wide distribution in the sea; it reaches a length of 8 feet, but rarely exceeds 6 or 7 feet.

The eel is a peculiar creature in many ways, and its propagation has always been involved in mystery; the floating eggs of some species of eels have been found in the Bay of Naples, and the young have been recognized in small, peculiar, transparent fish, formerly known as Leptocephali, which, by the bye, undergo interesting transformations. It appears certain that eels migrate into the sea to spawn, that the spawn is pelagic, and hatches in the sea, where the young undergo their transformations. The males are smaller than the females, and the eggs are very numerous. Eels are much esteemed on the Continent and in England, London boasting of several eel-pie shops, and fish restaurants where stewed eels and eel soup are prominent items of the bill of fare. In Scotland there is a great prejudice against them, and also in some other countries such as Abyssinia. Eels are imported largely from Holland and Denmark, in which latter country the experiment referred to is being made.

Another peculiarity of the eel is that it shows a marked fear of light; to such an extent is this the fact that the conger will not migrate to the open sea when the moon is at the full. This weakness is to be turned to good account, in order to confine the congers within the limits of the Little Belt; this will be done by having the northern egress of the straits brilliantly illuminated by means of groups of powerful electric lamps securely fastened at the bottom of the sea, so as to control the point of exit in question.

THE CHANCES OF LIVING IN A MODERN BATTLE.

In Homeric days a battle was a conflict of armed mobs. The nearer you got to your assailant, the better was your chance of killing or being killed. The bigger the man, the better were his chances in the strife. In these piping times of mechanical warfare, the situation is reversed. Battles are fought at ranges of a mile or so. The smaller the man, the less are his chances of being hit. An ingenious mathematician has figured out that perhaps the casualties on the Japanese side must have been considerably less than those of the Russians in the recent war, if it be assumed that the marksmanship of each was equally good.

The advantage of the Japanese was inversely as the cubes of their height and breadth. The average targets offered by each to the enemy are as the cubes of 1,585 and 1,642, or as 106 to 118, an advantage in favor of the Japanese of about 12 per cent.