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## AIR BUBBLES.

It is greatly to be regretted that the inception of such a great industry as that of the automobile carriage in this country should be hampered by the sensational methods adopted by some of its so-called promoters. We refer to the omnipresent Autotruck Company, which, under the magic spell of certain names notorious in the more spiey periods of the political history of our city, still continues to enlarge on paper the sphere of its proposed operations. We have scarcely had time to grow familiar with the Air Power and Autotruck companies, with their capitalization of \$10,000,000 or more, and their intention to "control the trucking interests" of the city, before we are told that "Richard Croker is about to cross swords with the Third Avenue Railroad Company by fitting out a line of omnibuses driven by compressed air," etc. It is also added incidentally that "the Autotruck Company proposes to run stages similar to those proposed for Fifth Avenue, in Chicago and in Los Angeles, Cal.," yet we doubt if anyone has yet seen a street autotruck, and even the company cannot say more than that "orders for the construction of these vehicles have been given."

## LIMITATIONS OF THE AUTOTRUCK.

We think it is extremely unlikely that the autotruck, if it should ever get beyond the precincts of Wall Street, will succeed in displacing entirely the horse-drawn truck. For certain conditions of our city trucking it would be an immediate and absolute failure; as for instance, in a snowstorm like the last, in which Mr. Croker's autotrucks would be even more helpless than Mr. Vreeland's trolley cars have proved to be.

The weak spot in the autotruck would lie in the fact that the measure of its tractive force would be determined by the adhesion of the driving wheels, and in the greasy condition of the streets on which heavy hauling is done, the adhesion would be very small indeed. If a 5-ton autotruck attempted to cross the well lubricated paving of West Street or Water Street with a full load, not all the \$10,000,000 of vaporous capital of the air company, if put into the motors, could budge it an inch.

If the driving wheels should chance to drop into one of the multitudinous holes with which the Metropolitan Street Traction Company, having got in its wires, has strewn our thoroughfares, it would stay there until the discarded horse could be brought around to drag its discredited competitor from the pit.

## ELECTRICITY AS A THAWING AGENT.

If the statistics were gathered of the number of houses that are burned down every winter, as the result of attempts to thaw out frozen pipes by the perilous methods ordinarily practiced by the householder, the results would be decidedly sensational. To Prof. R. W. Wood, of the University of Wisconsin, great credit is due for showing that a frozen water pipe may be thawed out by the expedient of running through it an electric current of the proper strength.

In the present case a stretch of 300 feet of pipe between a house and the street main was solidly frozen. One wire was attached to the pipe in the cellar, and the other to a faucet across the street. The flow of the current was down the service pipe, along the main, and by way of the frozen pipe to the connection in the cellar. It was only necessary to heat the pipe to sixty degrees, and it is stated that within twenty minutes there was a full head of water in the cellar. The apparatus employed was planned by Prof. Jackson, and is being used with great success, two houses at a time being relieved thereby from their water famine.

It is evident that while electric thawing avoids the obvious risks of thawing out by hot coals or similar applications of heat, it has dangers of its own, and should only be applied by an expert workman. The theory of electric thawing is that the current in flowing through the metal meets with a resistance which raises the temperature of the pipe. The temperature will depend, other things being equal, upon the sectional area of the pipe, and care should be taken that there is no considerable reduction of the size of pipe at any point between the electric terminals, since there would be an

immediate overheating due to the reduced area which would be a source of danger. The current used would not have to be as large as might be supposed, the coefficient of electrical resistance being, for instance, twelve times as great for lead as for copper. With proper precautions the process is not dangerous, and the saving in the way of excavation and plumbing will be very considerable.

## COST OF THE BOSTON SUBWAY.

The figures of the cost of the Boston Subway, as given in the fourth annual report of the Boston Transit Commission, are very gratifying to the friends of the proposed rapid transit tunnel in New York. It was estimated in 1894, before work was begun, that the cost of the subway would be \$5,000,000. Now that the work is completed, a close estimate places the total cost at \$4,250,000, exclusive of the cost of certain alterations called for by legislation in 1897. It is not often that engineering works cost less than the estimate, and we do not call to mind any case where works of this magnitude have not somewhat exceeded the estimate.

There are no special difficulties or uncertainties connected with the construction of the New York underground scheme which afford reason to expect that it would cost more than the estimates. The work would all be of a kind with which engineers are familiar, and, indeed, if the funds for construction were furnished as fast as the engineers could use them, and a big force of labor were engaged simultaneously along the whole route, we think it is likely that the tunnel could be built for something less than the estimate of \$30,000,000.

## COMPARATIVE MERITS OF THE PANAMA AND NICARAGUA CANALS.

In our recent comparison of the advantages and disadvantages of operation in the two proposed canals across the isthmus, we omitted to draw attention to one or two features which would have more or less effect upon the commercial success of the canals, should both be built. We refer to the question of favorable winds as affecting the amount of sailing tonnage that would seek either route, and to the yet more serious question of the curvature of the canals as affecting both steam and sailing vessels. It is in favor of Nicaragua that for ten months of the year there are steady trade winds, which would enable sailing ships to reach either terminus without the assistance of tugs except in entering the artificial harbors. In the latitude of Panama, on the other hand, there are long periods of calm which might render somewhat lengthy towing necessary. While the objection counts for something, it is not so serious as might be supposed, for the reason that the deep sea sailing tonnage forms a very small and rapidly diminishing proportion of the total tonnage. In fact, it is probable that by the time either canal is finished, the tramp steamer will have completely ousted the sailing ship from the long distance carrying trade.

In laying out a ship canal, the curvature is one of the most important questions for consideration. In view of the ever-increasing length of ocean steamships, it is desirable to make the canal as straight as possible. If, owing to the nature of the country, curves are necessary, they should be "easy," that is to say, their radius should be large. When a large ship passes up the Manchester Ship Canal, she has to be assisted by a tug at her head and one at the stern to enable her to make the turns. This is tedious, costly and full of risk. The smallest curve at Panama will be four times as easy as that of the Manchester Canal in England, and double as easy as those of the Kiel Canal in Germany.

The curvature of the Nicaragua Canal has not been determined, but for about 50 miles of its course down the San Juan Valley it must necessarily be very sharp, even after the waters of the river have been dammed. The approximate curvature of the river channel shows a total length of curvature in the valley of 39.6 miles. The curves of the Panama Canal are of 8,200 feet radius or over, while the river channel at Nicaragua has six curves of 700 to 1,500 feet, 15 of 1,500 to 2,500, and 21 curves of 2,500 to 3,000 feet. Although the Ochoa dam will widen the channel, it will be difficult, even with costly excavation in cutting away the spurs of the hills, to reduce the curvature to the extent necessary for easy navigation.

## MASONRY VERSUS WOODEN DRY DOCKS.

There is a growing conviction among naval men that the United States should cease to build wooden dry docks and in future construct all of its docks of masonry. The principal argument in favor of wooden structures is, or used to be, the smaller first cost. While a timber dock could be built for from \$400,000 to \$600,000 according to its size, a similar masonry structure used to cost from two to three million dollars. This of course was an extravagant figure, but seems to have been unavoidable under the plan of periodical appropriations by Congress, which caused the work to extend over long periods with much consequent waste of time and money.

The recent bidding for a stone drydock at Boston

brought out the welcome fact that a masonry structure can be built for a moderate increase of cost over one of timber. The cost of the dock will be about \$1,000,000 whereas the timber dry dock (known as No. 3) at the Brooklyn navy yard cost between \$600,000 and \$700,000, and in the two years of its existence it has cost for repairs \$171,000.

Prof. W. L. Cathcart, of Columbia University, in a paper on the subject read before the American Society of Civil Engineers, gives some significant figures regarding the cost of repairs on the two types of docks, in which it is shown that the least average annual expenditure for repairs and maintenance was \$230 per year for the stone dock at Mare Island, while the highest expenditure was that upon the Brooklyn navy yard wooden dock, above mentioned, which averaged \$85,500 per year. A comparison of three stone docks, those at Boston, Norfolk, and Mare Island, shows an average yearly expenditure of \$1,558, while the average on four timber docks at New York, League Island, Norfolk, and Port Royal, was \$13,364. Commodore Endicott, Chief of the Bureau of Yards and Docks, stated that a timber dock has to be practically rebuilt in from twenty to twenty-five years, the experience of the navy all tending to prove that the masonry dock is superior in practically every respect.

## THE FASTEST VESSEL AFLOAT.

Until the new and large torpedo boats of the "Turbinia" type, now building at Newcastle, England, have been completed, the credit of having turned out the fastest vessel will belong to a German yard. The "Hai Lung," built by Schichau, of Elbing, for the Chinese navy, is credited with having made a run of 18½ knots at an average speed of over 35 knots an hour. The builder states that the highest speed realized during the run was 36.7 knots or 42.26 miles per hour. The best run of the "Turbinia" for a mile is 35 knots, so that the Schichau vessel has a substantial lead.

The most remarkable feature of this boat next to her speed is the fact that she is fitted with reciprocating engines. At the time the "Turbinia" made her phenomenal speed, it was popularly supposed that it was entirely due to her new form of motor. In great part no doubt it was; but there is reason to believe that the excellent steam-raising qualities of her boiler contributed in no little degree to the result. Relatively considered, the performance of the "Turbinia" was more meritorious, for the reason that she is only a 40 ton craft, while the Schichau boat is of 180 tons displacement, or four and one-half times larger. The new and enlarged "Turbinias" will be full sized torpedo boats, and for this reason it is likely that they will surpass the "Hai Lung" by a considerable margin of speed. Just what the excess will be is a matter which is exciting much speculation in naval quarters.

## FLASHLESS RAPID-FIRE GUNS.

It is reported that the new French rapid-fire gun invented by Colonel Humbert gives no flash or sign of fire. If this be true, the French have made an advance in artillery second only in importance to that which marked the introduction by them of smokeless powder. In the operations around Santiago, the only means by which our men could locate the position of an enemy's piece was the flash. If this should be removed, the art of war, especially on land, will become more difficult than ever, for a masked battery of smokeless and flashless guns would be positively undiscoverable. The only description of the gun that has come to hand is rather obscure; but it would seem that an attempt is made to cool the larger portion of the gases below their flash point before they are allowed to reach the open air. The rate of fire has reached a maximum of twenty shots per minute. To accommodate the increased expenditure of ammunition it is proposed to reduce a single battery from five to four guns and increase the number of ammunition wagons.

## RAILS AND TIE-PLATES.

One of the most useful improvements ever introduced on American railroads is the tie-plate. Before its invention the life of a wooden tie, especially if the tie was of soft wood, was frequently limited to the time it could withstand the cutting of the rail into its upper surface. Wear, due to this cause, was always considerable, and as the weight and frequency of trains increased, it became excessive.

In earlier days it was supposed that the material of the tie gave way by crushing; but of late years it has been believed that it is the wave-like movement, set up in the elastic rail by the wheels of the cars, that acts with an abrading effect upon the fibers of the wood. If this is the true explanation, no amount of widening of the base of the rail will prevent it from cutting into the tie.

The interposition of the tie-plate (a square plate with stiffening ribs on its under side) between the base of the rail and the tie has proved wonderfully effective in preventing this cutting action. The longitudinal ribs of the plate sink into the tie, and keep tie and plate in a fixed relative position; the rail spikes

pass through holes punched in the tie-plate, and are thus held at all times snugly against the rail. Mr. Sandberg, whose good work in past years in advocating the use of rails of greater weight and stiffness is universally appreciated, does not appear to understand the true function of the tie-plate as explained above; for he has lately made a plea for the widening of the base or flange of the rail as a means of preventing cutting of the ties. The only possible gain if this were done would be an increased stability against overturning of the rail (which, by the way, is not called for, overturning being a very rare occurrence), and a broader bearing on the ties, which, as we have seen, would not go very far toward preventing their destruction. Moreover, to widen the base throughout the whole length of the rail would be extravagant, for the reason that the present base has ample cross-section considered as the bottom chord of a girder to carry the load concentrated between adjoining ties.

#### SUGGESTIONS CONCERNING TRADE WITH RUSSIA.

Russia occupies an area of 8,500,000 square miles, a sixth of all the land of the globe, and it has a population of 130,000,000 souls. There are 140 different races and 90,000,000 of the inhabitants are farmers. This country, certainly, constitutes a world large enough to command the attention of the leading manufacturers and exporters of the United States who are seeking a market for their surplus.

There is a general desire on the part of Russian merchants and dealers to establish relations with American manufacturers, provided that it can be done advantageously to themselves; but, as a rule, however, American houses have a general agent in England or Germany, who supervises all the business for Europe and appoints sub-agents in Russia, who naturally receive but a small fraction of the commission. Russian agents naturally object to dealing through an agent in London or Hamburg, and would much rather deal directly with the home company. One of our great locomotive works and a great pump works, some years since, gave the exclusive agency for their goods in Russia to St. Petersburg agents, who deal directly with the home company, and practically control the Russian market for locomotives and steam pumps, their trade amounting to millions every year, while agents for rival companies are unable to compete with them. What has been accomplished by these companies can be done by others with equally meritorious articles. English firms give a credit of from nine to twelve months, the buyer usually accepting a draft, payable at a London bank, without interest. Longer credits and open accounts are also common. American exporters usually require payment at an American bank, on the presentation of bills of lading showing that the freight had been delivered on board the steamer at some seaport. This is well enough for such cash articles as cotton, resin, etc., but, where there is sharp competition in manufactured articles, the terms offered by other countries must be made to secure business.

The American consuls in Russia are in constant receipt of letters and circulars from American manufacturers and export associations, making inquiries as to the prospect and methods of introducing their goods, but purchasers naturally desire to see and examine any article they desire to purchase, and, therefore, the circulars printed in English, which few merchants can read, are of little use. Russians have respect and admiration for the inventive genius of the Americans, and while conservative, they are always willing and anxious to look into new inventions from the United States; but those who desire to do business in Russia should prepare special matter and have the same printed in either German or Russian, preferably Russian. They should state the price of the articles offered for sale at the lowest terms of discount, terms of payment in Russian values and weights, and cost delivered on board of vessel at a prominent seaport. The surest and best plan to introduce goods into Russia is to send samples by a thoroughly competent representative of the business. It is not absolutely necessary for him to have a knowledge of the Russian language, as interpreters can be found in all the leading cities of Russia, yet an acquaintance with Russian, German, or French would be of great assistance. Articles of manufacture, with the exception of portable and traction engines, thrashing machines and plows made in the United States, are preferred to those manufactured elsewhere. American thrashers and engines are too light to stand the rough usage to which such machines are subjected in Russia. There is a large and increasing trade in American harvesting machinery and farming implements, such as binders, mowers, reapers, hay rakes, etc. The only plows used in European Russia are those manufactured in Russia and Germany, which are cheap and give good satisfaction. The Germans are constantly studying the Russian market, and manufacture articles in the style and manner they find specially adapted to the wants of the Russian farmers.

Notwithstanding the rapid progress Russia is making in the establishment of manufactories, which are being

encouraged by the government, she is not able to keep pace with the increased demand for iron, locomotives, cars, coast steamers, battleships, elevators, electrical apparatus and supplies, wood working machinery, tin plate, agricultural implements, resin, cotton, roofing slate, leather, scales, heavy ordnance, typewriters, tools, bicycles, sewing machines, hardware, coal and other machinery, photographic materials, as well as in other lines in which our supremacy is unquestioned. Russia offers such a rich field for investment and profitable trade that our manufacturers should study the market and methods of doing business. The Russian railway and manufacturing systems are now in their infancy, and there will be for years a constant demand for car material, railroad machinery, etc.

As in other export trade, it is the buyer, and not the seller, who determines the kind of articles he wants and the form in which he wants them turned out, labeled, and packed for shipment. It is the business of the seller to ascertain what the buyer wishes and offer him a better article for the same or less money than he has been paying.

The recent order removing the duty on almost every article used in agriculture will make such a reduction in their price as to place them within the reach of many farmers who have been unable to purchase them until now, and must largely increase their sale. There is a fine field for fire extinguishing apparatus, hose, electric cars, passenger and freight elevators, improved flour mills, planing mills, coal and other mining machinery. It is proposed by Ambassador Hitchcock, if possible, to hold an American exposition in 1901, immediately following the Paris exposition, as the best means of introducing and advertising goods, and offering American manufacturers an opportunity to become acquainted with Russian merchants and to acquaint themselves with the kind of goods adapted to the market, and the methods of doing business. By a recent convention the International Money Order system between the United States and Russia went into effect on the first day of January, 1899.

The above is an abstract of the interesting Consular Report of W. R. Holloway, our Consul-General at St. Petersburg.

#### THE COMSTOCK MINES AND THEIR DRAINAGE.

A systematic and determined attempt is to be made to lower the water level in the great Comstock mines, and permit a resumption of extracting ores down to the 2,100 foot level. By a combination of the directors of the thirty, or more, mines interested, \$100,000 has been raised for this purpose. At present, these mines are flooded 40 feet below the outlet of the Sutro tunnel, which is 1,663 feet below the opening of the shaft of the Savage mine. The purpose is first, to exhaust the upper level of 500 feet of water and then, if the plan pursued is successful, the remaining levels, extending as far down as 3,300 feet, in the deepest shaft, will be ultimately drained, and the stocks of ore, known to exist in the submerged territory, will be brought to light. No estimate of the quantity of water that will have to be withdrawn, in order to dry out the various mines, has been computed, but that it is enormous is well known. The magnitude of the task is fully realized by those who have the matter in charge. In 1877, the half dozen pumps of the Hale and Norcross mines raised, in six months, no less than 400,000 tons of water at a cost of one cent for every 20 gallons raised; 1,800,000 tons were pumped out in 30 months. The experience of every deep mine on the Comstock lode is identical.

The cessation of pumping caused the immediate flooding of the shafts. Some conception of the enormous task undertaken can be discerned from these facts. The cost of raising these floods will be, it is estimated, only one-twelfth more as compared with the cost in former years.

The stocks of paying ore remaining in all of the lower levels of the Comstock are believed to be very great. In former years ores of low value were regarded as not worth mining, owing to the high cost of reduction. At present ores realizing only \$4 per ton can be mined at a fair profit. It is also believed that ores of as high grade as was ever mined from the lode still exist in the unexplored portions. The reports of all experts unite in supporting, as probable, this theory. That sufficient low grade ores will be found to pay for their extraction, and more than the cost, is a demonstrated fact. It has always been claimed by the geologists of the Comstock lode that the probability of a continuation of the great ore body to an indefinite depth is more than good, and that rich bodies of ore will be discovered, as soon as science, in some way, devises means of moderating the high temperature met with in the lower levels. It is believed that this problem can be solved. Another difficulty of a serious character is the subterranean bodies of water occasionally met with, and which have at times caused serious loss of life, but a pumping plant of large caliber will, it is believed, greatly diminish the danger from this source. The difficulty of mining in a temperature of 120°, sometimes reached in the lower levels of the Comstock, and the dangers resulting from unexpected floods,

can be provided for by later appliances than were used when formerly worked.

The Comstock lode was discovered in 1859, and up to the year 1879 it produced ore of the assay value of \$363,961,205. The value of its subsequent production is not known exactly, but to place the total to date at \$500,000,000 is not considered by well informed experts any exaggeration. The wild speculation following the development of this great lode forms an interesting page in mining history. The abandonment of mining in the lower levels resulted from the exhaustion of high grade ore and the high cost of extraction. Ore in the 1,600 foot level and above is about exhausted. With the draining and ventilation accomplished, development will be resumed, and there are many who believe that great results will follow. The later history of this most wonderful of all lodes of precious metals may prove quite as romantic and miraculous as that of its earlier days.

#### NEW MACHINE SHOP FOR THE NEW YORK NAVY YARD.

The formal result of the deliberations of Commodore Melville, of the Steam Engineering Bureau, and Commodore Endicott, of Yards and Docks, relative to the erection of a new machine shop at the New York navy yard will be sent to the Secretary of the Navy. It is understood, however, that they favor the construction of a machine shop for naval work on an entirely different plan from the one destroyed. The present idea is to extend the boiler shop toward the dry docks a distance of 400 feet, moving the boiler-making plant to the lower end of the structure and devoting the western end to the machine shop until the new building can be erected on the site of the old one.

The new building will be one story high, 365 feet long, and 150 feet wide; the added depth of 75 feet being taken from the length of the boiler shop. An office and administration building will be constructed, so that the offices will be in no way connected with the shops. The setting-up shop is to be 100 feet deep, and in the space inclosed in the three sides of the square occupied by the buildings provides for a power house to be erected away from the main buildings. The tools and machines for the new shops will be of the most approved pattern, and it is thought that the shop will be the most complete one in the possession of the government and capable of turning out work with great rapidity and accuracy.

#### A CURIOUS ACCIDENT ON A TROLLEY CAR.

An inspector in the Brooklyn Water Department is now at his home in Brooklyn suffering from an electric shock, which paralyzed him from the waist down, which he received in a trolley car. He boarded the car while it was raining hard. He wore no rubbers, but had on very thick shoes, the heels of which were secured by rows of heavy nails. He stepped from the platform upon the iron plate which forms the threshold of the car, the door of the car sliding back and forth in a groove in this plating. He at once experienced a sharp shock, and the conductor pulled the helpless man away from the plate and carried him to a seat. The other passengers were then sent out of the car; the car was run to the power house, and after a considerable time had elapsed the man was sent home in a carriage.

It is difficult to account for such a severe shock. The pressure carried by the trolley wires is about 550 volts, and the shocks which are ordinarily obtained do not do any harm. It is probable that the injured man must have received the current through the iron nails in the heels of his shoes. It is also possible that the car heaters were improperly wired, and that a loose wire may have touched the framework of the heaters and been thereby conducted to the iron plate which covered the threshold of the door, through the medium of the iron supports of the heaters.

#### A STRANGE SOCIETY.

The Woman's Rest Tour Association is a curious little society which is now becoming quite well known abroad. It is an association having headquarters at Boston, and it might be termed a mutual bureau for information. The society means to furnish women who travel for purposes of rest and study with such practical advice and encouragement as shall enable them to make their trips independently, intelligently, and economically. It has more than 575 members. There is a library of Baedeker's guide books which are lent to members who may wish to use them on their travels. Foreign and American lodgings are listed in a small paper which appears from time to time, and information is given regarding travel abroad. The membership includes many school teachers of very small means to whom it is vitally essential to make every dollar go as far as possible in a European tour, which is expensive at the best. The association is a remarkable example of women's willingness to help one another.