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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 TRANSATLANTIC RUN OF THE "KEARSARGE."

The notoriety given by the public press to the recent run of the battleship "Kearsarge" across the Atlantic at an average speed of 13.1 knots an hour, and the mutual felicitations indulged in thereat, must have proved somewhat puzzling to the average layman, who is accustomed to read on any day of the week that such and such a transatlantic liner has come into port after making the same transatlantic run at an average speed of 23 knots an hour or over. "Why," he must have said to himself, "all this jubilation because a first-class battleship has sailed the seas at a speed which would be only respectable for one of the better class tramp steamers?" Not only must the average speed seem to be in itself very low, but he will probably have in mind the fact that four years ago, when the "Kearsarge" underwent her official trials, she maintained for four hours an average speed of 16.84 knots an hour. "Why, then," he will say, "must we have all this mutual congratulation over a United States battleship which, on a specially-ordered sea voyage, cannot come within four knots per hour of the speed she made on her acceptance trials?"

And yet, in spite of the apparent discrepancy, this run of the "Kearsarge" was a really creditable performance, since it was made entirely under natural draft and at an average speed only one knot lower than her natural draft speed at the time she was built. Battleships and cruisers are designed to steam at varying rates of speed according to the particular needs of the occasion. For cruising purposes and making such long runs as that which she has just completed, the "Kearsarge" was given sufficient motive power to enable her, when steaming under natural draft, to maintain a speed under favorable conditions of 14 knots an hour; and in order to give the vessel a reserve of speed which she can call upon when she is chasing or being chased by an enemy, or when she wishes to avoid torpedo attack or to make some sudden change of position in a naval engagement, she carries a set of blowing engines by which the rush of air through the furnaces can be speedily augmented, and the steam-raising power of the boilers and the horse power of the engines proportionately increased. Under the latter conditions, the speed increases nearly three knots an hour; and as a matter of fact, on her trials carried out in 1899, the "Kearsarge" during a forty-hour continuous run under natural draft, maintained an average speed of 14.1 knots an hour, and during a forced-draft trial of four-hour duration, she showed an average speed of 16.84 knots per hour. It will be seen, then, that on the recent run across the Atlantic, the performance of the ship was within one knot per hour of the speed achieved under natural draft during the highly favorable conditions of an official trial.

Unfortunately for the subsequent reputation of battleships and cruisers, the maximum forced-draft speed achieved under exceptionally helpful conditions is invariably taken as being the speed of that ship; that is to say, she is credited, not with the speed which she will show for 360 days out of the 365 of the year, but with a speed which she may not use more than two or three times in the year, and which she can only reach when she has the best of coal in her bunkers, and when the boiler-room crew is in a state of first-class efficiency.

Hence it is misleading to talk of the 18-knot "Maine" and the 17-knot "Kearsarge." It would be nearer the truth to call them respectively 15-knot and 13-knot vessels.

Furthermore, the wide difference in speed between naval and merchant vessels, or say between a "Kearsarge" and a "Deutschland," is not in any sense due to imperfect design or poor handling in the former. For we must remember that while the "Kearsarge" required during her transatlantic run only about 6,500 horse power to drive her at 13.1 knots, the "Deutschland" in making her record trip at 23.5 knots, required over 37,000 horse power, or nearly six hundred per cent more power. Moreover, the model of the transatlantic liner is designed specially for high speed; for with a beam of 68 feet she has a length of over 680 feet, a ratio of beam to length of 1 to 10; whereas the "Kearsarge," with a beam of 72 feet, has a length of only 368 feet, a ratio of 1 to 5. The finer lines of the merchant vessel and her high freeboard are not only conducive to speed in ordinary still water, but they are especially helpful when driving into a head sea. We have traveled on the "Deutschland" when with 35,000 horse power she was maintaining 21 knots an hour in the teeth of a heavy southwesterly gale. The "Kearsarge," on the other hand, was obliged to slow down at times to 10 knots an hour on the same western trip, because she was taking green water over her forward turrets.

The run of the "Kearsarge," therefore, was highly creditable, and had it not been for obstructions of fogs, icebergs, and heavy weather, it is likely that the vessel would have about maintained her trial speed of 14.1 knots per hour.

THE BEHRING STRAIT TUNNEL AGAIN.

Once more the chimerical scheme for building a railroad from the Pacific coast terminus of the transcontinental railroad systems to Alaska, and carrying the road beneath the Behring Strait by a tunnel to connect with an extension of the Siberian Railroad, is being agitated. The improbability of such a railroad being built, or if built, being made financially successful, can only be understood by taking a map of North America and tracing the proposed course of the line. It will then be seen at a glance how vast are the distances which this proposed road must cover. From Vancouver on the Canadian Pacific line to Behring Strait is at least 2,500 miles. The Behring Strait would involve a tunnel nearly sixty miles in length, that would have to descend several hundred feet below sea level to find a stratum suitable for tunnel operations; then on reaching the Asiatic shore, there would be another stretch of about 2,700 miles to be surveyed and constructed before connection was made with the present Trans-Siberian system. The difficulties in locating and building such a line can only be understood by engineers who are familiar with the physical and climatic obstacles to be overcome. No mere hasty reconnaissance would be sufficient to give even an approximate estimate of the cost of the Trans-Alaskan portion of the route. As to the construction of the tunnel, the mere preliminary borings to ascertain the character of the material to be encountered would be an enormously formidable task in itself, and when this was successfully completed, there would still be a grave element of doubt as to the practicability of keeping the tunnel free from an inrush of water which, if it should occur under the pressure due to the great depth, could not fail to be disastrous.

We are aware that the enthusiastic promoters set down the cost of the 60-mile tunnel at twenty million dollars; but when we consider that the twenty miles of subway tunnel in this city are to cost thirty-five million dollars, it is pretty safe to say that the twenty million dollars would not be sufficient to cover the cost of the tunnel and the surveys, to say nothing of the 5,000 miles of connecting railroad that would be necessary. Even if the engineering difficulties could be overcome (as undoubtedly they could with sufficient time and capital), where is to be found a body of financiers to put through an undertaking which could not possibly render any return on the investment for many a decade to come, if ever it did?

Moreover, even if the road were built, it is pretty safe to say that it would have to depend almost entirely upon the passenger and local traffic for its development; for it could not possibly hope to compete in the carriage of freight with the large merchant steamships that are being built for the Trans-Pacific trade. The idea of an all-rail route from Paris to New York is picturesque, sentimental, and quite impractical. It is certain that in the present stage of development of Northwestern America and Northeastern Asia, the scheme will never get beyond the paper stage.

THE SPEED OF THE AUTOMOBILE.

There is something in high-speed travel that appeals, with the strongest fascination, to the general public. Just why a record-breaking run should have such fascination, it is difficult to determine; but perhaps it is that, unconsciously, we realize that every mile per hour added to our high-speed records is another evidence of the gradual victory of man over that all-pervading inertia which it is his constant effort to overcome.

The present year has witnessed some remarkable feats of speed, particularly in the field of the automobile. Unquestionably, the most astonishing performance was that of Gabriel, the winner of the first stage of the Paris-Madrid race, who covered a stretch of 331.2 miles at an average speed of 56.25 miles per hour. To maintain such a high average over roads that are more or less hilly must necessitate extremely fast running over certain portions of the road.

Although the meet for the Gordon Bennett cup, recently chronicled in this journal, did not witness any such high average speed as was achieved in France, the speed trials for short distances were the most successful ever held. Although it is true that the course in Phœnix Park is an ideal one for speeding, we must admit that the performance of Baron de Forest, when he lowered the world's record for a kilometer to 26 3-5 seconds, which is equal to a speed of 86½ miles per hour, is truly astonishing. No less astounding, either, is the record of Barney Oldfield, made recently on an oval track, of a mile in 55 4-5 seconds, or at a rate of 64½ miles an hour.

As far as we are able to ascertain, the highest speed attained by a railroad train on a trial that was properly tested by competent time-keepers, was a fraction of over 90 miles per hour, so that the automobile is to-day practically as fast as the locomotive. Of course, it is a very different proposition to run a single machine capable of carrying only two persons at high speed, and to do the same thing with a train capable of carrying three or four hundred people. The fact that nearly 90 miles an hour has been achieved by an automobile proves that it is merely a question of weight and horse power before these machines will be running a trial mile at the rate of one hundred miles an hour or over. Such performances, however, are merely sensational and spectacular; they have no practical value, except so far as they may afford data to the automobile makers on the action of the more delicate and sensitive parts of the engines when they are pushed at their utmost limit.

MARVELOUS PRODUCTION OF IRON AND STEEL.

In spite of the fact that during the past twelve months the iron and steel industry has been hampered by a long coal strike, and by something of a deadlock in transportation facilities, the total production of iron and steel in the United States has grown to truly enormous proportions. Probably in the whole history of the world there has never been a period when a single industry witnessed such a phenomenal development as that of the American iron and steel trade. We have been accustomed to regard the great industrial establishments of the country, and particularly those identified with the steel industry, as more than equal to any possible demands of the home market, yet so great has been our prosperity that our great blast furnaces and steel mills have been unable to cope with the demand, and it has been necessary to import a certain amount of pig iron from abroad.

During the last year the total production of pig iron was 17,821,307 tons, an increase of over two million tons on the preceding year and a gain of four million tons over the year 1900. Perhaps these figures are best understood when it is stated that last year's production was nearly double that of the year 1897.

THE SLAUGHTER GOES ON.

The rate at which our railroads are killing and maiming people continues steadily to increase. According to the report of the Interstate Commerce Commission on Railroad Accidents in the United States, within the three months ending March 31 last, 300 people were killed and 2,834 injured in train accidents. Other kinds of accidents, including those sustained by employes while at work, run up the total casualties to 827 killed and 11,481 injured. That these accidents cannot be put down entirely to the fault of the passengers and employes themselves is shown by the fact that during the quarter under consideration, 1,650 trains were in collision and 1,181 trains were derailed.

MORE NEWS ABOUT EDISON'S STORAGE BATTERY.

The latest authentic data concerning Mr. Edison's storage battery are found in the following interview published in the New York Times:

"The popular impression seems to be that my new storage battery was more or less a possibility, but that it began and ended there. That is not so—one of them has been in operation for the last three weeks in one of Altman's delivery wagons, and is doing all that I expected and claimed for it.

"There is a great deal to be said for the new battery, and all in its favor. It will average more than a third greater mileage for half the weight than will the old lead battery. It has an additional advantage inasmuch as it can be recharged at a much faster rate than the old battery. As much electricity as will send the motor forty miles can be put in it in less than an hour.

"Ever since I took up this problem of the greater capacity battery I have worked with the idea of using it for street locomotion—in automobiles and trolleys. And now the auto battery is finished. Last Monday three friends and myself took a trial run to Atlantic City in a car consisting of a Mors frame and one of

my batteries. We wished to attain great velocities over rough surfaces, and we succeeded beyond any of our expectations. The idea was to find any defects in either the frame of the car or the battery and motor. The latter two were entirely successful, but there are a few things which can be bettered in the car.

"My experience shows me that we have much to learn from the French makers—they have been at it longer than we have, and are still several years ahead. Several of the auto makers in this country have sent for my battery specifications and are beginning to make types of their machine in which it is to be used.

"I have been experimenting with an electric coach to-day, and it is surprising how well it showed up. We climbed Eagle Rock, where the hill-climbing contests are held, with the greatest ease, and we really did not dare to attain our maximum speed.

"We cannot put the new battery on the market in any quantity as yet. The best we can do now is to make one a day. By October we will make at least six daily, and about Christmas we will be in shape to meet any demand. The trouble has been that special machines had to be built, but the last of these will be completed next week. Another disadvantage I have to contend with is paying 40 per cent duty on a certain sheet steel that must be imported from England or Germany, and then in only limited quantities. By Christmas three rolling mills will be able to make it for me here in this country, and then the present high price for the batteries will be reduced.

"This battery will drive all other methods of locomotion out of business, and in less than ten years the horrible odor of gasoline on the public highways will be unknown. As for lack of recharging stations, that is nonsense. In the last month forty-five new ones have been installed in the New England States alone, and this is going on all over the country.

"Next year I will wager that I can take a car of my own design, fitted with my motor and battery, and go to Chicago and return in less time and with more pleasure than any other machine in existence. There will be no breakdown, no explosion of gas or gasoline, and the trip will be made at an even twenty-five miles an hour.

"Another thing, the battery will be made in four sizes, so that when fully charged it will run 25, 50, 75, or 100 miles, and if wanted, they will be made any size larger or smaller. Of course, the running power of the battery will depend to a certain extent on the work it is called upon to do. If the roads are rough and there are many hills, a charge will last a shorter time than if the conditions were such as are found in the city. But taking the maximum of bad going, the battery will only be exhausted about 25 per cent sooner than it would be under favorable conditions."

In looking up the official test made of the new battery in the delivery wagon at Altman's, the books showed that the old lead battery weighed 1,260 pounds and had a maximum of 25 miles, while the Edison battery which replaced it weighed 650 pounds and drove the wagon 36.8 miles. Besides which the old battery occupied 12.8 cubic feet, while the Edison took up only 8.5 cubic feet. This comparison was made by the Times.

PROPOSED FORTH-CLYDE SHIP CANAL.

The feasibility of a ship canal between the Forth and Clyde has been for many years a subject of discussion in shipping and commercial circles in Scotland. Several routes were suggested at various times, but no definite steps have been taken toward the preparation of plans. At present the prospect of the construction of such a waterway is, however, considerably brighter. A company of London financiers is taking an active interest in the project, and has, it is said, adopted the scheme put forward by Messrs. D. and C. Stevenson, a prominent firm of harbor engineers of Edinburgh. Messrs. Stevenson surveyed the route some years ago from Alloa, on the Forth, to Arrochar, on Loch Long, and are now making a further survey in detail, preparing plans, etc. An Edinburgh committee or syndicate is acting in conjunction with the London promoters, and the sum of £10,000,000 ($48,665,000) has been pledged, on condition that Parliament shall guarantee interest on capital. The promoters are confident that Parliament will aid the enterprise to this extent, in view of the importance of the canal for naval purposes.

In regard to this proposed deep-water canal across Scotland, David Alan Stevenson, C.E., says:

"The east and west coasts of Scotland are now connected by two canals, namely, the Forth and Clyde, from Grangemouth, on the Forth, to Bowling, on the Clyde, and the Caledonian, constructed at national expense, between Inverness and Fort William. Both of these canals are quite inadequate to meet the present wants of shipping, as they can only accommodate vessels of a small class. The first named is mainly used by barges, while the Caledonian can only be used by vessels of about 150 feet in length, 38 feet beam, and 17 feet draft. Both canals are seriously incumbered by numerous locks.

"At present all vessels bound from the east to the west coast of Britain, or *vice versa*, have to pass around the end of the island, through the Pentland Firth, with its rapid tide and dangerous sea, combined with deceptive currents and prevalent fogs, or 'south about' through the overcrowded English Channel, so frequently the scene of disastrous collisions. It cannot be doubted that a ship canal through the narrow neck of land which separates the east and west coasts of Scotland, capable of carrying the largest vessels, would not only obviate all the dangers and delays incident to the 'north about' and 'south about' routes, but would effect much saving in time, in the cost of insurance, in wear and tear of vessels and their engines, and hence in the cost of transit; it would also for strategical purposes be of the greatest importance.

"In designing such a canal the first points to be settled were, What are the essential requisites? These may be stated as follows:

"1. That it should be of such dimensions as to admit ships of the largest class of merchantmen, and also vessels of the royal navy, passing freely and with perfect safety from sea to sea, practically at all times.

"2. That it should be as free as possible from locks, hydraulic lifts, or other mechanical appliances, involving possible delay or risk to ships using it.

"Having assumed these, as I think, indispensable conditions, the next question for solution was, Can a route be formed from the German Ocean to the Atlantic which fulfills them, and also can the canal be formed at a cost which will prove remunerative?

"After careful study of the country and the levels, the conclusion was arrived at that a route along the valley of the Forth gives the only practical solution of the problem. There is, as is well known, a tract of country, extending from Alloa, on the Forth, westward along the valley of the Forth to within about 10 miles of Loch Lomond, where the surface of the ground is only from 30 to 50 feet above mean sea level and the stratum is an alluvial deposit. Between this and Loch Lomond the ground rises rapidly and attains a maximum height of 236 feet above mean sea level and dips again to the south end of Loch Lomond, the surface of which is only 22 feet above mean sea level. The distance across this higher ground, from the 50-foot contour on the one side to the 50-foot contour on the other, is about 8 miles, 1¾ miles of it being above the 200-foot line.

"Loch Lomond (which has ample depth for vessels of the largest draft) is to be utilized as canal toward the north end of the lock to Tarbet, and thence across to Loch Long there is only a distance of 1¾ miles, the ground attaining a maximum height of 130 feet above the mean sea level. Loch Long is practically the Atlantic Ocean, and the navigation of it is safe and the water of ample depth. This, then, is the route proposed by my firm, and the surface of Loch Lomond, which as I have said is only 22 feet above the mean level of the sea, is the proposed summit level of the canal, and having a water area of 21,000 acres and ample gathering ground—290 square miles—it would form an inexhaustible reservoir for supplying the locks with water. Only two locks at either end, at Alloa and Loch Long, would be required, as the level of the canal is only 13 feet and 17 feet above high-water level at these places, respectively. The exact route to be chosen will, of course, depend upon more minute inquiry than has yet been made.

"The eastern approach to the canal, which will be tidal, will be formed by deepening the Forth or making a cut inland, with a depth of 25 feet at a low-water spring tides, from opposite Grangemouth to the locks which it is proposed should be placed about 2 miles above Alloa. This will give a depth of 43 feet at high-water spring and 38 feet at neap tides. The distance from Grangemouth to Alloa is 6 miles. From Alloa the canal will pass to the north of the links of Forth and to the northward of the town of Stirling, then along the valley of the Forth to Gartmore and enter Loch Lomond near the mouth of the Endrick, a distance of 29 miles.

"Near the Loch Lomond end there are 5 miles of high ground, which, according to the geological survey, is the old red-sandstone formation. This part of the work will be open cutting. The distance from the junction of the loch and canal to Tarbet is 14 miles, and across the neck of land to Loch Long 1¾ miles. Loch Long is 15 miles in length to its junction with the Firth of Clyde. The total distance from Grangemouth to the Firth of Clyde is 65¾ miles.

"Regarding the dimensions of the canal, it is essential to its success that it be made on a large scale and free from locks, excepting at the seaward extremities. As the level of the water of the canal will be only about 13 feet above high water, one lock will be sufficient at high water, but two may be necessary at other times of tide. It is proposed to make the canal throughout with a depth of 30 feet, with a width at the bottom the same as the Suez Canal—namely, 72 feet—and side slopes varying with the nature of the material. The locks will be capable of passing the largest vessels afloat, or about 600 feet in length and 80 feet in width, with smaller locks alongside for smaller vessels.

"It would have been desirable to have proposed a canal of sufficient width to allow two of the largest vessels to pass each other at any place on the route; but in roughly estimating the cost it was found that this would involve so large an expenditure as to make it doubtful whether such a work would, in the meantime, prove remunerative. Frequent passing places, however, will be made at suitable intervals.

"There are no very serious difficulties to be overcome; though the cutting is no doubt a heavy one. There are few railways or road crossings of any importance, and the excavations are largely in soft material and the disposal of the excavations could be easily effected, owing to the proximity to the canal banks of waste ground.

"A ship canal of these dimensions would not only accommodate merchant vessels, but would prove of the greatest advantage to His Majesty's navy, as the largest ships of war at present in existence could pass through from the one coast to the other in about eight hours, and thus the facility for defending the coast in time of war would be very much increased.

"It is believed that the route suggested through the Forth Valley would prove the most satisfactory for a ship canal. Both approaches are in smooth water and free from every danger to navigation. The western outlet into Loch Long is exceedingly favorable, as ships of the largest class could at once proceed to sea quite free from the interruption and liability to grounding which they would meet with had the canal debouched into the River Clyde. The entrances to the Forth and Clyde are now so well marked by lighthouses and fog signals that vessels of any burden can run for these waters with the most perfect confidence.

"When considering the best route for the canal after vessels enter Loch Lomond, two other routes were feasible besides that already described:

"1. Across Lock Lomond to the opposite shore near Arden and then by a cut about 4 miles in length, partly open and partly in tunnel, to the Clyde to the northward of Ardmore Head.

"2. Along Loch Lomond to its southern end and through the vale of Leven to the Clyde at Dumbarton.

"The relative merits of the different routes from Loch Lomond to the sea, so far as distance is concerned, are as follows:

	Miles.
Tarbet route (Endrick to mouth of Loch Long)	28
Arden route	14
Dumbarton route	20½

"The Arden route is therefore the shortest, but it would be the most expensive, owing to a length of tunnel of 1¾ miles, which could not be overcome by open cutting, as it passes under land about 300 feet in height. The Dumbarton route is shorter than the Tarbet route by about 7½ miles, but as the Dumbarton route involves 5 miles additional canal, where vessels could only go about 5 miles an hour, and 6 miles of the Clyde, where the speed will probably be restricted to about 8 miles an hour, the time occupied by the journey either way will be about the same. In steaming up Loch Lomond and also down Loch Long vessels may go at full speed, and there would be no interruption from river traffic.

"The cost of the undertaking cannot be more than approximately estimated without particular investigation as to the nature of the strata in the line of the canal; but my firm estimate the cost of the Tarbet route, with their present knowledge derived from the ordnance and geological surveys, and including interest during construction, at £10,000,000 ($48,665,000). The cost of the management and maintenance my firm estimate at £60,000 ($291,990).

"The saving in distance that would be effected may be stated thus:

"1. From the Clyde to ports on the east coast of Scotland, northeast of England, and northwest of Europe the distance saved would be from 529 miles to 238 miles, in the majority of cases the distance being much more than halved.

"2. From the Forth to ports on the west coast of Scotland, northwest of England, Ireland, America, and the Mediterranean the distance saved would be from 487 to 141 miles; in all cases, except the American and Mediterranean route, the distance being more than halved.

"3. Tyne ports to the St. Lawrence River, the distance saved would be 150 miles.

"4. West of Britain and northeast of Ireland to middle western ports of the Continent, the distance saved would be from 377 to 98 miles."

The canal will affect an enormous tonnage, estimated by the sanguine engineers at 9,500,000 tons per annum. At an average rate per ship and cargo of 1s. 6d. (36 cents) per ton, this would yield a revenue of about £700,000 ($3,406,550).—Rufus Fleming, U. S. Consul at Edinburgh.