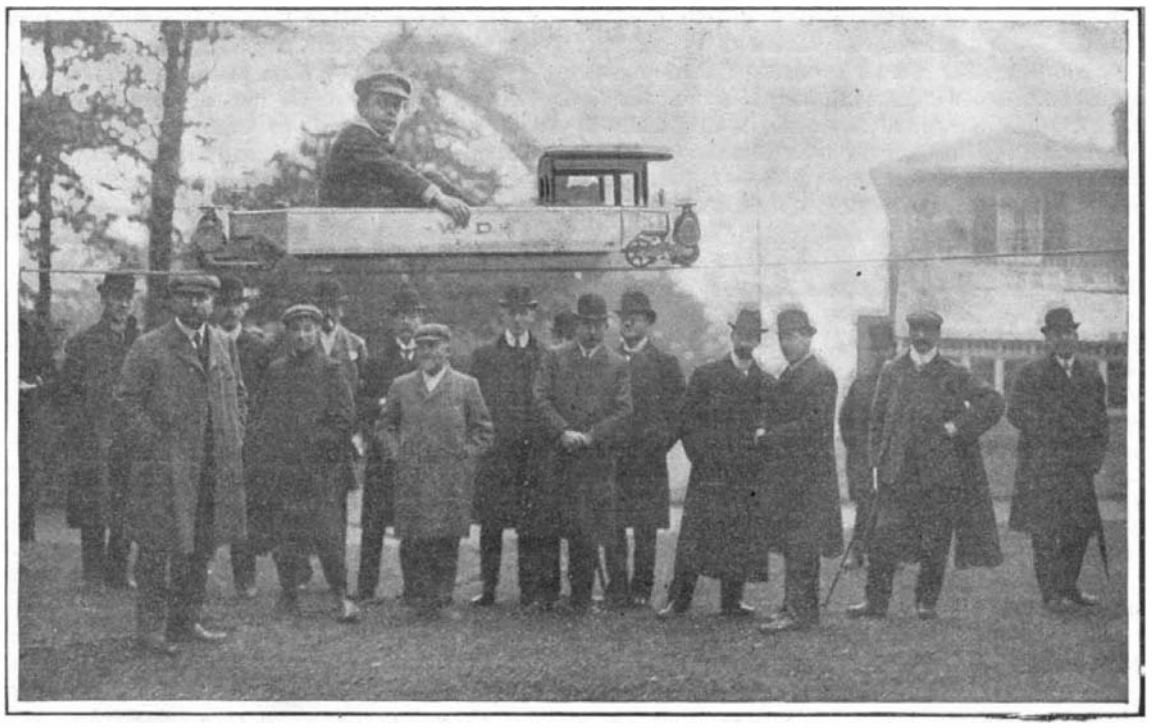
THE BRENNAN GYROSCOPE MONORAIL.

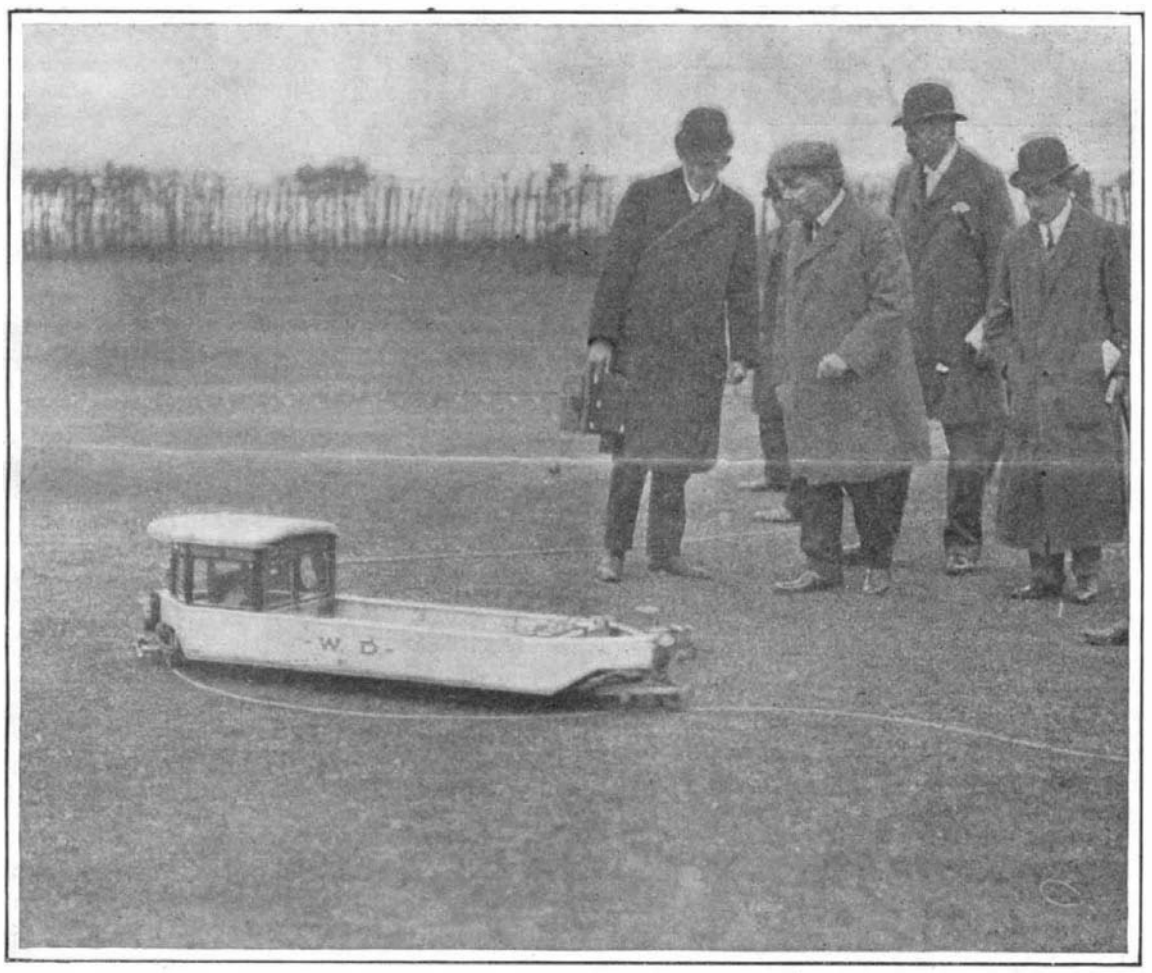
Were it not for the fact that its inventor bears a distinguished name, and that the exploitation of the device occupied two hours of the time of the last meeting of the Royal Society in London, the Brennan gyroscopic locomotive would deserve no further notice than is usually given to any interesting scientific toy. At the present writing, indeed, it cannot be regarded as having demonstrated its practical value, at least as applied to heavy trains of the kind that are now running on the railroad systems of the world. The model locomotive exhibited before the Society was only six feet long, and, judging from the illustrations, it must have been of rather light construction. It is not safe to argue that because in this small size the invention is operative, therefore it would be operative if built to the greater dimensions and enormously greater weight of a full-sized railroad train. We should be prepared to find that the weight and power of the gyroscopes would quickly increase to a point where they would be prohibitive. That is to say, the apparatus would be so bulky and heavy, and would make such considerable demands upon the available power, as to render the construction and operation of a train of standard size commercially impracticable.

From a study of the illustrations it will be seen that the locomotive consists of a long, shallow body, carried on a pair of two-wheeled motor trucks, one at each end of the car. It is driven by two electric motors, mounted one above the outer wheel of each truck, the power being transmitted by gears inclosed in gear cases, one on each side of the driving wheels. All four wheels act as drivers, power being transmitted to the inner wheels by means of outside coupling rods, similar to those used on the steam locomotive. The gear case and motors are clearly shown in the photographs. At each end of the car and mounted centrally above the swiveling trucks is a pneumatic brake cylinder, and above each cylinder is mounted a hand-wheel, which engages a threaded extension of the piston rod, and is adapted to be used in case of a failure of the pneumatic brake. In the model shown, there is a small closed compartment at the forward end of the car; and in the after portion of this, mounted on the floor of the car, is the double gyroscope, which serves to maintain the car in equilibrium. The gyroscopes are mounted in an air-tight case in which a partial vacuum is constantly maintained. They rotate in opposite directions in a vertical plane at the high speed of 7,500 revolutions per minute. Provision is made for assisting the gyroscopes in returning quickly to the horizontal plane. They are driven by small electric motors. The object of running the gyroscopes *in vacuo* is, of course, to get rid of the skin friction of the air, and Mr. Brennan, the inventor, claims that he has been so far successful that the model car will remain standing upright on its single rail for a considerable time after the current has been cut off. The motive power of the model is derived from accumulators carried by the vehicle itself, and current is also drawn from these to keep the gyroscope wheels in motion. In the model it is stated that the weight allotted to the steadying apparatus amounts to only about five per cent of the total weight.

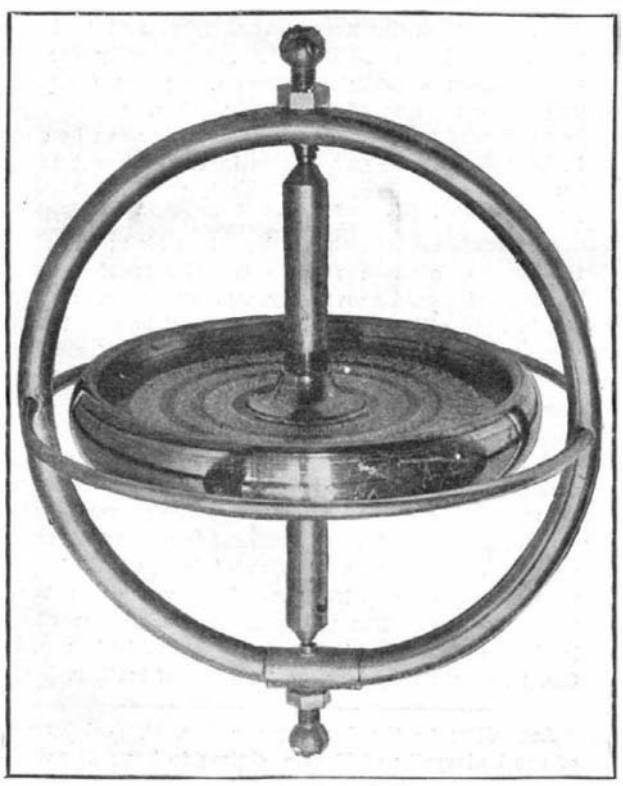
Mr. Brennan is an Australian, who achieved world-wide fame by his invention of the torpedo called by his name. The British government thought so highly of his invention, that it is credited with having paid him $550,000 for the exclusive rights to manufacture it. In the tests which were made, either before the Royal Society, where it was sent around the meeting room at Burlington House, or on the larger experimental track at the private grounds of Mr. Brennan, the model was sent around unusually sharp curves, up and down steep and abruptly changing grades, and caused to run o wire cable across a span of fifty



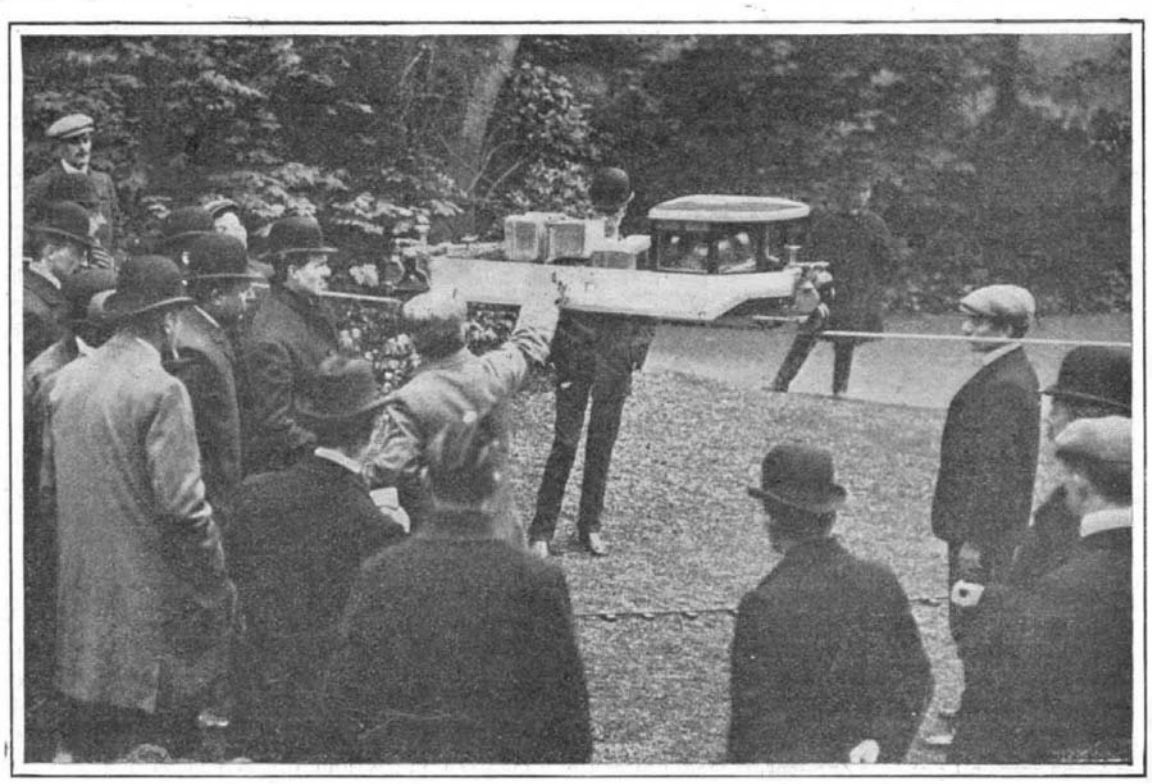
The Car Balanced on a Wire Rope.



The Gyroscope Train Taking a Sharp Curve.



The Simplest Form of Gyroscope.



Mr. Brennan Demonstrating His Invention at Brighton, England.

THE BRENNAN GYROSCOPE MONORAIL.

feet. One curious experiment, made in the society's room, consisted in running the car on to a tight wire rope fixed to a stout timber frame, and then turning the whole frame down through ninety degrees from the vertical to the horizontal position. While this was being done, the vehicle, unaided, continued to maintain a vertical position on the rope, and it held this position until the gyroscope frames were locked, when supports were of course necessary to keep the car upright.

With this novel railroad the peculiar phenomena associated with the gyroscope are strikingly demonstrated. In rounding a curve at high speed, instead of the car having a tendency to fly outward off the track as does the ordinary railroad train, the inner edge dips, so that the vehicle leans inward as does a cyclist when rounding a sharp curve on the racing track. Similarly, when a heavy weight is thrown on one edge of the car, instead of that side dipping, it rises, combating the pressure there imposed; this latter tendency is even more graphically illustrated by pressing the hand upon one side of the car, when one can feel the car forcing itself upward, opposing the efforts to disturb its equilibrium.

The inventor is now engaged in constructing a full-sized vehicle upon this principle. In this instance the car will be driven by a 100-horse-power gasoline engine coupled direct to the motor. The gyroscope will be 33 inches in diameter and make from 2,000 to 3,000 revolutions per minute. The road wheels will be motor-driven, and in this instance change-speed gears will be provided to facilitate hill climbing. In the case of the smaller model, in order to insure easy climbing of the more precipitous ascents, the speed is only seven miles per hour; but this factor can be modified to meet any conditions.

The evolution of this invention is the result of some thirty years' continual experiments, though the present model railway and its equipment has been completed for more than two years. Publicity of the invention has been delayed in deference to the requests of the British and Indian governments, both of which have financed the experiments to a certain extent. It is possible that it will be given a trial on light railroads in India, where railroad construction, owing to the mountainous nature of the country, especially in the northern territories, is beset with numerous engineering difficulties rendering construction highly expensive.

OUR 735,000,000-BUSHEL WHEAT CROP.

The commonest article in daily use is "bread," and its supreme importance is indicated by the fact that in all ages it has been considered as the symbol of food, and truly it is the "staff of life." The cultivation and milling of cereals is of the highest antiquity, and the references to the baking of bread occur on some of the oldest monuments.

Wheat is a splendid cereal crop, and the United States leads the world in its production. The 1906 crops, according to the official figures, are as follows:

	Bushels.
United States	735,261,970
Russia	450,000,000
France	324,725,000
India	319,586,000
Austria-Hungary	268,574,000
Italy	168,000,000
Spain	154,090,000
Germany	144,754,000
Argentina	134,931,000
Canada	131,614,000
Roumania	113,867,000

The crops of other countries bring the total up to the enormous figure of 3,423,704,000 bushels, so that the production of the United States is nearly 20 per cent of the world's output.

A graphical comparison of this crop with the finished product typified by bread and the intermediate stage—flour—is very interesting, and we have made an attempt to show the magnitude of the crop by means of well-known objects such as the Great Pyramid and the Washington Monument.

If the 735,261,970 bushels of wheat were placed in a bushel basket of standard shape, the basket would measure 792 feet in diameter at the bottom and 1,225 feet at the top, and would be 980 feet high. It would have to be strong enough to sustain the weight of 1,579,433 tons. The Eiffel Tower is a good object for comparison. Visitors in the crown of the tower would be able to just look over the sea of wheat. After the miller has taken the basket of wheat and milled the grain, he finds he has some 16,116,664 barrels of flour, which if put in one huge barrel would be 1,214½ feet high, and the largest diameter would be 962½ feet.

The baker now steps in, and out of this flour bakes 4,834,999,200 loaves of bread of standard size; and if this bread were all put into one loaf, it would measure 1,002 feet on the bottom, 1,387 feet at the top; it would also be 616½ feet thick and some 2,158 feet long. If this loaf of bread were set on end, the finished product would far overshadow the basket and the intermediate stage—the flour barrel.

The wheat would fill a trench 141 miles long—the distance from New York to Albany—and 35 feet in cross section. In view of these facts, is it any wonder that our transportation facilities are strained to the breaking point in carrying this enormously valuable crop?

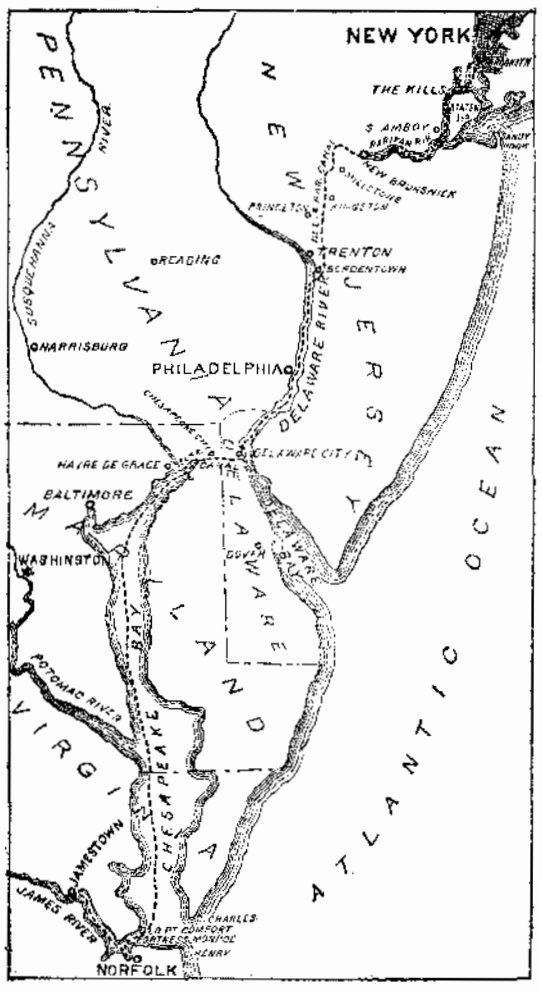
The wheat crop of the entire world is far below the average this year, and it is a much-mooted question whether we shall have any wheat to spare to make up the deficit abroad; and for this reason the price of wheat on our produce exchanges has gone upward of one dollar a bushel. It seems probable that the United States will be the arbiter of prices in the world's wheat market for some months to come.

TO THE JAMESTOWN EXPOSITION BY MOTOR BOAT.

BY GEORGE ETHELBERT WALSH.

No class of visitors to the Jamestown Exposition will find greater attractions this summer than those fortunate enough to own motor boats. Besides enjoying the pleasure of cruising through one of the most picturesque bays on our Atlantic coast, the owners of motor boats will find themselves in a measure independent of the usual crowded hotel accommodations and inconvenient lodging facilities. With Norfolk, Virginia Beach, and Old Point Comfort within easy reach by water from Jamestown, the motor boat enthusiast can visit the exhibition in the daytime and spend the nights miles away from the tumult and crowd, comfortably housed in his own little boat.

The problem to many is, How to get to Jamestown in a small motor boat? Of the thousands of owners of motor boats scattered along the Atlantic coast,



COURSE OF MOTOR BOAT TO JAMESTOWN.

probably only a few realize the comparatively safe and easy route which the canals and rivers offer across the States of New Jersey, Delaware, and Maryland. The outside route is too dangerous for the average small motor boat, and many who would otherwise enjoy the trip are afraid to make such a venturous journey in a boat twenty to thirty feet in length. But the inside route is shorter, safer, and in many ways the more picturesque. Instead of running miles out at sea, dodging dangerous capes and treacherous shoals, the motor boat on the inside route from New York or any point on the Sound or Long Island makes its way quietly and safely through a system of canals, rivers, and bays. Any boat from sixteen feet in length up to the thirty-footers, drawing no more than four or five feet of water, can take the inside route with the most happy results.

With New York as the starting point, the motor boat makes its way down the Upper Bay and enters the Kill von Kull back of Staten Island and then through the Arthur Kill to the entrance of the Raritan River at South Amboy. This run is scarcely more than eighteen miles, and through smooth and safe water. The Raritan River runs in a most irregular line from this port to New Brunswick, a total distance of less than eleven miles. A motor boat drawing only four or five feet of water can make the passage without mishap. If the trip is taken just before high tide, the lines of the banks will be clearly defined by the marsh grass, and the channel can be followed easily.

At New Brunswick the Delaware and Raritan Canal, which has a depth of seven feet, enters the Raritan River, and vessels with masts fifty feet high can pass through the canal. The distance through the canal from New Brunswick to the Delaware River below Bordentown is 44 miles, and at the regulation speed of four and a half miles per hour the trip will take the better part of a day. The toll through the canal is collected at the entrance, and clearance papers are given. The canal connects with the Delaware River below Bordentown, and one passes through or near such historical places as Bound Brook, Millstone, Kingston, Trenton, and Bordentown. Once on the Delaware River, the next objective point is Delaware City, sixty miles down the river. The navigation of the Delaware River is a rare treat. The river broadens and stretches out in pleasant vistas. At no point is the channel less than six feet in depth. This is found near the beginning at Kinkora Bar, and when that is safely passed there is an average depth of over seven feet. At low tide many of the bars and flats are exposed to full view, and the direction of the channel can easily be noted by the eye. At Delaware City commences the Chesapeake and Delaware Canal, which is fourteen miles long and has an average depth of nine feet. There are three locks in it, and all bridges have draws over the canal. The ordinary small motor boat can pass under these bridges without trouble. As in the former canal the speed allowed is four and a half miles, and any violation of this rule may result in a fine of $20. In approaching locks or drawbridges which are to be opened in either of these canals, the notice either by horn, bell, or whistle must be sounded at least three hundred yards away to secure prompt attention.

The Chesapeake Canal carries one to Back Creek, near Chesapeake City, a short, crooked, and somewhat treacherous body of water, less than four miles in length. The shoals can be avoided, however, by keeping well away from either shore. Unfortunately, the channel is not marked by buoys or other danger signs. At some points Back Creek is only six and seven feet deep, but at others it is nine and ten feet deep and from 120 to 150 feet wide. The creek connects with Elk River, which runs to Turkey Point on the Chesapeake, a distance of eight miles. Elk River is wide and deep enough to follow without trouble. Turkey Point is directly on Chesapeake Bay, and the wide expanse of water stretches 195 miles down to Norfolk. It broadens out as the journey extends. The views are all that one can desire, and boats of all descriptions increase in numbers. There are abundant good harbors and many famous towns and cities to see. One can spend weeks in exploring either coast and always find something new to enjoy. The western shore is generally followed by small boats to Norfolk, which takes one past the harbor of Baltimore, Annapolis, and other important places. Norfolk is reached by following the western shore, and Jamestown is just in the offing. The total distance from New York city to Norfolk by this route is approximately 352 miles, and it can be made in from four to five days, traveling at a speed of seven miles an hour; but as allowances must be made for passing through canals and locks, a week should be taken for the trip.

The requirements for such a trip are simple. A motor boat sixteen feet long and four feet beam can do it just as easily as one twenty-five feet in length and six feet beam. There is no necessity for provisioning for a long journey at any point, for towns and cities are passed constantly, where supplies can be purchased. If one chooses, the nights can be spent in hotels and boarding houses in the different towns. With a few cushions and blankets provided, sleeping on the boat will not be an unpleasant experience. Waterproof blankets should be taken along to protect the occupants from rain. On Chesapeake Bay a spray hood would prove very serviceable, and an awning to keep off the glare of the sun. The usual equipment of life preservers should be carried for emergencies. The fuel supply can be replenished at almost any point along the route.

It is said that a high polish may be obtained after nickel plating on small steel articles, such as screws, by tumbling them with leather and dry rouge. The articles are placed in a tumbling-barrel with leather scraps. Some dry rouge is put into the barrel along with the screws and leather and the whole is tumbled for some time. The rouge coats the surface of the leather, and causes it to act like a polishing wheel. Canvas scraps may be used in place of leather.

According to the Ironmonger, Mr. E. L. Rinmann, of the University of Upsala, claims to have discovered a new process for the electrical extraction of aluminium from blue clay, by which the cost of production is reduced to about one-quarter of the present rate.