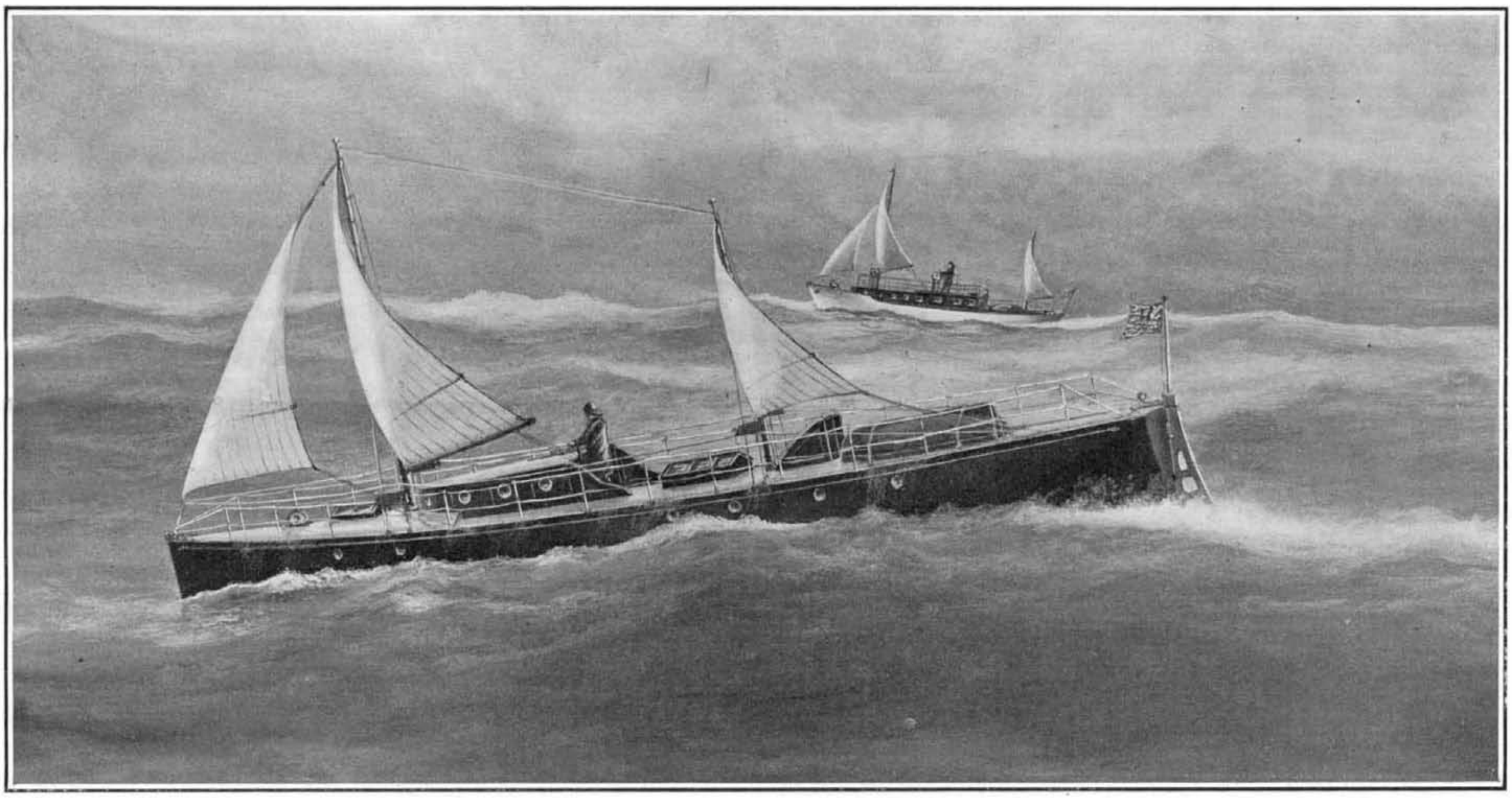
THE TWO COMPETITORS IN THE MOTOR BOAT RACE TO BERMUDA.

The first long-distance race for sea-going motor boats over the 700-mile stretch from New York city to the island of Bermuda starts upon June 8. A handsome $1,000 trophy was offered last fall by a member of the New York Yacht Club, but unfortunately there was not the response expected from owners of motor craft, and but two competitors will start in the race. These boats are shown in our illustration, which depicts in the foreground Mr. Eben Stevens's new 59-foot cruiser the "Ailsa Craig," and in the background, Mr. Peter Shields's 60-footer "Idaho." The former of these two boats was designed by A. Cary Smith, the well-known naval architect, and built by Purdy & Collison at City Island, while the "Idaho" was designed and built by Stearns & McKay, of Marblehead, Mass.

The "Ailsa Craig" should be by far the faster boat, as she is fitted with a 70-horse-power Craig, 4-cylinder, 4-cycle engine of 9-inch bore by 10-inch stroke, while the "Idaho" has a similar "Standard" engine of but 25 horse-power. The former boat's dimensions are as follows: Length over all, 59 feet 2 inches; length on water line, 59 feet; beam, 10 feet; draft, 4 feet 6 inches. The hull is constructed with four water-tight bulkheads, and there is a total sail surface of 320 square feet carried.

The principal dimensions of the "Idaho" are as follows: Length over all, 60 feet; length on water line, 53 feet; beam, 12 feet 3 inches; draft, 3½ feet. A total sail surface of 300 square feet is carried. This boat is a particularly comfortable cruiser, with a large cabin, engine room, and galley, and two good-sized staterooms. Her interior is finished in mahogany. She has a complete electric lighting outfit, and a powerful searchlight.

The race will start at 3 P. M. from the Motor Boat Club of America's station on the Hudson River at the foot of West 108th Street, and it is expected that the boats will finish some three days later at a stake boat off St. David's Head at Bermuda. The distance is 650 nautical miles. Although there are but two competitors, these should serve to demonstrate the usefulness of the motor boat as a sea-going pleasure craft, since these two pioneers have been designed and built for this special purpose.



THE TWO CRUISING MOTOR BOATS ENTERED IN THE RACE TO BERMUDA.

Automobile Notes.

Many automobile events were held on Decoration Day and the days preceding and following, both here and abroad. These consisted of endurance tests, hill-climbing tests, and track races, and the results of some of these events are given in the following notes.

Two hill-climbing contests were held on Decoration Day, one at Wilkesbarre, Pa., and the other near Bridgeport, Conn. The contest at the former place was the second annual one up the side of the Wilkes-barre Mountain. The course was 6,000 feet in length, with a total vertical rise of some 700 feet, the average grade being about 15 per cent. The fastest time up this incline was made by a Simplex-Peugeot motor bicycle, which covered the 6,000 feet in 1 minute 40 seconds, at an average speed of 40.9 miles an hour. The next best time was made by Mr. Walter C. White in his own steam machine, who covered the distance in 1 minute 49 4-5 seconds, thereby beating the best time made a year ago by 21 2-5 seconds. This time corresponds to an average speed of 37 1-4 miles an hour. The third best performance was that of a Stanley steam runabout, which made the climb in 1:56 4-5, at an average speed of 35.32 miles an hour. The best time made by a gasoline car was 1:59 2-5, which was the performance of a 60-horse-power Matheson. This corresponds with an average speed of 34.26 miles an hour. Two 30-horse-power Stearns machines obtained first and second places in the race for stock touring cars of all prices and horse-powers. The times of these two cars were 2:16 4-5 and 2:19 2-5 respectively. A 50-horse-power 6-cylinder Chadwick stock touring car made the climb in 2:02 3-5, while in the free-for-all a 60-horse-power Thomas was second in 2:01 1-5, and a 25-horse-power Pope-Hartford fourth in 2:06 4-5.

At the hill climb on Sport Hill, near Bridgeport, still faster time was made. This hill is a mile long. It has several rather sharp turns and an average gradient of about 15 per cent. A Stanley steam runabout made the climb in 1:24 2-5, and was tied by a 40-horse-power Locomobile of the 1908 type. This corresponds to an average speed of 42.65 miles an hour. The Stanley steam machines in both tests were driven by amateurs, while the gasoline cars were driven by experts. The Locomobile just mentioned was piloted by Joseph Tracy. Some of the best times made by other cars at the Bridgeport hill climb were 1:30 2-5 (39.82 m. p. h.) made by the new 70-horse-power Thomas runabout, and 1:32 3-5 made by the 50-horse-power 6-cylinder Stevens-Duryea. A Stearns and a Pope-Hartford car both came to grief at some of the turns. The cars were badly damaged, but the drivers and the spectators were not injured.

The Long Island Automobile Club conducted a 294-mile endurance test on Long Island on May 30 and 31. Twenty cars started and nineteen finished, ten with perfect scores. These were a Cadillac and Maxwell runabout and Columbia, Oldsmobile, Pope-Hartford, Matheson, Packard, Pope-Toledo, Pierce-Arrow, and Winton touring cars. Although the test was not a particularly strenuous one, since the roads of Long Island are noted for their smoothness, yet it is interesting to note that the cars which were penalized lost points for such insignificant troubles as carbureter adjustments, broken fan, and examining an engine. The only accident was that of a Haynes touring car, which skidded in making a sharp turn and broke a rear wheel.

The first endurance contest of the year to be held on the Pacific coast took place May 19. The start was made from San Francisco, and the test was made over a 98-mile course in San Mateo County. Thirty-four cars started, and fifteen of these, including two Reos, two Ramblers, three Buicks, a Maxwell, a Haynes, a Pierce-Arrow, a Glide, a Premier, a Studebaker, and an Elmore, secured perfect scores. The contestants were allowed to replenish their gasoline and water only once.

The third annual Tourist Trophy race was run on the Isle of Man on May 30. The roads were very bad on account of rain, and the contestants were therefore allowed an extra gallon of gasoline. There were twenty-two light touring cars in this race, and only two of them finished the 241.7-mile course on their fuel allowance. These were a 20-horse-power Rover, which won in 8 hours, 23 minutes, 27 seconds, at an average speed of 28.81 miles an hour, and the 16-20-horse-power Humber, whose time was 8 hours, 35 minutes, 17 1-5 seconds. Last year the race was won by a Rolls-Royce car at an average speed of nearly 40 miles an hour. But two of the heavy touring cars finished in the 201.42-mile race, which was held at the same time. These were a 30-horse-power Humber, which won in 7 hours, 11 minutes, 1 second, at an average speed of 28.03 m. p. h., and a 25-horse-power Gladiator, the time of which was 7 hours, 31 minutes, 35 1-5 seconds.

Demonstration of Vanadium Steel for Automobile Construction.

That the introduction of vanadium in the making of special alloy steels for automobile construction has created a mild sensation in metallurgical circles was evidenced by the presence of an even dozen of the most famous steel experts in this country at the plant of the United Steel Company at Canton, Ohio, recently, when the second heat of vanadium chrome steel was poured. This second heat was a world's record, inasmuch as it exceeded by 5 tons former heat of 40 tons, both of which were for the Ford Motor Company.

The experts watched the entire course of making the steel from the ore through all the various stages; then through the process of rolling, and finally forging into automobile axles. They were particularly pleased at the splendid manner in which the steel acted. Some of them had feared that difficulties would develop when it came to forging, similar to those which arise in forging nickel steel. This fear proved to be entirely without foundation. Not only could the steel be forged in one heat, whereas nickel requires fifteen to twenty, but the dies stood up as well under the work as in forging ordinary low-carbon steel. The finished product showed remarkably fine and uniform texture. A final analysis of the steel proved that the result was a success from that standpoint also, and that this 45-ton heat made in open-hearth furnaces is equal to the best that has ever been produced in the small experimental furnaces or crucibles.

In Ohio during 1906 there was one life lost for every 214,279 tons of coal mined, whereas in 1905 it was 226,628 tons, showing, states the Engineering and Mining Journal, the increased danger to which the miner of the present day is subjected, and the necessity for new mining legislation in order properly to protect those who work underground. There was one life lost for every 366 persons employed.

A Microscope for Demonstration.

BY DR. H. LEBRUN.

The great progress that has been made in microscopy within the last thirty years is known to the layman only by hearsay. Few persons except scientists and physicians have seen more than a glimpse of the new world revealed by the microscope, and popular ideas on the subject are vague and often erroneous.

A school may have a few microscopes, but it cannot afford to possess many of these costly instruments. As many slides as there are microscopes can be shown to a class. Then the slides must be replaced by others. I have devised means of obviating this tedious and unsatisfactory procedure and enabling each student to examine fifty microscopic preparations in succession without loss of time. One form of apparatus, employed for low powers, consists of a binocular microscope mounted on an American stereoscope box in which the slides are carried on an endless band and moved by turning a crank. The oblique top of the box bears two superimposed plates which can slide in directions at right angles to each other. The microscope, attached to the upper plate, can thus be brought over any point of the object. At the bottom of the box is a drawer in which the microscope and its accessories are kept when not in use. This apparatus permits a series of microscope objects to be viewed quickly and conveniently by many persons in schools, lecture rooms, museums, and exhibitions.

For powers higher than 70 I employ an ordinary monocular microscope with a specially contrived stage, and a number of objects mounted in a circle or a spiral on a single large plate of glass. I have devised a microtome which automatically deposits successive sections in the manner specified. The stage may be constructed either to bring the microscope over any particular preparation or any point of it by means of two mutually perpendicular sliding movements, as in the first type of apparatus, or to bring any desired point under the fixed microscope by the combination of a rectilinear and a rotary movement of the glass plate. In either case the movements are controlled and registered by graduated scales so that any point can easily be found again.

Convenience and economy of time and money are not the only advantages offered by these new arrangements. A very instructive series of related objects, such as the successive stages of development of a disease germ or successive sections of an embryo, can be arranged on a single plate, which will thus illustrate a whole organism or the entire history of a disease.

All these devices can be applied with equal advantage to projection microscopes.—Translated for the Scientific American from Umschau.

Factors of Safety—or of Ignorance.

BY DR. JOHN BESSNER HUBER.

The student of biology discovers an expenditure of cosmic forces far beyond the requirements of sentient creatures. Nature is never a niggard; but is on the contrary amazingly extravagant in her provisions. The roe of a single fish, for instance, contains oftentimes millions of potential fish lives of that particular species. Medical history furnishes countless instances of such physical endurance as argues enormous reserve potentialities. The flagellants were, under stress of intense emotions, able to submit to most dreadful scourgings, such as one would in our day consider impossible to be survived. In those mental epidemics in the middle ages when the victim danced, there were swaying circles which, during many hours together, manifested strength hardly conceivable to us moderns.

In times quite modern the "Convulsionnaires" were wont to bend their bodies in bridge fashion, and to permit very heavy weights to be dropped upon their tense abdomens. Lying thus they could bear planks having several men sitting upon them.

Who is not thrilled in reading how Napoleon led his army across the Alps, to the point where his troops believed themselves absolutely spent; not another step could they carry their panting bodies. But here that magnificent, though untutored, psychologist had his band play "La Marseillaise." Its strains amid those snow-capped heights were a mighty stimulus to courage and patriotism, whereby such reserve strength was awakened as the rank and file had not dreamed themselves possessed of; so that with triumphant shouts they finished the titanic task their general had laid upon them.

The saying, "the half of his strength he put not forth," argues a latent potentiality which is the secret of the influence that many notable men are able to exert. It is in every one's experience that under stress of fright or under the inspiration of great affection or other tremendous emotion, things have been accomplished of which one would never have imagined himself capable. And physicians especially know that most men and women complete the span allotted to them by Nature, despite the many diseases, despite accidents and other untoward circumstances to which they are during their lives subjected.

There are, then, in our bodies forces in reserve, often unsuspected, which avail in times of undue stress and strain, and by means of which a fairly normal condition is preserved despite many inimical agencies. This must have been realized from time immemorial by observing physicians; but probably no very scientific recognition has ever been taken of the matter until Dr. S. J. Meltzer recently addressed the Harvey Society of New York city on "The Factors of Safety in Animal Structure and Animal Economy."*

Meltzer borrows the term "factor of safety" from the mechanical engineer, who thus designates the margin of safety required in constructing engines, bridges, houses, and the like. If, for instance, the tensile strength of boiler steel plates and stay bolts is 60,000 pounds to the square inch, the actual stress which is allowed for the work of the boiler should not be more than 10,000 pounds per square inch for the plate and not more than 6,000 pounds per square inch for the stay bolts—which means that the stress to which the plates may be exposed in the boiler should be only one-sixth or one-tenth of the actual strength of the steel. The factors of safety are here said to be six for the plate and ten for the bolts. In mechanics, then, it is calculated that the structures should be capable of withstanding not only the stresses of reasonably expected maximum loads, but also those of six or seven times such loads. The factor of safety is founded upon finite human ignorance of what might happen, and upon a wise and very praiseworthy desire to provide against such contingencies. Wherefore these factors are oftentimes termed factors of ignorance. And, with regard to the human machine, the latter term would seem rather the preferable one. For this machine is, by comparison with those constructed out of inorganic materials and worked by men, of complexity quite infinite. It is, of course, much more difficult to foretell the possible strain, the stress of environment, accidents, the attacks of parasitic organisms, and the myriad other agencies hurtful to the human machine, many of which we are powerless to prevent, concerning many of which we are in ignorance—ignorance, we are however proud to say, which is yearly becoming more and more dissipated.

Improving the Liverpool Channel.

To keep the Crosby channel in a navigable condition, Liverpool is now annually expending $150,000 in dredging and $50,000 additional is required for dredging at the landing stage to enable the great ocean-going steamers to proceed alongside the stage to disembark their passengers. The original provision called for a minimum channel depth at low water of 36 feet. Most of the large Atlantic liners draw approximately 30 feet. Sand accumulations have reduced the channel depth at low water to 28 feet, and several large steamers have recently grounded. The dock board, recognizing the danger to navigation and anxious to remove the obstruction, has decided to expend a large amount of money for the construction of a training wall on the south face of Taylor Bank.

The training wall will be nearly two miles long, and will consist of huge blocks of concrete, requiring several years to complete and many thousands of tons of stone and cement. The object of the wall is not only to prevent the narrowing of the channel, but to produce a sufficiently powerful scour to do away with the accumulations of sand patches. The engineers who are to execute the work believe that the flood tide in striking the western portion of the wall and curving with the wall sharply to the southward and eastward will eat away the northern portion of Askew Spit, and that the ebb tide in striking the southeastern portion and following the trend of the wall will assist materially. It is also believed that the western portion of Taylor Bank will be cut away. If the training wall fulfills the anticipation of its designers, a very much straighter and a considerably deeper channel will be provided, and the facilities for navigation will be greatly improved.

Interesting Tests with an Automobile Spark Coil.

Some interesting experiments were made recently in England in connection with a test of a synchronized ignition system employing a single spark coil with vibrator for use with a 6-cylinder motor. A 6-volt battery was used in order to compensate for the extra resistance introduced in the circuit in the form of a hot-wire ammeter. The first peculiarity noticed was that the current consumption increased from 1.42 amperes at a commutator speed of 200 R. P. M. to 1.62 amperes at a speed of 1,000 R. P. M. (or 6,000 contacts per minute). At still higher speeds it diminished, as one would naturally expect it to do, the consumption at 1,400 R. P. M. being but 0.98 ampere.

Another interesting fact discovered was that at 900 R. P. M. of the commutator (corresponding to 1,800 of the engine) the vibrator ceased to operate, and but a single spark was obtained at each plug when the circuit was broken at the commutator. At this speed the commutator was making 90 contacts per second. As at a commutator speed of 500 R. P. M. and a current consumption of 1.5 amperes the vibrator is stated to have made from 150 to 160 vibrations per second, or 3 vibrations for each contact, it can be readily seen that a point would soon be reached where the vibrator would make only two and then one vibration per contact, and finally none at all. Thus it can be seen that by making the contacts short enough and using a single coil with vibrator, the vibrator will automatically cease working at high speeds, and the simplicity of a coil without vibrator will be obtained. It might be necessary to fit a second condenser to take care of arcing at the contacts, however.

A test was made to ascertain the maximum commutator speeds with which a regular succession of sparks could be obtained at the plugs when the latter were submitted to different compression pressures. These were found to be 1,600, 800, and 160 R. P. M., with compressions of 70, 110, and 150 pounds to the square inch respectively.

In order to show that the spark coil would stand a high temperature, it was placed in an oven and gradually raised to a temperature of 180 deg. F. After two hours' submission to this heat test, the coil would still work, although it gave a somewhat attenuated spark. At ordinary temperatures, the insulation resistance between the primary and secondary windings was found to be 0.2 megohm with a testing pressure of 200 volts.

The Agassiz Centenary.

A few weeks ago the birthday of Audubon was celebrated—perhaps the keenest and most loving observer of birds and quadrupeds our land has known. On May 23 the world commemorated the second centenary of Linnæus, the founder of modern botanical science and of nature study in the vegetable kingdom. On May 27, Harvard University celebrated the centenary of the birth of Louis Agassiz, who must be ranked among the foremost nature students and nature teachers of all lands and times. The exercises were held in Sanders Theater, with Col. Thomas Wentworth Higginson as the presiding officer. Col. Higginson gave a short address, filled with personal memoirs of the naturalist and teacher, and was followed by President Eliot.

Other speakers were Prof. A. Lawrence Lowell, of Harvard; Dr. J. C. Gray, of the Harvard Law School, and Prof. W. H. Niles, of the Massachusetts Institute of Technology. A number of letters, written by Agassiz to former pupils, were read by Prof. J. L. Winters, of Harvard, and there were also readings of poems on Agassiz written by Longfellow and Whittier.

On May 30 a tablet in Agassiz's honor was unveiled in the Hall of Fame for Great Americans—one of only three thus far given to Americans of foreign birth. He is worthy of that honor, and of remembrance and emulation by every one who prizes a knowledge of the truths of natural history and of the principles upon which the material world is ordered.

Nature lovers and nature students, who nowadays seem to comprise about ninety-nine one-hundredths of the community, might well regard the present month, especially in the present year, with peculiar interest.

Artificial Copper.

Dr. Ira Remsen, president of Johns Hopkins University, according to newspaper reports, is authority for the statement that Sir William Ramsay has discovered a method of making artificial copper, and that the great discovery will be made known to science when Sir William will read a paper on the subject before the Royal Chemical Society of Great Britain.

Prof. Remsen has a private letter from the famous Englishman, stating that Sir William has succeeded in accomplishing what no other chemist has ever been able to do—the segregation of one element from another and the production of copper by the synthetic or combining process from the elements sodium, lithium, and potassium. A combination of these elements when treated with radium vapor gives as a product copper sulphate, which is readily "broken down" into copper. Such is the substance of his experiments. The discovery, if true, is of so startling a nature that we must withhold judgment until the publication of Sir William Ramsay's paper. This brief preliminary note is published merely for what it is worth, and not as a verification.

Oil, states Power, is not a fuel that is, so to speak, indigenous to this country. Yet if all our bituminous coal were properly utilized by the extraction of the by-products, it is possible that there would be a large available supply of tar, which is an excellent liquid fuel. Oil fuel needs no manual labor, and men tired out with firing coal many hours on stretch can be replaced by mechanically-supplied liquid fuel. It is not surprising, therefore, that the admiralty are having built at Chatham three 500-ton oil fuel lighters for service at Sheerness, pending the erection of four 5,000-ton steel oil tanks for the Medway.

* The Harvey Society Lectures. (The Lippincotts.)