SCIENTIFIC AMERICAN

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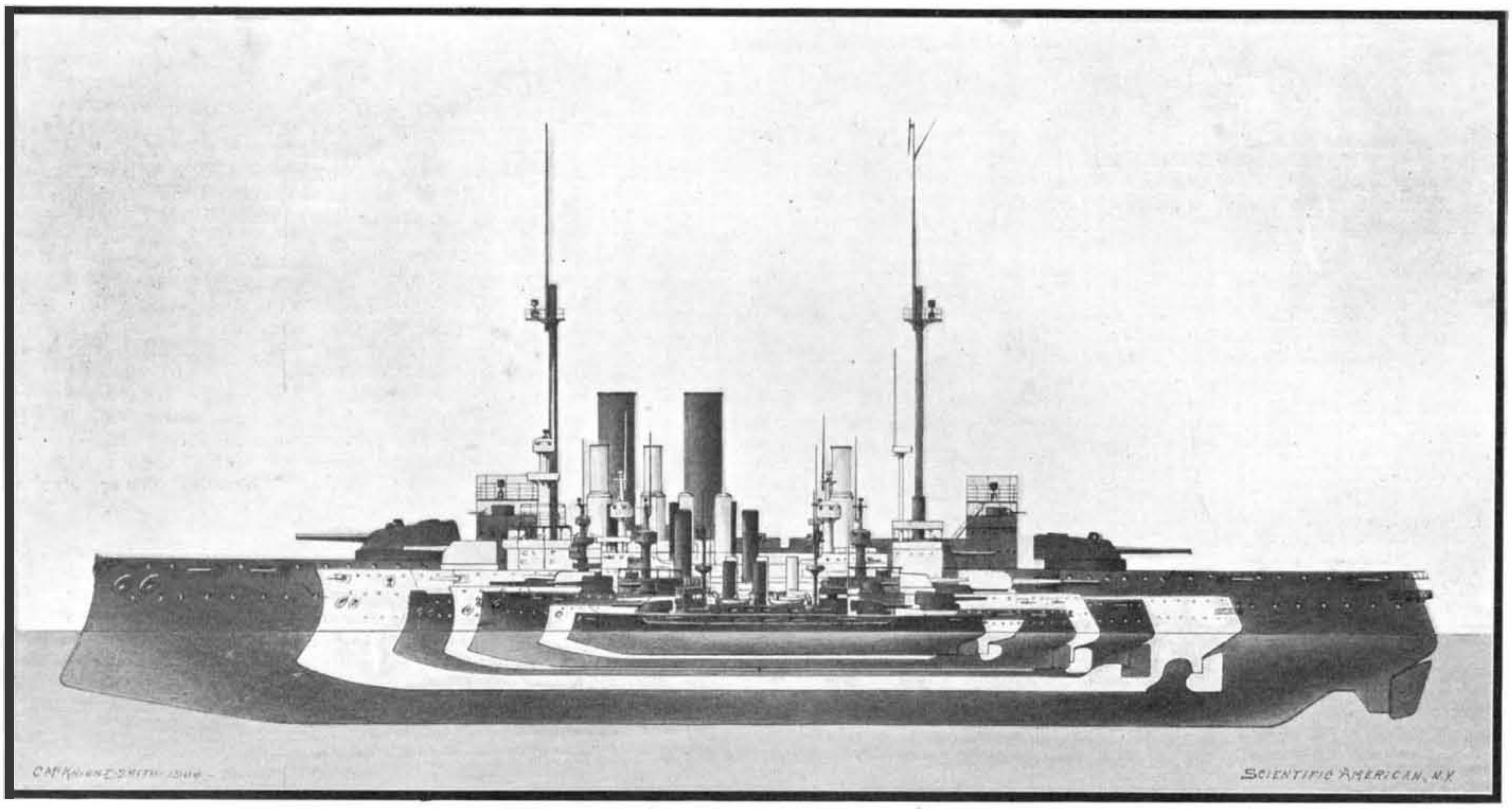
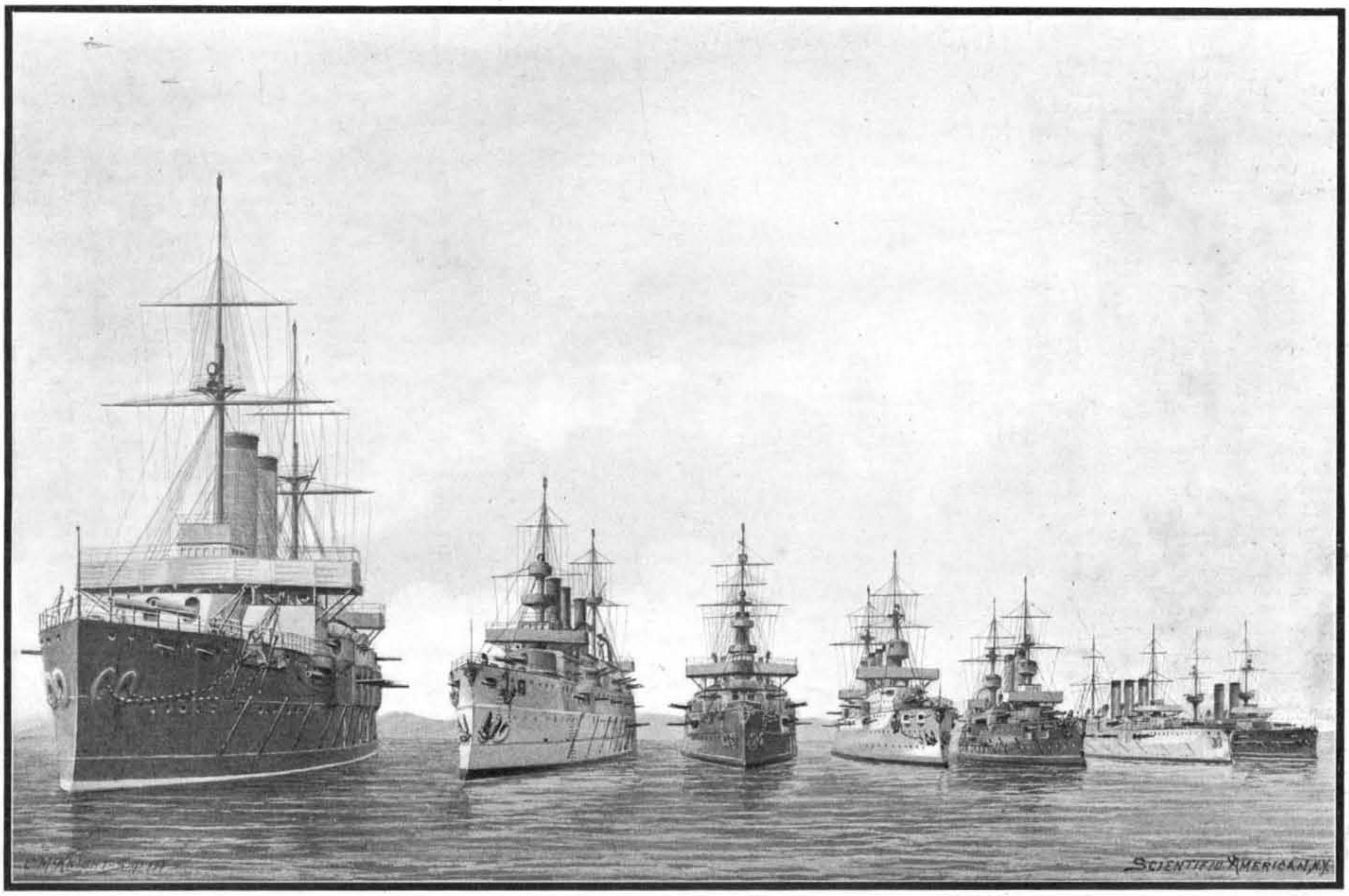
Vol. XCI.—No. 5. ESTABLISHED 1845. | NEW YORK, JULY 30, 1904. | [8 CENTS A COPY $3.00 A YEAR.



The Relative Strength of the Navies of the World in Warships Built and Under Construction, if the Port Arthur Fleet Were Destroyed.



England,	France,	United States,	Germany,	Russia,	Italy,	Japan,
1,867,250 tons.	755,757 tons.	616,275 tons.	505,619 tons.	488,732 tons.	329,257 tons.	253,681 tons.

Relative Size of Navies Shown, if All Ships Now Under Construction Were Completed, and the Port Arthur Fleet Were Destroyed.

WHAT THE LOSS OF THE PORT ARTHUR FLEET MEANS TO RUSSIA—A DROP TO FIFTH PLACE.—[See page 79.]

WHAT THE LOSS OF THE PORT ARTHUR FLEET WOULD MEAN TO RUSSIA.

In making a general statement of the relative strength of the navies of the world, it is necessary to define clearly the basis on which such estimate is made. Otherwise, the comparison is apt to be misleading. A few months ago the Bureau of Intelligence of the United States navy made some valuable comparisons, based upon its own invaluable sources of information, in one of which the navies were compared on the basis of the number and displacement of warships actually completed on January 1, 1904, and the other on the basis of the number and displacement both of the warships actually completed and of those under construction at that date. It should be noted that in these estimates no account is taken of gunboats and other vessels of less than 1,000 tons displacement, nor do they include transports, dispatch vessels, converted merchant vessels or yachts, or obsolete cruisers. Vessels, moreover, that are authorized, but upon which no actual work of construction has been done, are excluded from the comparison.

At the outset, attention should be drawn to the fact that although the United States has a most liberal programme of construction in hand, the great delay in completing our ships causes us to make a relatively poor showing in a comparison of vessels actually completed, the United States coming fifth on the list and below Russia and Germany. Furthermore, were the vessels which are now building for the various navies of the world completed, the United States would move up from fifth to third position, with Germany fourth and Russia fifth. About a month after the publication of these tables by the Bureau of Intelligence, the war between Russia and Japan opened with the loss of several vessels of the Russian navy, and such serious damage to others, that they must of necessity be deducted from the total available ships of the navy. This has been done by reckoning the battleship "Petropavlovsk," the cruisers "Variag" and "Boyarin," the torpedo transport "Yenesei," and the gunboat "Korietz" as hopelessly lost. If the battleships "Czarevitch," "Retvizan," and "Pobieda," and cruiser "Pallada," which, after having been repaired sufficiently to become once more an active fleet, were to be destroyed either by the Russians themselves, to avoid their falling into Japanese hands, or by the Japanese in a sea fight, the subtraction of this tonnage of about 70,000 from the Russian total would cause Russia to drop from third to fourth position, Germany taking her place in the relative standing of the navies as they now are. The same transposition has to be made in the table showing the comparative strength of the navies, were the ships that are now building completed, Germany coming fourth, or next to the United States, and Russia fifth.

It would be mere guesswork to endeavor to modify the second comparison by the losses which may occur to both the Russians and Japanese before the war is ended. If the Baltic fleet should be sent out, and succeed in raising the siege of Port Arthur, there might be a great naval engagement, attended with such a serious loss of Japanese ships, as would throw back the development of this, the youngest among the navies, for a full decade. On the other hand, if, as now begins to look possible, the Baltic fleet be not sent out, it is likely that Port Arthur and Vladivostock will be captured, and the whole Asiatic fleet of Russia destroyed or taken. If this should occur, it would involve the loss of the cream of the Russian navy, since for the past few years, the new Russian ships, as they have been completed, have been dispatched to the Far East. The total loss would include seven battleships, four armored cruisers, seven protected cruisers, and a few gunboats, making a total of about 170,000 tons. In this case the Russian total, if all ships now under construction were completed, would be about 388,875 tons. She would still rank fifth in point of displacement, or about 60,000 tons larger than Italy, but a long way below the next nation, Germany. This, however, is mere speculation; and we have only changed the figures of the tables of the Bureau of Intelligence so far as they are actually affected by the war, to the extent of including in the totals for Japan the two cruisers purchased from Chile, and by subtracting from the Russian totals the vessels known to be lost or seriously disabled.

RELATIVE STRENGTH IN WARSHIPS, JANUARY 1, 1904.

To-day.		If all ships now building were completed.	
	Tons.		Tons.
1. Great Britain...	1,516,040	1. Great Britain...	1,867,250
2. France.......	576,108	2. France........	755,757
3. Germany........	387,874	3. United States...	616,275
4. Russia........	346,458	4. Germany........	505,619
5. United States...	294,405	5. Russia..........	488,732
6. Italy...........	258,838	6. Italy...........	329,259
7. Japan........	243,586	7. Japan..........	253,681

The engravings on the front page of this issue represent the comparative strength of the navies of the world, were all the ships now under construction completed. Each navy is represented by a typical battleship of that navy, the size of the battleships corresponding to the relative strength of the navies. In each case the basis of comparison is a battleship representing by its size the total tonnage of vessels built and building for Great Britain, namely, 1,867,250 tons. In the upper engraving the vessels are imposed one above the other in order of their size, and in the lower engraving they are shown bow on. The next largest total to that of Great Britain is that of France, 755,757 tons; then comes the United States with 616,275 tons; Germany, with 505,619 tons; Russia, 488,732 tons; Italy, 329,257 tons; and Japan, with 253,681 tons.

Of course, it must be understood that these figures are a guide to the future standing of the navies of the world, say in four or five years from the present time, only if we suppose that the relative rate of building and the relative liberality of appropriations for new construction remain the same. Thus, if our own contractors are as slow in completing ships as they have been in the past, where construction has lagged from one to three years behind contract dates, we might find ourselves in the fourth instead of the third position; and, therefore, the value of the flattering estimate of our future naval standing, shown by these tables, will be dependent very largely upon considerable increase in the punctuality with which contracts for naval ships are completed.

An Interesting Utilization of the Cooper Hewitt Light.

A series of remarkable moving pictures has been recently secured at the plant of a prominent Pittsburg machine company by the American Mutoscope and Biograph Company with the aid of the Cooper Hewitt light. These pictures were taken for exhibition in St. Louis in the private auditorium of the company on the Fair grounds. When "moving pictures" of the Jeffries-Sharkey heavyweight contest at Coney Island were taken the scene was an arena interior. The ring was cut down to 20 feet, and 400 arc lamps were strung above it, the heat from which caused the combatants much discomfort. In several of the pictures in question the entire length of a quarter-mile aisle is shown, and at no time were more than sixty-four of the mercury vapor tubes used. The camera was placed on a platform fifteen feet from the ground, suspended from an electric traveling crane. The crane was moved slowly down the long aisle about 50 feet in the rear of the Cooper Hewitt lamps, the latter being also suspended from a traveling crane moving at equal speed. So far as possible in the taking of these pictures, any sunlight through the glass skylights of shops was taken advantage of, but it is not safe to depend very much upon the help of the sun in a moving picture which is four or five minutes in the taking. The sixty-four lamp tubes were hung in sets of eight, in eight frames. They required only 30 to 40 kilowatts, or about one-fifth of the energy consumed by the four hundred arc lamps referred to above. The camera made fifteen exposures a second, or nine hundred to the minute. Among the more interesting pictures are the welding of a ten-foot ring for an electric generator, the railway motor aisle, the forging of a ten-ton steel crank-shaft by a thirty-ton steam hammer, one of the eight main quarter-mile aisles devoted to the construction of big power types and a six-minute view of employes leaving one of the shops in East Pittsburg.

Death of Dr. Isaac Roberts.

Dr. Isaac Roberts, well known as a geologist and astronomer, died at Crowborough, England, July 18.

The original investigations of Dr. Roberts in the domain of astronomy have added largely to man's knowledge of the stars, clusters, nebulæ, and the structure of the universe.

The honorary degree of doctor of sciences was conferred upon him by the University of Dublin in 1892. In 1895 he was awarded the gold medal of the Royal Astronomical Society, on the council of which he had served for several years. He bore the titles of Fellow of the Royal Society, Fellow of the Royal Astronomical Society, and Fellow of the Geological Society.

Since 1890 his investigations had been continued at his observatory at Starfield. Two quarto volumes of his "Photographs of Stars," "Star Clusters," and "Nebulæ," with scientific deductions founded upon them, were published in 1893 and 1900.

Experiments have begun at the United States proving ground, Indian Head, with several kinds of smokeless powder. The preference thus far seems to be for the macaroni-shaped powder, which comes in strips, rather than for the flat powder. An endeavor will be made to find a satisfactory ammunition bag, possibly of smokeless powder cloth and twice as long as the present bag. If smokeless powder can be made with success in 40-inch strips the larger-sized bag will be adopted for use in the navy. The advantage of this will be that only two bags, instead of four, will have to be inserted in the gun, and thus the rapidity of fire can be increased.

Electrical Notes.

The Neu-Catrice lamp was introduced to the notice of the mining fraternity at a recent meeting of the Institution of Mining Engineers. It has small accumulators, two cells in all, and the electrolyte is contained in such a way that the lamp can be held in any position without spilling the fluid. Small charging plugs are provided, and the lamp can only be lighted when a small shutter—connected with the switch—is closed and the charging plug withdrawn. In one size the whole apparatus weighs rather less than 4 pounds, and gives 0.8 candle power for 11 hours; a larger size weighs 5 pounds, and gives 1 candle power for 15 hours. A special charging table is used, on which the lamps—connected in series—are charged daily by the colliery dynamo. The cost of maintenance has been found, at the Bruay collieries, to amount to one halfpenny per lamp per diem. The total working cost of electric mining lamps has been found to be seventy-five cents per lamp per annum more than that of the ordinary oil lamp; but this does not seem to be a high price to pay as an insurance against explosion in mines, more especially in cases where the atmosphere is dangerous.—Electrical Magazine.

A new kind of microphone was recently described by the inventor, M. Tariel, before the French Physical Society. The novel feature of the instrument is the special way of preparing the carbon grains and other similar bodies. After taking carbon plates only 0.15 to 0.2 millimeter in thickness, having a perfectly plane and polished surface, and breaking them by hand into small pieces, the fragments are passed through a sieve, the meshes of which can be traversed only by particles of less than 1 millimeter. This powder is introduced into a microphone, arranged as follows: A movable electrode, constituted by a carbon plate of the same thickness as the particles, is connected with one of the terminals of the telephone line, while the other electrode is formed of a carbon block in the neighborhood of which the particles are placed; this electrode is arranged on a thin carbon plate, to which the other wire of the line is connected. The distance separating the electrode is just 1-10 millimeter, the whole being solidly fixed in a ebonite box. The following merits are claimed for this new device: On account of the great number of contacts between the plane and light particles used, the apparatus is highly sensitive. The vibrating surface is diminished as compared with other types of microphone, and there are no insulating bodies retarding the vibrations between the two electrodes, such as felt, wool, etc. There are further no polarization phenomena, and the apparatus will not give rise to the production of electric arcs. It will finally be possible to construct microphones of smaller weight, smaller dimensions, and at the same time of a sensitiveness at least identical with that of other types of apparatus. When connecting with this microphone a small receiver, the terminal of which is introduced into the hearing circuit, a complete microtelephonic apparatus of the minimal weight of 27 grammes is obtained, which can be held to the ear by means of a spring.

The Current Supplement.

The current SUPPLEMENT, No. 1491, opens with a copiously illustrated article on modern coal-hoisting apparatus. Prof. H. L. Callendar describes some instructive experiments on an air-cooled petrol motor. Scientific experiments on this type of engine have been comparatively few, for which reason Prof. Callendar's work is all the more valuable. Mr. Richard K. Meade exposes the fallacy of the tests ordinarily applied to Portland cement. In an interesting article entitled "'Striking Objects Found at Carthage," the Paris correspondent of the SCIENTIFIC AMERICAN describes some noteworthy archeological discoveries. The N-rays are again made the subject of some discussion. It will be remembered that Dr. H. W. Wiley, of the United States Department of Agriculture, some time ago began a series of elaborate experiments, for the purpose of determining the effect of well-known preservatives upon food, among them borax. The experiments have now been concluded. A digest of Dr. Wiley's report is published in the current SUPPLEMENT, and will doubtless be read with considerable interest. Mr. Emile Guarini begins a series of articles on the electro-metallurgy of steel, which may well be considered a most exhaustive review of the entire subject. Although the present installment is unillustrated, the articles that will follow will be exceptionally well illustrated with diagrams and photographs. The Paris correspondent of the SCIENTIFIC AMERICAN continues his technical description of the racing cars in the Gordon Bennett Cup Race, describing in this installment the Mors car, the Belgian Pipe car, and Mr. Edge's Napier car.