EXPERIMENTAL DETERMINATION OF THE VELOCITY OF LIGHT.

Albert A. Michelson, of the U. S. Navy, read a paper before the American Association of Science, at its late meeting, on "The Experimental Determination of the Velocity of Light." The paper was pronounced one of the most important read before its appropriate section. Mr. M. said that but three scientists, Foucault, Fizeau, and, more recently, Cornu, have sought to experimentally ascertain the distance of the sun from the earth. Foucault used the method known as that of "Wheatstone's Revolving Mirror," the application of which was first suggested by Arago. Fizeau and Cornu both used another method, known as that of the "toothed-wheel." In Foucault's experiments the distance traversed by the light was 20 meters. The result obtained by him was 185,200 miles per second. Cornu's stations were about 14 miles apart. The result obtained by him was 186,600 miles, which exceeds the former by 1,400 miles. The objection to Foucault's method is that the displacement, which enters directly in formula, is very small, and therefore difficult to measure accurately. The objection to Fizeau's is that the total disappearance of the light was necessarily uncertain.

The object of Mr. Michelson's experiments is to increase the displacement in the first method. This can be done in several ways: (1) By increasing the speed of the mirror; (2) by increasing the distance between the two mirrors; (3) by increasing the radius of measurement, *i. e.*, the distance from the revolving to the scale. In Foucault's experiments the speed of the mirror was 400 turns per second; the radius of measurement was about one meter, and the distance between the mirrors was about 10 meters. The displacement obtained was about 0.8 millimeters. In Mr. Michelson's experiments the speed of the mirror was but 130 turns per second, but the radius of measurement was from 15 to 30 feet, and the distance between the mirrors was about 500 feet. The displacement obtained varied from 0.3 of an inch to 0.63 of an inch, or about 20 times that obtained by Foucault. With a greater distance between the mirrors and a better apparatus he expected to obtain a displacement of two or three inches and to measure it to within one-thousandth part of an inch. Tables of observation of the velocity of light in air were given by Mr. Michelson, the mean result being 185,508 miles per second.

Danger from Lubricating Oils.—From a paper read by Prof. John T. Ordway, at a recent meeting of the New England Cotton Manufacturers Association, it appears that many of the oils used for lubricating machinery may be classed as dangerous, because when heated to a sufficient degree they throw off an inflammable vapor. In this respect it is claimed that some of the animal and vegetable oils are even more hazardous than those which are partially mixed with earth oils, and that the higher price of an oil is by no means a guarantee of safety. An account was given of a fire last summer in the Bates Mills, Lewistown, Me., at which the flames, on reaching the weaving room, shot across it in all directions on a level of about five feet from the floor, and with sufficient heat to melt the lead connections to a gas meter located on the same plane of hight from which the gas had been fortunately shut off while a towel hanging two feet below this level was not scorched. This would seem to show that there was a body of inflammable vapor hanging in the air, cast off by the oil used on the machinery.—*Scientific American.*

The Chinese make cracked porcelain by combining steatite with enamel. When put in the oven the mixture divides so as to show a network, as it were, of cracks.

THE EFFECT OF BRAKES ON RAILWAY TRAINS.

At a recent meeting of the Institution of Mechanical Engineers, at Manchester, England, "The Effect of Brakes on Railway Trains" was the subject of a paper by Capt. Douglas Galton, C. B., in continuation of a paper read by him at the Paris meeting of the institution. He described minutely the results obtained by experiments on the London, Brighton and South Coast and Northeastern railways. Recapitulating what appeared from these experiments to be the essential conditions of a good brake, he said the pressure with which the brake-blocks were applied to the wheels should be as high as possible, short of the point which would cause the wheels to be skidded and slide on the rails. In practice, and as a question of safety, it was of the greatest importance that, in the case of a train traveling at a high rate of speed, that speed should be reduced as rapidly as possible on the first application of the brakes. For instance, a brake which reduced the speed from 60 miles an hour to 20 miles an hour, in say six seconds, had a great advantage as regarded safety over a brake which would only reduce the speed from 60 to 40 miles an hour in the same time. The maximum pressure should be applied to the wheels as rapidly as possible, and uniformly in all parts of the train. The skidding of the wheel, so that it slid on the rail, was altogether a mistake, so far as rapid stopping was concerned; in addition to this it must clearly cause a deteriorating effect in tending to force forward the rails and sleepers; whereas, so long as the wheels continue to rotate, no such effect would be produced. Railway companies, in considering what form of brake was best suited for traffic, must, whilst they gave full weight to the mechanical conditions discussed in this paper, also ascertain the durability and facilities for maintenance and repair presented by the various systems. It was further clear, from the present series of extents, that the universal application of continuous brakes would raise many questions as to the strength of the rolling stock now in use, much of which was constructed originally to meet other conditions of traffic.

Bridging the Bosphorus.—Capt. James B. Eads, the well-known engineer of the iron bridge at St. Louis, who has long been connected with the jetties at the delta of the Mississippi river, has recently prepared plans for bridging the Bosphorus, thus connecting Pera with the Asiatic shore. Capt. Eads was assisted in his calculations and surveys by A. O. Lambert, a civil engineer. The bridge will be 6,000 feet long and 600 feet wide. It will have fifteen spans, and will be almost entirely built of iron. The hight of the roadway above the surface of the water will be 120 feet, 60 feet less than the elevation of the Brooklyn bridge. The center arch will be a span of 750 feet, one of the longest spans ever contemplated. The central piers or main portion of the structure will be 50 feet thick, built of solid granite blocks fastened together with iron braces. The main tiers are 270 feet high from foundation to summit. The cost of the entire structure is estimated at between $18,000,000 and $25,000,000, and six years are given as the time to complete it. Excellent granite is near at hand, and as the iron work will probably be done in France and Belgium, there will be no delay. It is also thought that cheap labor can be employed. The increase in the value of property that will necessarily follow the completion of the work, it is believed, will amply repay the cost of the project. The construction of the bridge will doubtless do much towards the completion of the Euphrates Valley railroad, making it the preferred route to India.

A train was attacked by robbers between the City of Mexico and Vera Cruz, who killed the baggage-master, wounded the conductor and escaped with $27,000 in silver.

IMPROVEMENT IN OUR SHIP-BUILDING INDUSTRY.

So much is said about the impossibility of a revival of the ship-building industry in this country under the present tariff, that we are glad to pick up every item bearing on the subject. The following statistics will be interesting in this connection:

During the fiscal year ending June 30th, 1878, 32 iron vessels were built, with a tonnage of 25,960.29 tons. This record is second to the best record the country has yet made, which was in 1874, when the tonnage aggregated 33,097 tons. The next best record in tonnage was in 1873, when it amounted to 26,548 tons. The number of iron vessels built during the past year was greater than in any other year, the year which most favorably compares with it being 1873, when 26 were built. Of the vessels built during the past year, 9 were ocean propellers, varying in tonnage from 1,156 tons to 3,548 tons; 1 was a lake propeller of 306 tons; 1 was a stern-wheel river steamer of 1,028 tons; 7 were side-wheel river steamers, ranging from 128 to 1,285 tons; 13 were steam tugs, the largest of which measured 180 tons; and the remaining vessel was a yacht.

The number of vessels and the tonnage will, this year, probably exceed that of any previous year in the history of the country. One of the latest launches was the fine steamer *St. Johns*, for ocean and river travel, from the yard of the Harlan & Hollingsworth Company, at Wilmington, Del. The *St. Johns* is for the Charleston, Savannah & Florida Line, and her measurement is as follows: Length, 260; beam, 38 feet; beam over all, 64 feet. Her cylinder is 66 inches in diameter, with 12 feet length of stroke.

At the yard of John Roach, Chester Pa., the double turreted monitor *Miantonomah*, Government vessel, is in hand, receiving her machinery and finishing touches. Two other vessels are on the stocks, and a large number of men have recently been added to the working force in the yard, giving it a more lively aspect than it has worn for some time.

Coating Boilers.—Mr. Franz Beuttgenback gives the following recipe for the preparation of a coating for the inside surface of boilers to prevent the formation of scale: Gradually dissolve five pounds of a mixture of 25 parts of colophonium, two and one-half parts of graphite, and two and one-half parts of lamp black in 40 pounds of boiling gas tar, adding about one pound of tallow. The solution is diluted with about 50% of the petroleum and applied in a warm state. It has a pungent smell and should be put on rapidly, the precaution of using closed lanterns being necessary. Its effect is to cause the scale to come off in large flakes when picked.

To Remove Ink from Carpets.—When freshly-spilled, ink can be removed from carpets by wetting in milk. Take cotton batting and soak up all the ink that it will receive, being careful not to let it spread. Then take fresh cotton wet in milk, and sop it up carefully. Repeat this operation, changing cotton and milk each time. After most of the ink has been taken up in this way, with fresh cotton and clean, rub the spot. Continue until all disappears; then wash the spot in clean, warm water and a little soap, rinse in clear water, and rub until nearly dry. For ink spots on marble, wood or paper, apply ammonia clear; just wetting the spot repeatedly till the ink disappears.

Rusted Steel Grates.—First the rusted steel should be washed with a solution of half an ounce of cyanide of potassium in two ounces of water. Then it should be cleaned by brushing with a paste made of half an ounce of cyanide of potassium, half an ounce of castile soap, one ounce whiting, and water sufficient to form a paste of the whole.