

ENGINEERING.

Now that the misunderstandings between the railroads and the manufacturers have been removed and a satisfactory steel rail assured, orders for new rails are being placed in large quantities. A notable instance is a recent order of the New York Central Railroad for 101,000 tons to be delivered during the spring and early summer. Of this order, 51,000 tons are being rolled by the Lackawanna Steel Company, 42,600 tons by the United States Steel Corporation, and the balance by the Algoma Steel Company and the Bethlehem Steel Company.

The first application in England of the single-phase current to the operation of a steam railway is that on a section of the Midland Railway from Heysham to Morecambe and Lancaster. It involves electrification of ten miles of double-track road, and the equipment consists of overhead transmission, fed with single-phase alternating current at 6,600 volts and 25 cycles. Also, a section of the London, Brighton, and South Coast Railway, nine miles in length, is being furnished with overhead electric transmission, and the total length of single track that is being equipped is 23 miles. Current will be furnished by the London Electric Supply Corporation.

A vivid impression of the huge amount of material that enters into the construction of the great bridges which are being built across the East River, may be gained by a visit to the storage yard at Bayonne, where the steel for the construction of the roadways, floors, trusses, etc., of the new Manhattan Bridge has been gathered for shipment to the site as it is needed. The stack of metal, before removal to the bridge began, weighed 30,000 tons, was 35 feet high, 85 feet wide, and 800 feet long. The steel was manufactured at Phoenixville, Pa., and it required 1,600 flat cars to transport it to Bayonne.

A recent statement made by Baron Saito in the naval section of the budget committee, at Tokio, regarding the strength of the Japanese navy, shows the absurdity of regarding that navy, excellent as it is, as a competitor on equal terms with our own navy. The active list of the Japanese navy includes 13 battleships, 12 armored cruisers, 43 other cruisers, 59 destroyers, and 69 torpedo boats. Some of the important new ships are yet far from completion. The armored cruiser "Ibuki" and the battleship "Satsuma" are to be completed this year; but the armored cruiser "Kurama" and the battleship "Aki" will not be ready until 1911.

The gain in toughness and strength of steel, due to the introduction into the construction of a small percentage of vanadium, is shown in some recent comparative tests of a carbon steel frame of 78,000 pounds tensile strength and 46,000 pounds elastic limit, and a frame of similar section with vanadium added to the steel composition. The vanadium steel frame section, carried on supports four feet apart, stood twenty blows of a 5,000-pound weight falling from a height of 18 feet, before fracture took place. The carbon steel frame section was deflected $5\frac{1}{2}$ inches by the first blow and broke on the second. In the whole series of tests the vanadium steel showed about 15 per cent higher tensile strength and 25 per cent greater elastic limit than the carbon steel.

On March 9th there was laid at the Brooklyn navy yard the keel plate of the "Florida," which on the day of her launch will be the largest battleship afloat. A sister ship, the "Utah," is being built by the New York Shipbuilding Company, Camden, N. J. The "Florida," 521½ feet over all, will have 88 feet, 2½ inches beam, or a few inches more than the "Mauretania." Her normal displacement will be 21,825 tons, her full load displacement 23,034 tons. She will be driven by 28,000-horse-power Parsons turbines at a speed of 20¾ knots. Her armament will consist of ten 12-inch and sixteen 5-inch guns. As a result of the economies due to consolidation of the bureaus, our naval constructors expect with this ship to make a new record for rapidity of construction.

The Brennan gyrostatic monorail was introduced to the New York public by Prof. Chessin, of Washington University, St. Louis, in the course of a recent lecture at Columbia University. Demonstrations were made with a 15-pound model running upon a copper wire. The automatic balancing mechanism consisted of two fly-wheels whose weight was 1/20 of the weight of the whole car, and the model contained all the essential features of the large car, for the development of which the British government has appropriated a large sum of money. While the car was running upon the wire, weight, which it successfully balanced, was gradually added upon one side of the car, which did not lose its equilibrium until a load equivalent to about 2/3 of its own weight had been placed eccentrically upon its platform. According to the lecturer, the gyroscope, in a full-sized car, would constitute about 5 per cent of the total weight and occupy about 15 per cent of the total space.

ELECTRICITY.

A novel desk lamp has recently been put on the market, which consists of a long glass tube in which the filament instead of being coiled is stretched out in a single horizontal line. The entire light is projected downward on to the desk by means of a semi-cylindrical reflector. The result is that the light is distributed over a larger area, and is more diffused than with the ordinary incandescent bulb.

The frequency of accidents to passengers alighting from the rear platform of one car and walking in front of a car approaching from the opposite direction, has led an inventor to devise an alarm which is sounded by the motorman when he stops his car if he sees another car coming on the opposite track. The alarm is located on the back platform, and at night the device is illuminated, so that the sign reading, "Look out for the car on the other track," may be read.

A novel telephone receiver without a diaphragm has recently been devised, for which many advantages are claimed. It consists of a permanent magnet, the poles of which are connected by a soft core, making a continuous magnetic circuit. A coil wound around this core is connected to the transmitter and a suitable battery. When the transmitter is spoken into, the undulatory current affects the entire magnetic circuit of the receiver, reproducing the voice very distinctly. It is said that with this receiver there are no overtones or disturbing sounds due to the vibrating of a diaphragm. In one modification of this telephone the sounds were produced with such clearness as to fill a large hall.

A new type of coffee roaster is now being made, consisting of an inner stationary and an outer rotating cylinder of perforated steel, between which the coffee beans are placed. The inner cylinder is electrically heated, and the beans are mixed thoroughly to provide a very even roast, by means of blades which operate in the space between the cylinders. One of the objections to the ordinary roaster is the fact that it must be opened to permit of sampling the contents, to determine when the beans have been properly roasted. In the new electric roaster a small cup is provided, which may be operated by the pressing of the knob to throw out three or four beans without stopping the cylinder, thus enabling the operator to sample the roasting.

In a recent issue of the Electrochemical and Metallurgical Industry, M. U. Schoop discusses the decomposition of water by means of electricity to provide gases used in the oxyhydrogen welding flame. The proportion of 1 volume oxygen to 2 of hydrogen is not suitable for welding metals, as the oxyhydrogen flame should have an excess of hydrogen. However, M. Schoop has found that by using acidulated water, the proper proportion of oxygen and hydrogen may be obtained. This result he achieved in experiments which had to be discontinued, and he suggests that others should take up this problem, and try it out with a view to obtaining a commercially practical system of producing directly the gases necessary for the oxyhydrogen flame.

Much has been done abroad in developing the electric furnace for refining steel. Although little has been done heretofore in this line, in this country, the decision of the United States Steel Corporation to install two Héroult electric furnaces, of much larger capacity than ever before built, shows that we have been closely watching the experiments of others, and are now ready to profit by the work they have done. One of the Héroult furnaces is to be used at South Chicago, to produce an extra fine steel for rails. The metal will be taken from a Bessemer converter, and then refined in the electric furnace. The furnace will have a capacity of 15 tons, and if it proves a success, furnaces of twice this capacity will be installed. The second Héroult furnace is to be installed at Worcester, to refine steel used in making wire. Here the furnace will be used in conjunction with the open hearth.

Another "C. Q. D." message has awakened the public to the importance of equipping all ocean-going vessels with wireless telegraph apparatus. In the case of the collision between the "Horatio Hall" and "H. F. Dimock," this importance was more strikingly shown than in the previous collision between the "Florida" and the "Republic." The passenger steamer was equipped with wireless telegraph apparatus, but the injury it received was so serious, that the operator had no time to send out any detailed information about the accident or its whereabouts. Although the passengers were taken aboard the "Dimock," considerable anxiety was felt for their safety, owing to the absence of further wireless messages. The freight boat with the passengers aboard was in a precarious condition, but could summon no assistance because it possessed no wireless outfit. Had the law been in force compelling all vessels to carry wireless telegraph apparatus, it would have been possible for the "Dimock" to communicate with the revenue cutter "Gresham," which was searching for it in the fog.

SCIENCE.

In an obituary notice of the late Mr. Ezram von Jerzmanowski we stated that he was the introducer of the water-gas process in this country. A subscriber of the SCIENTIFIC AMERICAN questioned this statement, and held that the honor belonged Mr. T. S. C. Lowe. We are informed by Dr. Arthur H. Elliott, engineer-chemist of the Consolidated Gas Company, that the credit of the introduction really belongs to M. Tessie du Motay, the inventor of the water-gas process, and that Mr. von Jerzmanowski was an assistant of his. Mr. T. S. C. Lowe modified Du Motay's process, and made it practically continuous.

Mrs. W. K. Vanderbilt's plan of building in New York city four model tenement houses for tuberculous families deserves praise. What the tuberculosis patient needs, and what he can get only in a well-conducted hospital or sanitarium, is intelligent supervision of his sleeping quarters. According to Mrs. Vanderbilt's scheme, the families to be housed in her model tenements will be thus supervised until they can safely live elsewhere. A particularly valuable feature of her plan is the fact that it tends to keep the family together. The dispersion of the family undoubtedly has its bad effect upon the patient himself, and frequently results in the separation of the entire family.

The recent newspaper announcement of the discovery by two homeopathic physicians of "Tho-rad-x," "the most powerful therapeutic agent in the world," which like all other cure-alls "will revolutionize the practice of surgery," has been made the butt of ridicule in serious medical papers. It is asserted that radium has hardly lived up to the promises which were originally held out. After all, it must be confessed that we are still much in the dark as to the therapeutical value of radioactive substances. The indiscriminate publication of such "discoveries" cannot but have an evil effect in so far as they arouse false hopes.

Capt. C. E. Thomas of Saranac Lake has discovered an opening to a great cavern on the summit of a mountain in the Adirondacks, N. Y. He penetrated the cave for about 1,000 feet, and then returned because he had no proper equipment to continue his exploration. The cave is situated on a mountain known as "W" Mountain, several miles from Standish, N. Y. The mouth of the cave is about 50 feet wide, and the first room 50 feet long, 20 feet wide, and 30 feet high. Bats lined the walls. In the second room, which was about 40 x 15 x 25 feet, ramified passages were found.

On April 9th, 1908, an inverted rainbow was seen from the Italian geodynamic observatory of Rocca de Papa by Prof. Agamennone, the director of the observatory, and a party of visitors. The morning was showery; and when the visitors reached the observatory, 2,500 feet above sea level, and looked down on the vast Campagna, they were astonished to see, projected on the vineyards and trees beneath, a perfect rainbow with its convex side down and its middle point bearing northeast. Inverted rainbows are very rare, even in mountainous regions. None of the visitors, who were French and Italian meteorologists, had ever seen one, nor had Prof. Agamennone, although he had been director of the observatory for eight years. The phenomenon, however, is not unknown. It was observed from the Eiffel Tower in Paris in April, 1891. In this case there was a double rainbow, extending above and below the horizon to form two nearly complete concentric circles.

Last July Drs. Soubbris and Crouson, with the aeronaut Decugris, made a balloon ascension for the purpose of studying the cause of "balloon sickness," which has been ascribed both to deficiency of oxygen and to deficiency of carbon dioxide in the blood; Agazotti going so far as to recommend, for inhalation at great altitudes, a mixture of 13 per cent of oxygen and 87 per cent of carbon dioxide, in preference to pure oxygen. Dr. Soubbris, who alone suffered from balloon sickness in this ascension, experienced six distinct attacks; of which three were relieved by Agazotti's mixture, and the others were cured, far more completely, by pure oxygen, which therefore appears preferable for inhalation. Various other observations were made during the ascension. The arterial pressure was found to vary irregularly, with the altitude and the individual. The muscular strength of two of the men diminished regularly as the altitude increased, while in the third case the strength first diminished and then increased, as the following table shows:

Altitude.	Muscular Strength—		
	No. 1.	No. 2.	No. 3.
0	45	57	41
13,120 feet.....	38	38	42
11,800 feet.....	42	51	39

No definite law of variation of cutaneous sensibility could be detected with Weber's compass. Bonnier's diapason also gave negative results in regard to acuteness of hearing.