THE PAINTING MACHINES AT THE WORLD'S FAIR.

(*Continued from first page.*)

reservoir, etc., are mounted upon a truck which is readily moved from place to place. Into the reservoir the kalsomine is poured after having been properly mixed, and through it, from the bottom, there is forced a jet of air at a pressure of 18 to 20 pounds per square inch. In this manner the contents are kept agitated, and any deposit of sediment prevented. From the top of the reservoir the air is then conducted through a pipe to a point on the outside near the base, and here, by means of a half inch regulating valve, the color passes into the main air pipe, where it unites with the compressed air, forming a spray which passes into an ordinary three-quarter inch garden hose of any desired length. At the end of this hose is attached a nozzle, consisting of a brass pipe, flattened out so as to leave an aperture one-sixteenth inch wide and about 1½ inches long. One machine furnishes spray for two nozzles, each being operated by a skilled painter, who applies the color as one would handle a lawn-sprinkling hose. While trained painters are not absolutely necessary to the proper operation of the appliance, it has been found that better results are obtained by their employment. From ordinary scaffolding the color is sprayed upon the woodwork in sections, the machine being moved as the work progresses.

In many cases in the main buildings the use of a separate compressor has been unnecessary, the Exposition having in operation throughout the grounds underground pipes supplying compressed air for the operation of the ejectors in connection with the sewerage system. Where this power is available, the process is the same, except that the compressed air is heated by means of a coil adjusted in a salamander containing a coke fire. This secures the proper temperature, and enables the machine to work in very cold weather, when hand painting is impossible. Heating is not required where individual compressors are used, because the friction of the machine raises the temperature of the air to the required point.

There are now at work within the grounds fourteen machines, each with a force of three men, working eight hours a day.

A comparative test recently made showed that one painter could cover with a brush a daily average of about eight squares, while a machine upon similar work accomplished with equally satisfactory results nearly twenty times this amount, there being, however, two nozzlemen for each machine. As high as 304 squares have been done by one machine in eight hours, but this was an exceptional case, where all conditions were favorable for rapid work. On December 8, 1892, a number of machines began work upon the interior of the Manufactures building. At the end of three weeks, with a daily average of about 30 men, 1,332,669 square feet, half of the entire surface to be covered, had been finished. One of the advantages of this system is that in the coldest weather, when brushes are frozen solidly in transit from pail to wall, the machine work goes actively ahead.

The only comparison between machine and brush whereby the former suffers is in the amount of material used. Where 20 barrels of kalsomine are required for hand work, the machine will use 21. With a saving, however, in time and labor of about 20 to 1, the small amount of waste in material is scarcely worthy of consideration.

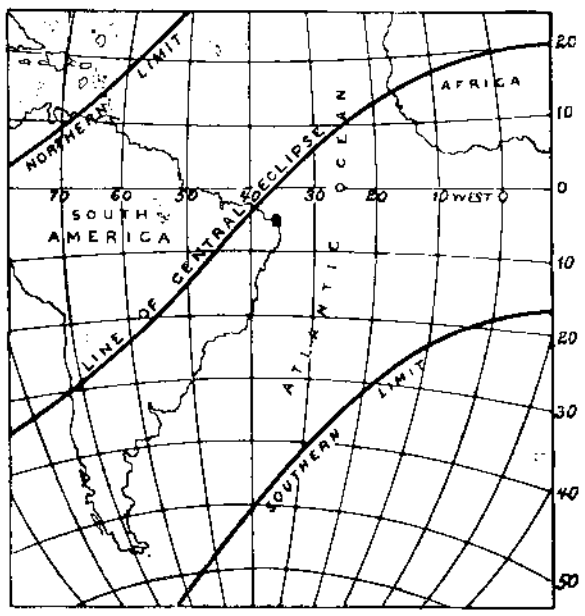
Luminous Air.

Dr. Philip Lenard, of Bonn, assistant to Professor Hertz, has recently exhibited a novel light produced by electric oscillations, and a paper has been read on the subject before the Royal Prussian Academy of Sciences, at Berlin. Hertz has shown that the rays proceeding from the cathode of a Geissler tube, which are capable of exciting phosphorescence, will pass through thin metal. If it were practicable to find a sheet of metal foil thick enough to be airtight and opaque, yet thin enough to be permeable by this discharge, it would be possible to allow these rays a passage into the open air by closing an opening in a discharge tube with such a piece of foil. This idea has been realized by Dr. Lenard by means of an ingeniously arranged apparatus and a hammered aluminum plate 0 003 millimeter thick. This plate forms in the apparatus in question a shutter which Dr. Lenard calls the "window," because while quite impermeable to air and light, it allows the rays from a cathode at a distance of 12 centimeters to penetrate it freely. These rays render the air faintly luminous. A halo of bluish light surrounds the "window," and is moderately bright only on its surface. At the same time a strong odor of ozone is recognizable. Substances capable of phosphorescence, if held near the "window," shine with their peculiar light on the side nearest to it. All the phenomena of phosphorescence cease if a magnet is so applied to the discharge tube as to repel the cathode rays from the inner side of the "window." The atmosphere is a dull medium for the cathode rays to penetrate, coal gas is more permeable, and so is hydrogen, while oxygen and carbonic acid are less permeable than air.—*Elec. Engineer, London.*

THE TOTAL SOLAR ECLIPSE OF APRIL 16.

Professor Pickering, of the Harvard College station at Mina Aris, in the Chilean Andes, reports that the atmospheric conditions on the day of the eclipse were all that could have been wished for, and that the results will be satisfactory to the highest degree. He says, in a dispatch printed in the New York *Herald* on the morning of April 17: "The corona seen, generally speaking, resembled the corona of 1871, as graphically portrayed by Captain Tupman, and complex, like that observed by Liais in 1857, which extended some 700,000 miles from the sun. There were four streamers, two of which had a length exceeding the sun's radius, or stretching out more than 435,000 miles. Several dark rifts were visible, extending directly outward from the moon's limb to the utmost limit of the corona. Filaments were numerous about both the solar poles. Compared with the corona of January 1, 1889, the corona just observed was more brilliant. During the total eclipse several flaming solar prominences attained great distinctness and brilliancy. Within the streamers no rapid movements were observed, but the impression of the scene was rather one of calm and tranquillity. The streamers were widely extended at the base, but not very long. The moon appeared of almost inky darkness, with only enough illumination at the edge of the disk to make its rotundity conspicuous, while from behind the orb streamed out on all sides the radiant filaments, beams and sheets of pearly light, which formed an irregular 'star-like decoration,' with the black lunar globe in its center. The inner corona was of dazzling brightness, but still more dazzling were the eruptive prominences, which blazed through it—to use the words of Professor Young—'like carbuncles.'

"The spectroscopic observations secured are very promising. As the eclipse progressed the temperature



PATH OF THE ECLIPSE OF THE SUN, APRIL 16

of the air fell considerably below its normal. The lowest reading of the thermometer occurred several minutes after totality. Upon review of all the observations, it may be said the corona was a combination of that of 1871 and that of 1857, as drawn by Liais. The photographs obtained were very numerous and highly satisfactory."

In a subsequent dispatch it is stated that the first contact, when the edge of the moon began to touch the edge of the sun, occurred at 7h. 17m. 6s. A. M. The second contact, when the eclipse became total, was at 8h. 19m. 9s. The third contact, marking the cessation of the total phase, was registered at 8h. 21m. 59s.; and the final contact, at which the moon left the sun's disk, at 9h. 30m. 10s.

Professor Pickering says the results of photographs obtained with the differential spectroscope give twenty lines in the "reversing layer" of the solar atmosphere —the shallow stratum of gas lying just above the photosphere and known to contain the vapors of many elements commonly found on our globe. Twelve of these brilliant-colored spectral lines were seen through the telescope. This is said to be the first time that these lines have been successfully photographed.

Seven prominences were observed, estimated to have attained a height of 80,000 miles. The integrating spectroscope showed red and yellow lines, two green lines and one blue in the corona.

A dispatch received by Director Holden, of the Lick Observatory, from Professor Schaeberle, states that the expedition sent to Chile from that institution to observe the eclipse was also signally successful, and that fifty photographs were obtained.

There were eight expeditions stationed along the line of totality for the observation of this eclipse, of which the United States observers selected locations upon the Andes, in Chile, where the atmospheric conditions were most promising. The expedition of the Harvard College Observatory, under Mr. Bailey, Professor Albrech, of Valparaiso, co-operating with him, took their position at an altitude of 3,700 feet. Professor Schaeberle, from the Lick Observatory, went a few miles further north, to an altitude of 6,600 feet. At both these stations photographs were taken in addition to the visual observations. Next in order comes the expedition of the Argentine Republic, upon their own territory, under Mr. Thome, long known in the astronomical world from his association with Dr. Gould in the production of the great catalogues of southern stars, which complement Argelander's catalogues of the stars of the northern heavens. In Brazil, upon the Atlantic coast, are three parties—an English expedition under the direction of Mr. Taylor, forty miles from Ceara; a French party in the same neighborhood, and a Brazilian party under the well known M. Cruls. On the coast of Africa there are two expeditions—an English expedition located sixty miles northerly from Bathurst, under the direction of Professor Thorpe, and a French expedition a few miles further to the southward.

When the photographs and full details from all these sources come to hand it is expected that they will form an important addition to our knowledge of solar physics, and possibly afford material aids in lines of investigation whose connection therewith has not heretofore been seen.

The Italian Torpedo Cruiser Arethusa.

The Arethusa is another of those ships of high velocity and great offensive powers which are soon to be added to the Royal Naval Squadron. Her principal dimensions are the following: Length, 70 m.; width, 8·20 m.; depth, 5·43 m.; tonnage displacement, 846·44 t. The armament is composed of six torpedo-launching tubes, five rotating on the deck and one fixed on the bow, of one cannon of 125 millimeters, of six cannons of 57 millimeters. Her defense consists of a deflective deck and coal bunkers super-added to it. The machinery, according to the contract, should be of 4,000 H.P., but the builders of the Arethusa, Orlando Bros., have been able to obtain the showing of 4,422 H. P. They consist of two vertical triple expansion engines supplied from four locomotive boilers with forced ash pit draught. Allowing for the great increase of horse power obtained, the speed has reached 21 knots as a maximum, and 20·7 knots as a mean of three hours trial, that is to say, about a mile in excess of the other ships of this type existing in our navy. The Arethusa with natural ventilation makes 18 knots, so under both natural and artificial draught she is the fastest ship in our navy next to the Piedmont. The plans of the ship are due to the lamented Commander Vigna, those of the engines to the engineer Salvatore Orlando. The guns come from the Armstrong establishment of Pozzuoli.—*Revista Nautica.*

Incandescent Lights.

The chemical composition of the mantle in the new Auer incandescent lights has lately been discussed in the *Journal fur Gasbeleuchtung.* The substance deposited on the cotton web consists of the oxides of metals of the cerium and zirconium groups, which exist in various minerals, for the most part in combination with silicic acid. The oxides are extracted from the minerals, and dissolved in nitric acid. This solution forms the bath in which the cotton web is dipped, and impregnates the latter so thoroughly that, on drying and burning, a finely meshed mantle of the oxides remains. It is necessary that the oxides employed in the manufacture should be free from iron, as that metal exercises a marked deleterious influence on the radiating power. Few experiments have been made to test the durability of mantles made from different oxides, but those of complex composition appear to last best. M'Kean has demonstrated that thorium oxide develops the highest illuminating power from the gas, while oxide of lanthanum ranks next, followed in order by the oxides of yttrium, zirconium, and cerium. A mixture of two-thirds oxide of thorium and one-third oxide of yttrium is recommended for obtaining the highest lighting efficiency. He has also shown that the tint of the light is altered by the constitution of the mantle. The oxides of lanthanum, thorium, and zirconium all give a white light, the oxides of cerium, didymium, and niobium, even in small amount, give a yellow tint to the light, while cerium oxide in large proportion gives a red light, and oxide of erbium a green one.

A Good Watch for One Dollar and a Half.

In another column will be found the advertisement of Messrs. R. H. Ingersoll & Bro. of their $1.50 watches. We can say of this article it is an excellent time keeper, and fully answers to all they claim for it The fact they are able to put it on the market at the price stated is a remarkable evidence of American ingenuity, while it also indicates the wonderful perfection to which clock and watch mechanism have been brought in this country.

The little electric engine advertised by the same firm is likewise a gem in respect to mechanical perfection and operation, yet they sell it at the low price of one dollar.