Correspondence.

TRUTH ABOUT THE "DREADNOUGHTS."

To the Editor of the SCIENTIFIC AMERICAN:

As a constant reader of the SCIENTIFIC AMERICAN I read with great pleasure your article in the last issue, "The Truth About the German 'Dreadnoughts.'" I wish to say that I have always followed the naval constructions of the different powers very closely, and find that your statement is absolutely correct as to the numbers of ships laid down by Germany, their armaments, etc.

After having read so many articles about the "menace" of the German navy, the exaggerated numbers of ships laid down by Germany, as seen almost daily in the British newspapers, and, sorry to say, copied quite extensively by many papers in this country, it is really refreshing to read the plain truth which you have so nobly represented to your readers, and which, believe me, will not only make the SCIENTIFIC AMERICAN the cleanest and most reliable paper in this country, but will make it a necessity to every reader who reads to learn the truth!

Cincinnati, O. LOUIS KAYSER.

THE NEW GERMAN PHOTOGRAPHY.

To the Editor of the SCIENTIFIC AMERICAN:

I noticed in your last week's issue an article regarding a new phonograph invented by Nees, Hamburg, Germany. As your article gave but little data on its workings, perhaps the following may prove of interest to your readers.

The instrument is a clumsy affair, its waxed recording and transmitting cylinder being about ten times larger than the ordinary phonograph. The recording, however, is made very much like the common type of instrument: the vibrations of the stylus are tangential to the cylinder.

In the transmitter no stylus is used, nor vibrating diaphragm, but a smooth cylinder revolving synchronously with the waxed one, and in contact with it. A fine jet of compressed air is directed against the line of vibrations on the wax and can only escape through the grooves in the wax made by the stylus in the recorder. In line with the jet of air is placed the horn, thus involving the characteristics of a syren.

Washington, D. C. E. H. HAWLEY.

More About Signaling to Mars.

Prof. Pickering's idea of signaling to Mars by means of a huge system of mirrors, which will flash the sun's light rhythmically to our planetary neighbor, seems to have attracted not a little attention, and to have called forth other schemes from more or less eminent scientists.

Prof. Pickering believes that $100,000 should be spent in preliminary work before any attempt is made to flash signals. These preparations will consist in the building of a huge telescope, and in experimental observations made with the co-operation of the foremost astronomers of the world. The object of this preliminary work is to decide whether or not the canals of Mars are really artificial. In all, three years' time would be consumed in these preliminaries.

A correspondent of the New York Sun, who states that he is a practical heliograph man, calls attention to a fact which seems to have been overlooked. Prof. Pickering proposes to make mirrors of such a size that they must necessarily be moved by machinery. His idea appears to be that if they were each ten feet across, there would be about 500 of them to the mile. The heliograph man points out that a pocket mirror two inches square will do just as much work as a mirror that is ten feet square. All that any mirror can reflect is the single image of the sun. He states that it is possible to flash from 6 to 48 miles with a shaving glass. This seems to be borne out by the fact that the standard size of an army heliograph is less than 4 inches. Hence, 10-foot mirrors would hardly be any more serviceable than 4-inch mirrors. The Sun's correspondent suggests that instead of spending $10,000,000 on an elaborate system of mechanically-moved mirrors, it will be much cheaper to buy 5,000 10-cent mirrors, or to make a bargain with any looking-glass manufacturer to sell scraps of silvered plate glass at least two inches square. An army of 5,000 men should then be deployed, stationed ten feet apart on the Staked Plains of Texas. They should be given a front sight which will enable them to aim at Mars.

Prof. David Todd of Amherst College also intends to improve the opportunity offered by the earth's proximity to Mars next autumn to discover whether or not the planet is really inhabited. He assumes that if Mars has inhabitants, and if they are as intelligent as we are, they may possibly attempt to communicate with the earth at that time, and that they may employ Hertzian waves for the purpose. It is his plan to take the most sensitive wireless telegraph receivers he can find up in a balloon, in order to diminish any obstructive influence that the atmosphere may exert, and listen for signals in space. We wonder how Prof. Todd can tell whether his signals come from Mars, or whether the receivers have not simply responded to electrical waves sent out from the sun.

Attention has already been called in these columns to Prof. Wood's idea of using a large black spot on the white alkali plains, with which signals may be "winked." According to Prof. Wood, the spot could be made in small sections of black cloth arranged to roll up on cylinders, exposing the white ground underneath, the cylinders being turned simultaneously by electric motors.

Official Meteorological Summary, New York, N. Y., April, 1909.

Atmospheric pressure: Highest, 30.65; lowest, 29.70; mean, 30.06. Temperature: Highest, 80; date, 19th; lowest, 24; date, 11th; mean of warmest day, 64.5; date, 19th; coolest day, 34.5; date, 11th; mean of maximum for the month, 57; mean of minimum, 42; absolute mean, 49.5; normal, 48.7; excess compared with mean of 39 years, 0.8. Warmest mean temperature of April, 54, in 1871; coldest mean, 41, in 1874. Absolute maximum and minimum for this month for 39 years, 90 and 20. Average daily excess since January 1, 2.6. Precipitation: 5.93; greatest in 24 hours, 3.80; date, 14th and 15th; average of this month for 39 years, 3.39. Excess, 2.54. Accumulated excess since January 1, 1.80. Greatest April precipitation, 7.02, in 1874; least, 1.00, in 1881. Snowfall, melting as it fell, 0.08 inch. Wind: Prevailing direction, northwest; total movement, 10,420 miles; average velocity, 14.5 miles per hour; maximum velocity, 83 miles per hour. Weather: Clear days, 8; partly cloudy, 8; cloudy, 14. In which 0.01 inch or more of precipitation occurred, 15. Fog (dense), 19th; sleet, 29th; frost, light, 16th, 25th; heavy, 12th; killing, 11th. Thunderstorms, 19th, 21st, 22nd, 29th.

The Current Supplement.

There has recently been acquired by the Bavarian state railroad for the haulage of motor coaches over short distances, a new type of steam motor which embodies several novel features. This new motor coach is described and illustrated in the opening article of the current SUPPLEMENT, No. 1741. Mr. Prevost Hubbard, of the United States Department of Agriculture, contributes an authoritative discussion of the temporary tar and oil binders, emulsions, and similar preparations as dust preventives. An ingenious apparatus for destroying moths is described, which apparatus consists of nothing more or less than a powerful searchlight which attracts the moths, and a trap for impounding them. The use of the gyroscope for the steadying of aeroplanes is set forth by Lucien Fournier. The cost of electric heat is estimated in the light of the most recent information. Sir Oliver Lodge sets forth briefly the modern electrical view of matter. Among the minor articles may be mentioned those on the new British battleship "Vanguard," "Aerial Flight in Theory and Practice," "Synthetic Preparation of Ammonia," "A Home-made Pneumatic Elevator," and "A Revolutionary Proposal in Blast Furnace Construction." Prof. Molisch describes a method of detecting the heat which emanates from living foliage. Mr. Lanchester's interesting paper on the Flight of Birds is concluded. S. H. Higgins writes on the Theory of Dyeing. The recent newspaper discussion of the habitability of Mars renders timely Mr. F. W. Henkel's popular article on Life in Other Worlds. The usual Engineering Notes, Science Notes, and Trade Notes will be found in their accustomed places.

THE PALACE OF MIRAGES.

BY JACQUES BOYER.

The apparent multiplication of objects placed between two parallel mirrors is a well-known optical phenomenon. The spectator's image is reflected from one polished surface to the other and back again. Inasmuch as at each reflection another image is added to the preceding image and the perspective is increased, the spectator sees himself infinitely multiplied, at least theoretically.

During the International Exposition of 1900 at Paris, Eugène Hénard built a Palace of Illusions on the Champ de Mars, in which structure reflecting mirrors were made to produce endless duplicates of architectural effects, electrical illumination being employed to increase the mystifying illusion. Somewhat similar, but even more bewildering, is the Musée Grevin which has recently been erected in Paris.

Hénard's "Palace of Illusions" comprised a hexagonal room about twenty meters (65.6 feet) in diameter, the walls of which were mirrors, framed in great Moorish arches resting on columns and pedestals located at the six angles of the hexagon. A dome carried on arches surmounted the whole. The optical repetition of the same architectural *motifs* created in the spectator the illusion of a great number of halls extending endlessly in all directions. In Fig. 1, the manner in which this effect was produced is clearly shown. The hall itself is shown in the center of the drawing by cross hatch lines, together with the six mirrors and the six columns. Immediately surrounding this hall, the spectator saw six exactly similar halls (shown in vertical lines), the result of the first reflection. Beyond this first reflection the spectator saw a second series of halls (horizontal lines), and farther on a third, which in turn was surrounded by other hexagons, and so on in an infinite series.

Considering only the first three repetitions, it will be observed that six halls are produced by the first reflection, twelve by the second and eighteen by the third. A man standing in the center will, therefore, easily distinguish thirty-six halls comparatively close to him, and for the following reflections a still larger number of halls, which increases indefinitely. It is evident that a particular piece of decoration, illuminated either with visible electric lamps or by spot lights, will be instantly multiplied in all directions, producing a wonderful spectacle.

The "Palace of Illusions" of 1900 was so illuminated that fifteen different luminous effects could be obtained, so beautiful that 2,000,000 visitors paid to wonder at the illusion.

The "Palace of Mirages" is a development of the idea which was carried out in the "Palace of Illusions." Whereas the "Palace of Illusions" could boast of only a single scheme of decoration, there are no less than three such schemes in the "Palace of Mirages"; that is, independently of lighting effects, the spectator is presented with three absolutely distinct effects.

This improvement has been effected by Hénard by employing, in addition to six large fixed mirrors for the walls, twelve smaller revoluble mirrors, which constitute the angles of the hexagon, and to which architectural *motifs* are applied. These smaller mirrors are pivotally mounted, so that they can be turned to present three different varieties of decorations for reflection. In Fig. 2 the principle of the mechanism is disclosed. At each of the angles of the hall six rotary drums are mounted, carrying six mirrors arranged in pairs, and forming three angles of 120 degrees each. Each angle of the hexagon also measures 120 degrees. Hence, by giving the drum one-third of a turn, the entire aspect of the hall and its perspective is changed. By means of a very delicate, electrically-controlled mechanism, the six drums can be turned either independently or simultaneously. When stationary, the mirrors of the drums complete the angle of the hexagon, so that they are apparently part of the walls. The drums are actuated by a friction wheel, and are stopped without shock by means of a brake of special construction. This precaution is absolutely necessary, when it is considered that even a very slight jar might shake off the very elaborate decorations applied to the mirrors.

In order to obtain sharp contrasts in effects, M. Hénard has interpolated a forest scene between two architectural illusions. By placing at the six angles of the hexagon tree trunks of different forms, the vast number of reflections produced by the mirrors leads the spectator to believe that he is the center of forest avenues radiating from him. It became necessary in carrying out this scheme to conceal the dome by a covering of foliage. This is accomplished by means of a flexible painted fabric, which slides through a central ring and which is capable of expanding to form a ceiling of leaves for the hall. The fabric is dropped by means of wires and invisible counterweights.

The three schemes of decoration selected are the following: A Hindu temple, a forest, an Arabian palace.

Although these three schemes of decoration themselves render it possible to obtain wonderful effects, Hénard has seen fit to heighten their possibilities by electric illumination. In the Palace of Illusions of 1900, fifteen different luminous effects could be obtained, but in the Palace of Mirages about three times as many are possible. In other words, 45 different luminous effects are obtained by means of 2,500 colored electric lamps, of which 1,800 can be simultaneously illuminated for the final effect in the last scene. If it be considered that the first three reflections produce an illusion of 36 halls, then the resulting illumination is equivalent to 36 x 1,800, or 64,800 lamps.

This system of electrical illumination is supplied with direct current of 500 amperes and 110 volts. In order to bewilder the spectator as much as possible, Hénard employs moving as well as fixed incandescent lamps. The moving lamps are tellingly employed in the forest reflections. Amid the foliage shimmering in the pale light of the moon, swarms of luminous butterflies are seen beating their wings incessantly. Presently, the butterflies disappear, and a shower of multicolored stars drop from the branches.

The forty-five different luminous effects are obtained by means of a special switchboard which is nothing more nor less than a keyboard having forty-five keys. Whenever a key is depressed, a new luminous effect is obtained. In other words, the electrician plays on a kind of switchboard piano, and changes the illumination at will.

The manufacture of the mirrors was no light task. It was necessary that they should be absolutely plane surfaces, so that no distortions in reflections would be produced.

Had this precaution not been observed, the alignment of the galleries would have been destroyed, and with it the optical illusion. Furthermore, the sides of the angles formed by the movable mirrors had to coincide exactly with the plane of the fixed mirrors.