Correspondence.

SIGNALING TO MARS.

To the Editor of the SCIENTIFIC AMERICAN:

Among the suggestions that are being made as to the proper method that should be used in the attempt to signal the Martians, there seems to be a wide difference of opinion upon a point which really admits of no debate. For instance, in your last number (May 15th) you tell of a "practical heliograph man," who comes forward with the astounding statement (which was said to be "overlooked") that a mirror two inches square will reflect just as much light as one ten feet square. Comment upon the importance of this discovery would be superfluous. We may rest assured that Prof. Pickering is not mistaken in what he says are the optical requirements of the experiment. The "practical heliograph man" seems to have confused the function of the mirror with that of the eye. A mirror simply reflects waves of light, the large mirror receives and reflects more light than the small one, a fact which admits of no debate; therefore, a mirror ten feet square is the same as three thousand and six hundred each two inches square.

However, all of the schemes suggested which involve the use of surfaces which reflect or absorb sunlight seem rather lame in view of the fact that the only time when they can be effectively used is when Mars is five times farther away than when nearest. Also, if a perfect reflector is used, it could only make a spot about three times as bright as the atmosphere, and perhaps not much brighter than the brightest clouds appear to an extra-terrestrial observer. Or, on the other hand, if a surface were used which would absorb all of the light which filters through the atmosphere, it would be seen through a medium (the atmosphere) which reflects about one-third of the total light that it receives, so the contrast would not be very great.

If a huge battery of powerful electric searchlights were directed toward Mars next September, and "winked" or turned on at critical moments, moments which rational minds could not fail to see the significance of, we might reasonably expect a response if we are ever to receive any at all. What is meant by critical moments are moments at which something of astronomical importance is happening, such as the conjunctions of the satellites of Mars with the sun, or their conjunctions with each other, or their moment of quadrature, or opposition, or similar moments in the motion of our satellite. If such signals were perceived, they would be responded to at similar moments, which would establish instantly the existence and intelligence of the inhabitants.

The "canals" of Mars may be "artificial," and yet not more so than the achievements of those creatures which we are accustomed to regard as belonging to a comparatively low order in the scale of being. It is quite within the range of the apparent fortuitous course of nature, that the type of life which has reached the zenith of development and become, morally and physically, the dominating factor upon our little neighbor, is closely allied, intellectually at least, to the creatures that manufacture in our fields and forests structures that are marvels of geometrical ingenuity. May not this type of consciousness, which we are pleased to classify as instinct, be responsible for what is observed upon Mars? WILFRID GRIFFIN.

Pittsfield, Mass.

THE SPEED OF THE "MAURETANIA."

To the Editor of the SCIENTIFIC AMERICAN:

In your Engineering Notes of April 3rd you say: "It begins to look as though the predictions of her captain that the 'Mauretania' will shortly cross the Atlantic at an average speed of 26 knots will be fulfilled."

How persistently these old traditions cling! Is it in order to speculate upon the day when the man in charge will be the man whose ingenuity has brought these floating engineering triumphs to their present state of perfection? At present the master is one whose advice is hardly sought, from the designing, from the laying of the keel, to the painting of the loadline. Seamanship is no longer the predominating qualification, but instead, a keen mechanical perception of the possibilities of steel and iron. The eyes of the world are centered, not upon the course the vessel takes, but upon the superb mass of machinery that drives her upon this course; and yet the captain is the proud possessor of the gold watch and testimonial presented for a record passage.

In these modern marine conveyances the engineering element is everywhere in evidence, from the propelling power to the compass that guides them on their way, and to the pantry heaters that warm the coffee.

Decades ago the tiller was reversed, but still the master orders "starboard" when he wants port, and "port" when he wants starboard.

Again the old tradition remains.

Victoria, B. C., Canada. JOHN W. E. LAKER.

[The contract for the "Mauretania" called for a sea speed of 24½ knots and a trial speed of 25¼ knots. For nine consecutive trips the ship has averaged over 25 knots. Her captain would be the last to take the entire credit to himself for this high speed. A record passage is the result of many favorable circumstances. First, there must be a properly-designed ship with ample power in her engine room. Given this, and the question of her time of passage is one of engine room and navigating bridge efficiency, and of favorable wind and weather.—ED.]

Eiffel's Experiments on Air Resistance.

Many experiments on the resistance opposed by the atmosphere to moving bodies have been made since Newton enunciated the formula $R = K S V^2$ for surfaces normal to the direction of motion. In this formula R denotes the resistance, S the area, and V the velocity. K is a coefficient which should be constant if the formula were rigorously correct but which has been found to vary greatly with the form and dimensions of the body. It varies also with the velocity, except for velocities less than 20 meters (65 feet) per second, for which it is sensibly constant. The resistance at velocities between 20 and 40 meters per second (45 and 90 miles per hour) is especially interesting because these are the velocities of swift vehicles, both terrestrial and aerial, and of destructive winds. The discrepancies between the measurements hitherto made are due to the complexity of the problem and the neglect of various elements, notably the separate effects of air filaments which differ at different points of the surface. Another source of error is the cyclonic motion of the air developed when great velocities are produced by means of a revolving aerodrome. These considerations explain why the values of K deduced from experiments vary from 0.07 to 0.12 (on the metric system), the highest values corresponding to the greatest areas and velocities.

Eiffel has endeavored to eliminate these errors in his experiments on the free fall of a long, heavy body which was constrained to remain vertical and to oppose to the air a level surface of simple form. The height of fall was about 312 feet and the body was guided by a vertical wire cable threaded lengthwise through the body. The pressure surface was attached to the falling body by springs, the compression of which was recorded on a blackened cylinder. The results were reduced to a barometric height of 30 inches and a temperature of 59 deg. F. For velocities between 18 and 40 meters per second the resistance of the air was found very approximately proportional to the square of the velocity, the exponent of V, however, appearing to increase slightly with the velocity, passing through the value 2 at the velocity of 33 meters (109 feet) per second. The coefficient K, after reduction to mean atmospheric pressure and temperature, was always between 0.07 and 0.08.

The Scientific American and a Certain Religious Picture.

A religious canvas has been exhibited throughout the country which is of so miraculous a character that, according to its owners, it completely baffled "a commission of scientists and chemists appointed by the SCIENTIFIC AMERICAN of New York, and the government chemists of Washington, D. C.," to quote the Los Angeles Express. The Editor of the SCIENTIFIC AMERICAN never saw the picture in question, nor did the SCIENTIFIC AMERICAN ever appoint a commission to examine it.

The picture is religious in subject. In it Christ plays a prominent part. According to the printed matter circulated by the exhibitors, "The figure of Christ appears as if walking in the pale moonlight. Above and behind the figure is a dark cross." There is nothing mysterious about the picture. It has undoubtedly been painted with luminous paints.

We have received so many letters of inquiry from subscribers who state that the SCIENTIFIC AMERICAN is made to appear as having indorsed this picture, that we take this opportunity of denying any of the statements attributed to us.

Prof. David Todd's Plan of Receiving Martian Messages.

Prof. David Todd of Amherst College has given out reports of his proposed attempt to rise above the earth atmosphere for a distance of ten miles or more, and equipped with sensitive receivers to catch Hertzian wave signals which may possibly be sent forth from Mars. Naturally, Prof. Todd is compelled to provide some means of sustaining himself and his companion, Mr. Leo Stevens, in the extremely tenuous atmosphere of the upper regions. According to his plan, two cylindrical tanks will be carried up, each about four feet high and from two to three feet in diameter, and capable of holding a single person. The cylinders will be entered by a manhole at the top, fitted from the inside with a screw cover. The bottom of each cylinder will be of clear thick glass. Three or four windows will be provided around the sides. Within the tank will be a small rotary air pump for supplying oxygen from the outside, to take the place of that which has been depleted.

The plan seems to us fraught with much danger and uncertainty. Assuming that signals are actually received, how is it possible for anyone to be certain that they are really sent by our planetary neighbor? All told, there are about 2,000 wireless stations scattered over the earth, each radiating electrical energy into space. Is it not conceivable that Prof. Todd's instruments may respond to the impulses sent out by one or more of these stations? Even granting that these impulses will be the dots and dashes of the Morse code, and therefore clearly of terrestrial origin, is there any certainty that other apparent signals which cannot be so easily traced to their source have really emanated from Mars? The atmosphere carries a charge of static electricity which probably fluctuates in quantity and may excite a receiver. Furthermore, why should it be necessary to carry up an equipment of tanks? Would not a simple helmet fed from an oxygen tank answer? Dr. Berson of the Berliner Verein fuer Luftschiffahrt reached an altitude of 34,000 feet with a simple apparatus of this kind.

Lastly there remains the objection that only with great difficulty have self-recording instruments been made light enough to be carried up by *ballons-sondes* inflated with hydrogen gas. Is it likely that a balloon of the magnitude planned by Prof. Todd will be able to carry aloft two men, the necessary amount of ballast, and two cylindrical tanks, pumps, instruments, and other scientific equipment to the height contemplated?

To Prevent Bubbles in Iron Castings.

Bubbles in iron castings are caused by evolution of carbon monoxide and other gases in the process of cooling and solidification. The formation of bubbles, which greatly diminish the strength of the casting, can be prevented by the addition of certain metals and alloys, which absorb oxygen and facilitate the elimination of other gases by raising the temperature of the molten iron, making it more fluid and producing more or less agitation in the mass. Ferro-manganese and ferro-silicon, which were first employed for this purpose, make the grain of the casting much finer and increase its strength by 15 per cent.

But pure and easily oxidizable metals, such as aluminium, magnesium, or sodium, are far more effective and they do not, like the alloys above mentioned, affect the general quality of the casting. Aluminium is especially suitable for very hard iron containing little silicon. An addition of 1/50 to 1/20 per cent of aluminium suffices to prevent the formation of bubbles. Magnesium has been used for several years in casting copper and copper-nickel alloys. It is now being employed in iron and steel foundries, in the form of an alloy with iron or with aluminium and in the proportion of 1/20 per cent of the weight of the casting. Sodium has not yet been employed in practice. Calcium not only absorbs oxygen but eliminates dissolved hydrogen. It combines with the carbon of the iron to form calcium carbide, which is decomposed by the hydrogen. Thus the calcium is again set free and the hydrogen is converted into acetylene, which rises and burns at the surface. Experiments have recently been made with ferro-vanadium containing a large proportion of carbon and consequently unsuitable for the manufacture of special steels.

A Crisis in Swiss Watchmaking.

An investigation made recently by the Swiss government shows that the watchmaking industry of Switzerland is passing through a severe crisis, which affects no less than 70,000 persons. The workmen who have been able to retain their employment have been compelled to consent to great reductions in wages. Skilled workers, who were receiving from $10 to $15 a week, are now paid only $6. The chief cause of the depression is to be sought in foreign competition, as France, Germany, and the United States have successfully undertaken the manufacture of cheap watches, in silver, nickel, and steel cases. The Swiss manufacturers of chronometers and fine watches do not appear to feel the depression as severely as the makers of cheap watches.

Roman letters of various sizes are commonly employed by oculists in testing acuteness of vision. Recent experiments by Guillery show great differences in the ease with which the different letters are recognized by the same person. T is especially difficult of recognition, and is apt to be mistaken for Y. By a similar optical illusion the angle of L is rounded off, making the letter resemble a reversed J. V is the easiest of all letters to recognize and O presents little difficulty. K is more easily recognized than H, which resembles it closely, and both N and Z are easily recognized. A is easily guessed at from its general form, but is difficult of positive recognition, including distinct perception of the horizontal line. E and F are among the most difficult of all the letters.