

THE OPPOSITION OF MARS IN 1907.

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A favorable opposition of Mars is an event which occurs at such rare intervals as to make it one of unusual value to the astronomer. This is especially the case at the present time, when speculations are rife respecting the surface markings of this interesting planet. We are assured by the astronomers that some of them are of a permanent character, while others undergo periodical changes. The alternate appearance and disappearance of white patches at the polar regions suggest the presence of ice and snow, and therefore of an atmosphere, which renders life not only possible, but highly probable. It should be noted, however, that, on account of the greater distance of the planet from the sun, the light received by Mars is very much less than the earth receives, although its heat from recent measurements cannot be much below that of the earth. It should also be remembered that the diameter of Mars is not much greater than one-half that of the earth. There are indications which are interpreted by some as explainable by the existence on the planet of intelligent beings. Should such exist, we are naturally led to reflect upon the geography and landscape of the planet as compared with those of our earth. But the purpose of this paper is not to discuss these speculations, but to exhibit graphically the peculiarly favorable conditions under which the astronomer will labor during the month of July, 1907.

The ability to observe a planet satisfactorily obviously depends very much upon its proximity to the earth. The distance between the earth and Mars varies between very wide limits. This is due to the great eccentricity of the planet's orbit, which is second only to that of Mercury.

The accompanying drawing is a plot of the orbits of the earth and Mars; and while they are elliptical, the difference between the lengths of the major and minor axes in each case is scarcely noticeable in a plot of these dimensions. But the eccentricity of the orbit of Mars is between five and six times that of the earth, which accounts for the great variation of the distances between the two planets at different oppositions. The center of the sun is represented at *S*. Through this point is drawn *PA*, the major axis of the orbit of Mars. *P* represents the perihelion, and *A* the aphelion of the planet.

In order to obtain a clear understanding of the precise relation between these orbits, the reader should realize that the earth's orbit is represented in the plane of the paper; while the orbit of Mars is inclined to it at a very small angle (nearly 2 deg.). That part of the orbit of Mars which includes aphelion, viz., *b A c*, is supposed to be above, while the remaining portion, viz., *c P b*, is supposed to be below the paper. The line *b c* is the intersection of the planes of the orbits of the two planets.

The positions of the earth and Mars are represented at different dates beginning January 5. Straight lines representing the distances between them are drawn connecting the centers of the planets at nine corresponding dates, viz., January 5, March 2, April 27, June 22, July 6, 13, 20, September 14, and November 9. The greatest possible distance would be reached if Mars were at conjunction and aphelion at the same date. This distance, represented by *a A*, is equal to the entire diameter of the earth's orbit ($=ae$) increased by *e A*. The least possible distance between the planets would be reached if Mars were at opposition and perihelion on the same day, i. e., if Mars were at *P* and the earth at *a*. It is represented by *a P*, and is equal to the minimum distance between the sun and Mars ($=SP$) diminished by the radius of the earth's orbit.

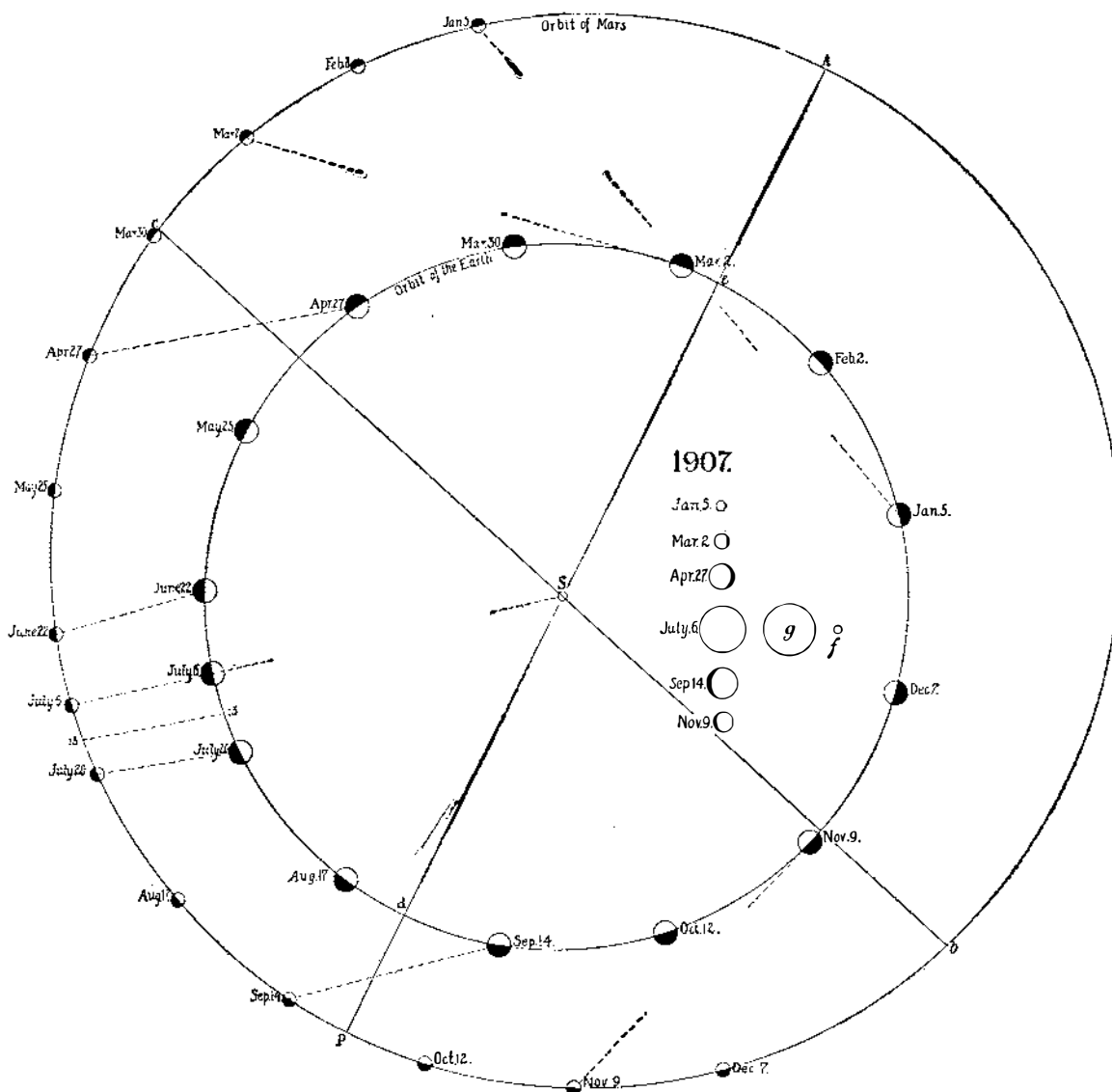
Some of the variations in the apparent diameter of Mars between these extreme possible positions are represented within the plot of the earth's orbit at six

dates of next year; and in each case the illuminated and shadow surfaces of the planet are indicated. The reader will readily determine the position of the dark surface prior to July 6; and will see that its position is changed after that date.

If the small circle *f* be taken to represent Mars when at that conjunction which is most unfavorable for observation, i. e., when the earth is at *a* and Mars at *A* (the greatest possible distance), the circle *g* will represent him at the opposition which is most favorable for this purpose, i. e., when the earth is at *a* and Mars at *P* (the least possible distance). The circle *g* is more than seven times the diameter of *f*, or more than fifty times the area.

The opposition which is most unfavorable for observation would occur if the earth were at *e* and Mars at *A*. In this position Mars would be represented by a circle a little smaller than that dated September 14 within the plot. The reader will readily convince himself of this by comparing the distances between the planets. The measurement *e A* is a little greater than that representing the distance between the earth and Mars on September 14.

By a comparison of the dates the reader will observe the gradual approach of the earth to Mars during the first six months of 1907, and their gradual separation during the latter part of the year. On July



THE RELATIVE POSITIONS OF MARS AND THE EARTH DURING THE YEAR 1907. OPPOSITION OCCURS IN JULY.

6, when opposition occurs, the sun, the earth, and Mars, in the plot, are in the same straight line; and at first sight we may be disposed to say that the minimum distance will now be reached; but on a careful examination we discover that, owing to the great eccentricity of the orbit of Mars, and the consequent diminution of his distance from the sun, the shortest distance from the earth will be reached a week later, i. e., July 13, when the earth will have gained upon Mars about $2\frac{1}{2}$ deg. On July 20 the distance between the planets will differ a very little from that of July 6, when the earth will have gained nearly 5 deg. on Mars. During this period of two weeks, viz., from July 6 to 20, the apparent comparative diameter of the planet will be represented by the circle opposite the date July 6 within the plot. If we compare it with that marked *g*, we see that its diameter will not differ very much from that which it would attain if the planet should reach its apparent maximum size. The difference is in the proportion of 65 to 72, or about eight-ninths.

An examination of the great variations in the apparent diameter of the planet, together with a consideration of the intensity of the light received and reflected when it is at its maximum distance from the sun and earth, as compared with the amount received and reflected when these distances are reduced almost to a minimum, will convince the most casual

observer of the peculiarly advantageous position of Mars relative to the earth during the month of July, 1907.

RAILWAY ACCIDENTS AND SURGERY.

Despite the institution of the most elaborate precautionary and disciplinary methods, the railroad operator, owing to the nature of his calling, is necessarily exposed to accidents and fatalities. According to the latest available returns upon this subject, no less than 3,632 men were killed and 67,067 injured during the course of a year upon the railroads of the United States. In Great Britain the calamity returns are considerably lighter, despite the congested nature of the railroad traffic, the fatality roll aggregating 416 killed and 6,590 injured. In this country one man out of every 357 is killed and one in 19 injured. In Great Britain the percentage is considerably lower, the proportion being one in every 10,144 killed and one in 747 injured. Upon the railroads in the latter country ambulance corps have been inaugurated among the operatives for the express purpose of succoring their injured comrades. The railroad operator, no matter in what path his duties may lie, is ever confronted by danger in a wide variety of forms. At the same time, many injuries have proved ultimately fatal, because of the long period of time that has elapsed between

the time of the injury and the arrival of the doctor; whereas had first aid been rendered, the life might have been saved, or at any rate the extent of the injury appreciably minimized, by the successful prevention of subsequent complications. In this country the effect of such delay is particularly marked, owing to the great distances separating points at which medical aid can be obtained. More than once, when a man has been injured during the journey of the train, he has had to lie unattended for an hour or two, so that when the surgeon received the case, the effects of the accident had so developed that the possibility of saving the life had become very remote.

Realizing this salient point, the employees on the Boston and Maine Railroad have adopted the movement in vogue among British railroads, and have inaugurated a means whereby the rendering of first aid to the injured may be taught among the numerous operatives.

The scheme was originated by the Railroad Branch of the Boston Young Men's Christian Association, and when it was brought before the directors of the company, its widespread benefits were immediately realized. The

authorities forthwith sanctioned the idea, and decided to defray the cost of initiating the men into first-aid work, the task of drilling the men being devolved upon Dr. H. H. Hartung, who is an active member of the National First Aid to Injured Society. Among the men too the scheme was warmly received, and the whole of the employees are being made proficient in the art of succoring the injured. The large shunting yards are the scenes of the greater majority of accidents, and the railway authorities have shown practical sympathy with the movement by the establishment of emergency stations, replete with every appliance necessary to render first aid, and to which the injured can be carried to await the arrival of the doctor. The greater part of the injuries received by railway men comprise fractures, contusions, crushings of various parts of the body, burns and scalds, and in some instances the supervening of blood poisoning within a short time of the accident, owing to the entrance of some foreign substance into the wound.

"Any surgeon will tell you," states Dr. Hartung, "that nearly everything depends upon the skillful and successful treatment of an injury immediately after it has been inflicted. Many an accident which is comparatively trivial in nature develops seriously, owing to the shock the system has incurred before the practitioner arrives. For instance, take a compound fracture. Many a poor fellow struck down has lain in

agony for an hour or so, owing to the absence of even the most rudimentary ideas of first aid, and when at last medical assistance is obtained, the case has so far progressed that it is practically hopeless for the patient's life to be saved, or should the medical man triumph, the man possibly becomes a cripple for life, when had his comrades been able to succor him immediately, the subsequent complications might have been averted. Again, the knowledge of how to apply

substitutes they can from things which are within convenient reach. In this direction the men have exhibited considerable ingenuity. At times efficient stretchers have been quickly and rudely fashioned from branches of trees growing on the railway embankments, while should wood be unavailable, as is the case in open and desert country, serviceable splints can be improvised from pillows or even coats.

When the men have mastered theoretically the prin-

gaged in practising the proper methods of removing an injured man from a precarious position, and carrying him either single-handed or with assistance to a more convenient spot. A common type of casualty is that in which one of the men on the engine, perhaps while walking round inspecting or oiling his charge, is struck by the cowcatcher through the engine starting unexpectedly, and is then thrown with force across the buffer frame. In such an accident the injuries



Instructing the Class in Bandaging a Victim at the Scene of the Accident.



Bandaging the Head and Limbs. Because of Great Distances, an Hour May Elapse Before Medical Aid Can Be Obtained.

the tourniquet and check bleeding is very often a matter of life and death, while the ability to treat poisonings, dress rough wounds, severe scalds, and burns very often gives the unfortunate patient a chance of living.

The railway men are taken through a complete curriculum, which is divided into two stages. The first course comprises a series of ten lectures together with the study of a manual. At first the men are acquainted with the anatomy of the human body, the names and positions of the various bones, and the functions of the muscles and vital organs. Then the blood circulation system is explained, as well as the principal arteries and veins. They are instructed in the application of the tourniquet and other means of checking bleeding. Respiration is then dealt with, and the men shown how to handle suffocation cases in various forms."

These elementary principles explained, the employees have described to them the various kinds of wounds, such as contusions, lacerations, poisonings, and so forth, together with the correct treatment for the respective types of injuries. Burns and scalds are treated, and demonstrations carried out to show the proper methods of applying the various bandages. Following this comes the treatment of sprains, dislocations, fractures, together with the utilization of splints. The men are practically shown how to improvise necessary appliances from the various facilities that are available, such as brooms and broken boxes. Many of them carry upon the trains complete emergency kits, but others are not so fortunately provided. Then they have to devise the most serviceable

ciples expounded in the lectures, they are submitted to a rigorous practical training, whereby they are able to demonstrate to the instructor how they would act in cases of emergency. For these tests the various shunting yards are utilized, one man acting as the supposititious victim. At such times one may see little groups of men darting hither and thither among the engines and cars with stretchers and other equipment with the utmost coolness, precision, and dispatch. The victim is supposed to have been crushed between two vehicles, run down by the locomotive, fallen from the train, or scalded. At the word of command the men dart across the rails, dodging the traffic, armed with their requisite impedimenta, and quickly, though tenderly, pick up the injured man, swathe him in bandages or splints, repose him on a stretcher, and consign him to the railway car ready for the practitioner when the train arrives at a convenient point for such assistance, since in the sparsely-populated districts an hour or two may elapse before the train reaches a station where a doctor is available. While engaged in these operations the doctor-instructor follows them through their work, pointing out the various symptoms of different injuries that the men must observe, and correcting them should their treatment be erroneous, at the same time carefully timing the operations. "It is imperative," urges Dr. Hartung, "that you should administer aid in the simplest and most effective manner. You must do something, and what is more important, do it quickly. Many an injury simply depends upon the speed with which the wound is bandaged up."

In another part of the yards men may be seen en-

invariably comprise fractures of the leg and skull. The position of the patient is an awkward one, and great skill and care are required in his removal without accentuating the pain or aggravating the injury. Again, there is a proper way of removing a victim from the train itself, when the case is not sufficiently serious in character to necessitate the employment of a stretcher. The man is placed in a chair, and gently removed from the car to the ground without the slightest jar.

When the men have become proficient in this work, they are initiated into the peculiarities of poisoning. The differences between common poisons are explained at great length, together with their respective symptoms and the methods of treating such cases with the means generally within reach.

Shock to the nervous system as the result of a serious accident, and unconsciousness, together with the treatments for the same, are also explained. Other forms of unconsciousness, such as might result from fits, concussion, and sunstroke, are fully dealt with, and the best remedies shown. Sunstroke is a very prevalent complaint among the railway men during the summer months, and in many instances the attacks are of such severity that instant treatment is essential to avoid fatality.

When the men have thoroughly mastered the theories in this work of first aid, they are submitted to a severe oral and written examination. Those that pass through this ordeal are awarded a diploma. The successful student can then, if he feels so disposed, participate in the advanced series of five lectures. These



The Proper Way of Removing an Injured Man Who Has Been Struck and Has Fallen on the Front End of the Engine.



The Correct Way of Carrying an Injured Man Single-Handed.



Struck and Thrown Upon the Cowcatcher, With Serious Injury to the Legs and Skull.

A MEDICAL CORPS FOR RAILROAD OPERATORS.



and devastating the towns on the west coast of this State, including Pensacola, it veered farther to the west, including in its zone much of the low-lying country that comprises the southern portions of Alabama and Mississippi, and the islands skirting their shore line.

In the confusion incident to the storm, the newspaper reports from the places visited by the storm are in the main so incomplete, that the reader cannot get an intelligent and comprehensive idea of the extent of the disaster and the actual causes of the greatest damage. Enough information is available from Mobile, however, to describe the character of the disturbance, the actual destructive force of the wind and water, and other phases which would be of special interest to the student of meteorology. The duration of the hurricane (for such it can properly be called) was remarkable. Beginning shortly after the midnight of September 26, the wind

The Destruction Among Mobile Live Oaks; Ninety Per Cent of the Trees Were Destroyed.

deal more in detail with the work of first aid, while the qualifying examination is much more severe, the successful ones receiving the medallion of the Association.

The whole cost of the undertaking is borne by the railway authorities, so that the employees do not have to expend a single penny in acquiring their knowledge. All that they have to do is to devote their own time to the instruction, and in this connection they have displayed commendable willingness.

Indirectly also the movement is of inestimable value to the traveling community in general, especially in view of the fact that railway disasters in America are much more frequent and serious than in England. A scrutiny of the points at which such catastrophes occur will demonstrate the fact that they frequently happen at some lonely and desolate spot far removed from medical aid. Consequently, two or three hours may elapse before the doctors arrive on the scene, and the death roll is accordingly heavier than would have been the case, had some assistance been forthcoming within a shorter time of the accident. With these trained railway men, the injured are bandaged up until more expert skill can arrive.

EFFECTS OF THE RECENT HURRICANE AT MOBILE.

BY DAY ALLEN WILLEY.

One of the most interesting storms, from a scientific



Typical Scene Along Mobile's Wharf Front; a Fruit Steamer Cast up on Shore.

standpoint, which has ever been experienced in the Southern States was that which recently caused so much damage along the Florida peninsula and the coast line of Alabama and Mississippi. Generally known as a "tropical hurricane," it differed from the usual disturbances of this class by reason of its duration, while in some features it bore a resemblance to the cyclone which at times prevails in the level regions of the West.

As is well known, the storm center hung over the West Indian Islands and the adjacent waters for a considerable period before it changed its course to the northwest. Consequently, the hurricane was not unexpected; its violence, however, surprised even the meteorological experts. Passing over the Florida peninsula

blew for fully twelve hours with a minimum velocity, with the exception of a few intervals or lulls, of 40 miles. The average velocity as recorded by the instruments at the Mobile Weather Bureau was but 55 miles an hour—not sufficient in the opinion of the experts to cause the destruction that resulted. The maximum velocity, however, was much greater. There were times when it exceeded 70 miles an hour. These "gusts," which might be termed a series of tornadoes, were responsible for most of the damage inland.

The site of Mobile is such that it was exposed to the full blast of the hurricane; for the city is built on ground which is low and flat. It is located partly at the head of Mobile Bay and on the northwest shore, a portion of the water front being on the Mobile River.



A House on the Long Shell Road; the Collapse Was Due to the Washing Away of the Foundations.



A River Steamer Lying Totally Wrecked in a Slip.

EFFECTS OF THE RECENT HURRICANE AT MOBILE.