POSITION OF THE PLANETS IN AUGUST.

MARS

is morning star until the 4th, and then evening star. His opposition with the sun occurs on the 4th, at 1 h. 21 m. A. M. He is then, as the word opposition implies, opposite the sun, rising at sunset, reaching the meridian at midnight, and setting at sunrise, being visible the entire night. As in July he increased in brilliancy when approaching opposition, so in August, after passing opposition, he will decrease in brilliancy, the process being reversed in the two months. The conditions are more favorable for August than July, as the planet is approaching perihelion during the whole month. Mars is nearest to the earth on the 6th, when he is 34,900,000 miles distant, about 100,000 miles nearer than on the 4th. He is retrograding or moving westward, as observers who carefully note his path in the sky will see. We can add nothing to what has already been said respecting this planet and the wonderful opportunity for observing him under conditions that will not take place again for seventeen years. It is surely not too much to expect that a discovery as unexpected as that of 1877 may reward some unwearied worker in the Martian field, and rejoice the hearts of those who find unceasing enjoyment in the study of the stars!

The moon is in conjunction with Mars the day before the full, on the 7th, at 11 h. 4 m. P. M., being 1° 52′ north.

The right ascension of Mars on the 1st is 21 h. 9 m., his declination is 23° 26′ south, his diameter is 26″.6, and he is in the constellation Capricornus.

Mars rises on the 1st at 7 h. 48 m. P. M. On the 30th he sets at 2 h. 30 m. A. M.

JUPITER

is morning star. He will be a bright and shining light on August nights, for he is near perihelion and approaching opposition. He rises about two and a half hours later than Mars on the 1st, and although he has to yield the first place to his ruddy rival, he will, as soon as he appears above the eastern horizon, share with Mars in the admiration freely bestowed by star gazers upon both planets. The opportunity is favorable for comparing the light power of the two planets. Jupiter, when brightest, gives out two and a half times more light than Mars, probably on account of the reflecting power of his cloud atmosphere, that hides the body of the planet from view, while the real surface of Mars is probably seen. Under the present conditions, with Mars at nearly his greatest possible brightness, and Jupiter nearly two months from opposition, the light-giving power of the two planets is about equal. The conditions are excellent for making the comparison. Mars is on the meridian on the 4th at midnight, and Jupiter at half past 4 o'clock in the morning. There is more satisfaction is observing the latter planet, for he is about 30° farther north. Jupiter is stationary on the 13th, and then retrogrades or moves westward. The two planets will afford a rich field for study and investigation during the whole month.

The moon, two days before the last quarter, makes a very close conjunction with Jupiter on the 13th, at 2 h. 26 m. A. M., being 2′ north. The conjunction is visible, and so close that it will be an appulse, moon and star seeming to touch each other.

The right ascension of Jupiter on the 1st is 1 h. 34 m., his declination is 8° 16′, his diameter is 41″.0, and he is in the constellation Pisces.

Jupiter rises on the 1st at 10 h. 15 m. P. M. On the 30th he rises at 8 h. 17 m. P. M.

VENUS

is morning star. Her period of retreat when she was hidden from view was short, and when the month commences she is far enough away from the great source of light to be a beautiful object as she appears above the eastern horizon two hours before the sun. As the month advances she rises earlier and increases in luster until she reaches her period of greatest brilliancy on the 15th at 10 h. A. M. This event occurs thirty-seven days after her inferior conjunction, when she is 39° west of the sun, and one-fourth of her illuminated disk is turned toward the earth, her light number being 187·6. Venus, as morning star, repeats in reversed order the much-admired phases of her course as evening star, passing from inferior conjunction to greatest brilliancy, as she previously passed from greatest brilliancy to inferior conjunction. Observers find it hard to decide which phase is the more beautiful. In the one she follows the sun, and sinks slowly below the western horizon. In the other, she precedes the sun, rising above the eastern horizon, and shining brightly until her light pales in the glowing dawn. Venus, as evening star, finds more admirers, largely from the convenience of the time for observation.

The moon four days before her change is in conjunction with Venus, on the 18th, at 7 h. 9 m. P. M., being 9° 45′ north.

The right ascension of Venus on the 1st is 6 h. 40 m., her declination is 16° 44′ north, her diameter is 47″.4, and she is in the constellation Gemini.

Venus rises on the first at 2 h. 53 m. A. M. On the 31st she rises at 1 h. 53 m. A. M.

MERCURY

is evening star until the 25th, and then morning star. He is in inferior conjunction with the sun on the 25th, at 10 h. P. M., when he ends his short course as evening star and passes to the sun's western side.

The right ascension of Mercury on the 1st is 10 h. 31 m., his declination is 7° 12′ north, his diameter is 8″.0, and he is in the constellation Leo.

Mercury sets on the 1st at 8 h. 9 m. P. M. On the 31st he rises at 4 h. 43 m. A. M.

SATURN

is evening star. He is closely approaching the sun, and when the month closes sets an hour later than the sun. The moon, when two days old, is in conjunction with Saturn on the 24th, at 1 h. 55 m. P. M., being 1° 19′ north.

The right ascension of Saturn on the 1st is 11 h. 52 m., his declination is 3′ 13′ north, his diameter is 15″.0, and he is in the constellation Virgo.

Saturn sets on the 1st at 9 h. 16 m. P. M. On the 31st he sets at 7 h. 25 m. P. M.

URANUS

is evening star. The moon makes a close conjunction with the planet on the 27th at 10 h. 11 m. A. M., being 11′ north.

The right ascension of Uranus on the 1st is 14 h. 1 m., his declination is 11° 48′ south, his diameter is 3″.5, and he is in the constellation Virgo.

Uranus sets on the 1st at 10 h. 31 m. P. M. On the 31st he sets at 8 h. 36 m. P. M.

NEPTUNE

is morning star. His right ascension on the 1st is 4 h. 38 m., his declination is 20° 33′ north, his diameter is 2″.6, and he is in the constellation Taurus.

Neptune rises on the 1st at 0 h. 36 m. A. M. On the 31st he rises at 10 h. 36 m. P. M.

Mars, Jupiter, Venus, and Neptune are morning stars at the beginning of the month. Saturn, Mercury and Uranus are evening stars.

Mechanical Refrigeration.

At the recent meeting in San Francisco of the American Society of Engineers, a paper was read by Professors Denton and Jacobus on the performance of refrigerating machines, in which, among other valuable conclusions, they show that a pound of coal used to make steam for a fairly efficient refrigerating machine can produce an actual cooling effect equal to that produced by the melting of 16 to 46 pounds of ice, the amount varying with the conditions of working. Commenting on this paper, the *Engineering News* says:

"To put the same facts differently, 855 h. u. per lb. of coal converting into work in the refrigerating plant (at the rate of 3 lb. coal per h. p. hour) will abstract 2,275 to 6,545 h. u. of heat from the refrigerated body. The waste of cold in actual ice making is such that the production of ice per pound of coal is about half this, or somewhat more if the ice is not made from distilled water. Ice making is far from being the sole use of refrigerating machines, however; in fact, now that the efficiency and reliability of mechanical refrigeration is proved, it wants only an appreciation of its advantages by the public to bring it into much more extended use than it has yet received.

In a paper on "The Ventilation of Buildings," by Mr. Alfred R. Wolff, M. Am. Soc. M. E., the author allowed 2,000 cu. ft. of fresh air per hour per person as sufficient for fair ventilation. With the air at an initial temperature of 80° F., its weight per cubic foot will be 0·0736 lb.; hence the hourly supply per person will weigh 2,000 × 0·0736 lb. = 147·2 lb. To cool this 10°, the specific heat of air being 0·238, will require the abstraction of 147·2 × 0·238 × 10 = 350 h. u. per hour. These assumptions may be accepted as correct, except as to the temperature to which the air should be cooled. Probably a temperature of 70° on a hot summer day would cause frequent complaints of cold; a maximum reduction of 10° from the external atmosphere is, however, a proper basis to calculate upon, at least for office buildings. Thus the necessary cooling effect calculated by Mr. Wolff may be accepted as correct.

Taking the figures given by Messrs. Denton and Jacobus for the refrigerating effect per pound of coal as above stated, and the required abstraction of 350 h. u. per person per hour to have a satisfactory cooling effect, the refrigeration obtained from a pound of coal will produce this cooling effect for 2,275 ÷ 350 = 6½ hours with the least efficient working, or 6,545 ÷ 350 = 18·7 hours with the most efficient working, the ammonia plant being used in either case, and compressed air being much less efficient. With mechanical refrigeration, if we assume 10 hours' cooling per person per pound of coal as a fair practical service in regular work, we have an expense of only 15 cts. per thousand persons per hour, coal being estimated at $3 per short ton. Of course, this is for fuel alone, and the various items of oil, attendance, interest and depreciation on the plant, etc., must be considered in making up the actual total cost of mechanical refrigeration. But, on the other hand, by the use of the most economical machinery, a much higher efficiency than that which we have assumed or than the highest given in the authors' table ought to be possible, as they have allowed a coal consumption of 3 lb. per h. p. hour.

These figures are sufficient, however, to prove the practicability of artificial cooling for office buildings, hospitals, theaters, hotels, and even for the best class of private houses. It is a curious example of the slowness with which people take advantage of modern inventions that thousands of men sit sweltering in hot offices in the midsummer days; business lags and the efficiency of workers whose time is worth many dollars per hour is greatly reduced. At the same time not more than three or four blocks away are great provision warehouses where the temperature is kept at freezing the year round, and at a very moderate cost. If it pays to keep dead ducks and turkeys cool on Greenwich Street, why would it not pay to keep live business men cool on Broadway?

What They Think of It.

Our contemporaries have universally commended to their readers the value of the "Scientific American Cyclopedia of Receipts, Notes and Queries," as a work of reference for engineers, mechanics, and households. The Boston *Journal of Commerce*, a newspaper of large circulation and influence in the New England States, has this to say of it:

"This splendid work contains a careful compilation of the most useful receipts and replies given in the notes and queries of correspondents as published in the SCIENTIFIC AMERICAN during the past fifty years, together with many valuable and important additions. Nearly every branch of the useful arts is represented. It is by far the most comprehensive volume of the kind ever placed before the public. The work may be regarded as the product of the studies and practical experience of the ablest chemists and workers in all parts of the world; the information given being of the highest value, arranged and condensed in concise form, convenient for ready use. Almost every inquiry that can be thought of, relating to formulæ used in the various manufacturing industries, will here be found answered. Instructions for working many different processes in the arts are given. Many of the principal substances and raw materials used in manufacturing operations are defined and described. No pains have been spared to render this collateral information trustworthy. Those who are engaged in any branch of industry probably will find in this book much that is of practical value in their respective callings. Those who are in search of independent business or employment, relating to the home manufacture of salable articles, will find in it hundreds of most excellent suggestions. In fact, the book is an overflowing treasury of practical scientific information, and is worth many times its price to scientific students."

Eruption of Mount Etna.

Mount Etna is at present very active, and it is thought by those competent to judge that a terrible outbreak is impending. The inhabitants of Catania, of Nicolosi, and the surrounding country are in a state of consternation. Twelve houses and a portion of a large church have been destroyed. Shocks are frequent, and a fissure has opened at the summit and a stream of lava is rapidly flowing down the sides of the mountain, threatening to overrun the village of Rinazzi.

It is thought that the first outbreak of this mountain occurred in the seventh century before Christ, and from that time on many disasters are known to have resulted from its outbursts.

In 1669, the city of Nicolosi was converted into a heap of ruins. A fissure 6 ft. wide and of unfathomable depth opened in the side of the mountain. In 1693 there was another great outbreak which leveled Catania to the ground and buried 18,000 of its inhabitants. At this time fifty towns were destroyed in Sicily, and the total loss of life amounted to nearly 100,000. The last eruption occurred in 1868.

The Power of Lightning.

On August 1, 1846, St. George's Church, Leicester, which was a new building, was entirely destroyed during a thunder storm. The steeple having been burst asunder, parts of it were blown to a distance of thirty feet in every direction, while the vane rod and top part of the spire fell perpendicularly down, carrying with them every floor in the tower, the bells and the works of the clock. The falling mass was not arrested until it arrived on the ground, under which was a strong brick arch, and this also was broken by the blow. The gutters and ridge covering were torn up, and the pipes used to convey the water from the roof were blown to pieces. Mr. Highton calculated the power developed in the discharge of the lightning which destroyed this church with some known mechanical force. He discovered that a hundred tons of stone were blown down a distance of thirty feet in three seconds, and consequently a 12,220 horse power engine would have been required to resist the efforts of this single flash.