POSITION OF THE PLANETS IN JULY.

JUPITER

is morning star. He has attained once more the supremacy that belongs to him as leader of the planetary brotherhood, and outshines every other star in the heavens in the small hours of the morning. He is a marked feature in the sky on beautiful midsummer mornings, as he pursues his path toward opposition. Jupiter's opposition occurs 34days later every year. It took place last year on October 12. It will take place this year on November 18. The reason is that his synodic period, or the time it takes him to move from opposition to opposition again, is 399 days, an easy number to remember. Meantime, the earth has made one revolution, and advanced 34 days on another, before the sun, the earth, and Jupiter come into line with the earth in the middle. The oppositions of the great planet, therefore, are retarded 34 days each year.

Jupiter rises at the close of the month about midnight, and observers will find him an interesting object from the time he comes looming above the eastern horizon until he is seen no more in the glow of the morning dawn. He is specially attractive as a telescopic study in his present position, a small glass bringing out his brilliant belts and shining moons.

Jupiter's satellites are again in good position for observation. A favorable time to look for them in July is at 2 o'clock in the morning. We give a few of the configurations for an inverting telescope at this hour.

On the 1st, the four satellites are visible, III, II, and I being on the left or west of the planet, and IV being on the right or east.

On the 4th, I is making a transit on the planet's disk, II is on the left, and IV and III are close together on the right, probably looking like a single satellite.

On the 11th, III is occulted by the planet, IV and II are on the left, and I is on the right.

On the 20th, I is making a transit, II, IV, III are on the right.

On the 21st, the four satellites are on the right, IV, III and I closely clustered near the planet and III farther away.

On the 30th, II is occulted, III is on the left, and IV and I near together on the right.

As we watch the manifold changes in these bright orbs, we cannot fail to recall the fifth satellite, the great astronomical discovery of 1892, and the third greatest discovery in the nineteenth century, and to hope that when Jupiter rolls round to his most favorable position again, Barnard with his bright eyes and the aid of the Lick telescope may find a companion for his tiny satellite.

The moon, four days before new moon, is in conjunction with Jupiter on the 9th, at 0 h. 54 m. P. M., being 3° 35′ north.

The right ascension of Jupiter on the 1st is 3 h. 21 m., his declination is 17° 28′ north, his diameter is 33″.4, and he is in the constellation Taurus.

Jupiter rises on the 1st at 1 h. 35 m. A. M. On the 31st he rises at 11 h. 54 m. P. M.

VENUS

is evening star. She has reached a position where she may easily be seen, setting during the month a little more than an hour after the sun. Observers must look for her a half hour after sunset a little south of the sunset point during the first part of the month, and still further south as the month progresses, until at its close she will be found 6° south of the sunset point. Few directions are necessary for finding the peerless star, excepting to learn her position in the sky. She herself reveals the secret of her presence as she glows in the evening twilight, and is beautiful to behold, even when smallest in size and just free from the eclipsing sunbeams.

Venus has an incident to diversify her July course. She makes a close conjunction with Mars on the 9th, at 9 h. 2 m. A. M., being 18′ north. The event would be more interesting if it did not occur in daylight.

The moon is in conjunction with Venus, the day after new moon, on the 14th, at 4 h. 42 m. P. M., being 3° 24′ north.

The right ascension of Venus on the 1st is 7 h. 54 m., her declination is 22° 13′ north, her diameter is 10″.4, and she is in the constellation Gemini.

Venus sets on the 1st at 8 h. 32 m. P. M. On the 31st she sets at 8 h. 20 m. P. M.

MERCURY

is evening star. He reaches his greatest eastern elongation on the 11th at 8 h. A. M., when he is 26° 30′ east of the sun. He is then visible to the naked eye in the west as evening star, but is too far south of the sun to be easily picked up. Southern observers will see him to better advantage.

The moon, two days after her change, is in conjunction with Mercury on the 15th, at 2 h. 15 m. A. M., being 6° 10′ north.

The right ascension of Mercury on the 1st is 8 h. 28 m., his declination is 20° 18′ north, his diameter is 6″.8, and he is in the constellation Cancer.

Mercury sets on the 1st at 8 h. 58 m. P. M. On the 31st he sets at 7 h. 22 m. P. M.

SATURN

is evening star. He ceases to occupy the most prominent place on the records of the month, but there are interesting points in his course. The telescopic view of his rings, belts, and moons is superb, and calls forth much admiration from many observers.

A correspondent of the *English Mechanic* describes the conjunction of Saturn and Gamma Virginis on April 8 as an extremely beautiful sight. The actors in the celestial scene were but 6′ of arc apart, almost touching each other, and visible in the same telescopic field. The contrast between the yellow planet and the brilliant white double star was exquisite. Observers should improve the present opportunity for a telescopic study of the marvelous planet, for his best period of visibility is passing away. It extends from February to July.

The moon, two days before the first quarter, is in conjunction with Saturn on the 18th at 8 h. 36 m. P. M., being 1° 5′ south. The conjunction will be visible, but the resulting occultation will be seen only in the southern hemisphere.

The right ascension of Saturn on the 1st is 12 h. 28 m., his declination is 0° 19′ south, his diameter is 16″.8, and he is in the constellation Virgo.

Saturn sets on the 1st at 11 h. 42 m. P. M. On the 31st he sets at 9 h. 48 m. P. M.

URANUS

is evening star. He is in quadrature with the sun on the 29th at 11 h. 49 m. A. M., being 90° east of the sun. This planet, after retrograding or moving westward since February 18th, becomes stationary on the 14th, and changes his course to direct or eastward motion, continuing to move in this direction until the end of the year. The four giant planets, Jupiter, Saturn, Uranus, and Neptune, are now all moving eastward or in direct motion.

The moon, the day after the first quarter, is in conjunction with Uranus, on the 21st, at 6 h. 4 m. A. M., being 1° 12′ north.

The right ascension of Uranus on the 1st is 14 h. 18 m., his declination is 13° 21′ south, his diameter is 3″.7, and he is in the constellation Virgo.

Uranus sets on the 1st at 0 h. 50 m. A. M. On the 31st he sets at 10 h. 46 m. P. M.

NEPTUNE

is morning star. He is of little importance on the celestial record, for he is very near the sun, and very far from the earth. Several months must elapse before he is in good position for observation.

The moon is in conjunction with Neptune, three days before her change, on the 10th, at 6 h. 33 m. P. M., being 5° 16′ north.

The right ascension of Neptune on the 1st is 4 h. 43 m., his declination is 20° 46′ north, his diameter is 2″.5, and he is in the constellation Taurus.

Neptune rises on the 1st at 2 h. 38 m. A. M. On the 31st he rises at 0 h. 49 m. A. M.

MARS

is evening star. He will be found low down in the west, and during the first part of the month in the vicinity of Venus and Mercury. The close conjunction of Mars and Venus on the morning of the 9th has been described. The planets will be near each other on the evening of that day, and on the evening preceding, and may be seen together in the field of a small telescope, giving an opportunity for comparing their size, color, and brilliancy.

The moon, when one day old, is in conjunction with Mars, on the 14th, at 11 h. 19 m. A. M., being 3° 49′ north.

The right ascension of Mars on the 1st is 8 h. 14 m., his declination is 21° 7′ north, his diameter is 4″.0, and he is in the constellation Cancer.

Mars sets on the 1st at 8 h. 48 m. P. M. On the 31st he sets at 7 h. 46 m. P. M.

THE OCCULTATION OF ANTARES.

The moon occults the star Antares or Alpha Scorpii on the 23d. The immersion takes place at 8 h. 28 m. P. M. The emersion takes place at 9 h. 19 m. P. M., the occultation continuing 51 m. The data are given in Washington mean time, and will vary in other localities on account of the moon's parallax. The moon is then three days past the first quarter and moves with her dark edge foremost. The star will disappear at the dark edge with a startling effect, as if it were suddenly blotted from the sky. Antares is a double star, of the 1.4 magnitude, of a fiery red color. It has a companion of the 7 magnitude of a bright green color, so near the principal as to be nearly involved in its flaming rays. It was not known for a long time if the smaller component shone with complementary or inherent light. The problem was solved in 1856 during an occultation of Antares, when the tiny companion emerged from behind the dark limb of the moon before its overpowering neighbor and gave a curious proof of its independent and not contrasted green color.

The occultation commences more than an hour after sunset. It will be visible and very interesting. The observer as soon as it is dark enough will see the moon approaching the star, and can watch the phenomenon through its whole progress, for when the occultation is over the moon is three hours above the horizon. A small telescope or an opera glass will greatly aid in the observation.

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

[FOR THE SCIENTIFIC AMERICAN.]

Ethan S. Chapin.

America is the home of self-made men. Thenumber of those who rise from the poorest homes and from most unfavorable surroundings to wealth and eminence is large. Comparatively few, however, become distinguished as scholars, unless while young they receive the advantages of a fairly good education.

Four years ago last March there died at Springfield, Mass., a man whose name should be widely known, Ethan S. Chapin, Esq. While a boy he went to school barely long enough to learn how to read and write. He began to support himself when he was but twelve years of age, and was a hard-working man all his life. Many will remember him as one of the proprietors of the well known Massasoit House in its palmiest days. Notwithstanding the disadvantages under which he labored, Mr. Chapin became a distinguished scientific scholar. He published several books; the latest, "Gravitation the Determining Force," is the one on which his reputation as a scientist must chiefly depend. As early as 1867, he advanced the theory of "The Instability of the Earth's Axis," a theory which no scholar of importance had ever taught, and which, when proposed by Mr. Chapin, was treated with contempt. Latterly, however, it has received increasing attention, and is now generally accepted by students of physical science. It has long been noticed that the geographical position of the observatories on the continent of Europe changed each year. They have been slowly receding from the North Pole. Various suggestions have been made to account for this phenomenon. There seems to be no alternative but to admit that this variation of latitude is caused by a movement of the poles. In other words, the geographical axis of the earth is not identical with its axis of rotation. The pole of the former is about fifteen miles distant from that of the latter. The geographical pole actually moves about four feet every year.

In consequence of this unsteadiness of its axis, the earth, as it moves along its orbit, has an eccentric, wabbling motion.

It is anticipated that further study in the line of this discovery will throw important light upon three facts of great interest to students, viz., the glaciation of the earth, the presence in the Arctic regions of flora which at present is characteristic of Southern Europe, and the tides.

Is it not possible that the variation of latitudes, which now is known to exist, and the changes in the level of the earth's crust, which have been going on in all ages, sufficiently account for all the evidences of glaciation found in various parts of the world, without supposing an extensive "glacial epoch"? This was Mr. Chapin's belief.

The presence in the regions around the North Pole of flowers and fruits which require an amount of light and heat now found in the southern part of the north temperate zone leads us to suppose either that the earth formerly received far more heat from the sun than it now does or that the position of those northern latitudes has very perceptibly changed. This latter hypothesis has been made more probable by the discovery of the instability of the earth's axis.

The eccentric motion of the earth caused by this instability of its axis is of great importance in explaining the phenomenon of the tides. In no other way can we so easily account for the accumulation of the tidal waves on opposite sides of the earth, and for their tardy movement following the track of the moon. It is very interesting to know that it was the study of this subject that led Mr. Chapin in the first place to discover the now generally accepted and important phenomenon of the instability of the earth's axis.

Fast Traveling.

The train which the Pennsylvania Railroad furnished for carrying the naval officials to Chicago on their recent visit to the World's Fair, the *Railway Master Mechanic* says, astonished most of those Europeans who participated in the journey, by its elegance and many conveniences. The train consisted of eight Pullman cars, which, with the engine, weighed over 500 tons. But notwithstanding the heavy train, the time from Chicago to Jersey City was made in less time than the "Limited." The distance from West Philadelphia to Jersey City, 92 miles, was covered in 102 minutes, and 18 miles between New Brunswick and Elizabeth were covered in 14 minutes, which is believed to be the fastest ever run with such a heavy train. From Pittsburg to Altoona two engines were employed to haul the train, but all the rest of the trip was made with the class "P" engine.

World's Fair Notes.

(*Continued from page 3.*)

think it advisable to skip this thoroughly delightful part of the Exposition. There is more real harmless amusement and instruction for the average person to be had in the Plaisance for $5 than can be obtained for three times the money elsewhere. It is something to hear the orchestras of all nations, which run in a direct line from the German band down to the Chinese artists, who will certainly be lynched when the cowboys come.

The Russian pavilion was opened with all the pomp and ceremony incident to the practice of the rites of the Greek Church. His Eminence the Most Reverend Nicholas, Bishop of the Russian Greek Church of America, was the celebrant of high mass, and after an address the bishop dipped the gold crucifix in holy water and sprinkled the temporary sanctuary, and then, amid the eager gaze of thousands of spectators and the chiming of bells, he sprinkled each of the exhibits with holy water. The party then returned to the temporary church, and all present were sprinkled with the water and allowed to kiss the crucifix.

One of the engineering successes of the Fair is the transmission of power by compressed air. From the huge compressors in Machinery Hall the air is carried to the Transportation building, in a nine-inch pipe, at a pressure of eighty pounds to the inch. The stately Baldwin locomotives and other exhibits are run by the air thus delivered. In the Mines building live steam is provided, which runs a compressor, which in turn furnishes the power for nearly all the machinery in the building. One peculiarity which was noticed particularly when the locomotives were started was that all the stuffing boxes leaked, until repacked. The gain in comfort is remarkable, as the Transportation building would be insufferably hot, if the machinery were to be run by steam. As it is, the exhaust air assists ventilation. Compressed air is also used in the sewage system of the grounds.

The legislature of Illinois has passed a bill enabling the Park Commissioners to purchase the Art Gallery building at the close of the Exposition. It is noted as being one of the purest and most beautiful architectural designs in the world.

Correspondence.

Square Shafting Made of Sheet Steel.

To the Editor of the Scientific American:

Your illustration of the broken shaft of steamship Hecla in your issue of June 3 shows clearly the inconsistency of one solid shaft forging. Had the same consistency of iron been secured together in sheets of steel say one-half to one inch thick, the shaft made square, bolted or clamped together to prevent either twisting or buckling, with the bearings collared on the square, I will venture to assert the practical engineer will agree with me in saying the steel plates composing a shaft as suggested will be naturally stronger than a single forged body of iron. I claim also a square shaft when broken is more readily mended by clamps and bolts than the round shaft now in common use. My reasoning for this is the same in building a timber of several boards from different lumber when secured properly together is much stronger than one solid timber. G. W. K.

New York, June 8, 1893.

A Simple Method for Determining the Velocity of Projectiles.

To the Editor of the Scientific American:

It may be of interest to amateur riflemen to know the following simple method for ascertaining the effect of gravity on a bullet shot horizontally from a rifle to any distance:

Sight the rifle upon the target, keeping the sights plumb above the center line of the bore of the rifle. Mark where the ball strikes. Then reverse the rifle, so as to have the sights exactly *beneath* the line of bore. In this reversed position sight it on the target as before, and mark where the bullet strikes. One-half the difference in the elevation of the two bullet marks will represent the effect of gravity in drawing the bullet away from a straight line.

Divide the difference in elevation of the two bullet marks by 32 and extract the square root. This will give the time in seconds that it took the ball to travel the distance.

The distance divided by this time will give the speed of the bullet per second. J. A. G.

Grand Rapids, Mich.

The Litchfield Mill.

To the Editor of the Scientific American:

In your issue of June 10, I notice a communication from Mr. E. L. Otis, of Minneapolis, who good naturedly brings you to task for referring to the great mill which exploded in this city, March 21, as probably the largest flour mill in the world. Mr. Otis exhibits true loyalty to his own city, and grows indignant at the thought that outside of his famed flour-milling city of Minneapolis could exist the largest mill in the world. If the SCIENTIFIC AMERICAN had qualified its assertion by adding "winter wheat," no objection to the statement could possibly be sustained, for the Litchfield mill was, so far as we know, the largest *winter wheat* flour mill in the world, having a capacity of 2,000 barrels of flour a day. The product of this mill was all sold in Europe, not a pound being put upon the market in this hemisphere.

A scientific explanation of this most disastrous, and at the same time most wonderful, explosion would not only interest Litchfield people, but your readers in general throughout the country.

HARRY E. KELLY,
Editor Herald, Litchfield, Ill.

The White Pine Aphis.

To the Editor of the Scientific American:

I send you by to-day's mail some specimens of a bug or beetle that is destroying the pine trees in this county, and any information that you may give, either by mail or through your valuable paper, will be appreciated by this community. You will perceive two small horns or teats on their backs that the common red ants nurse from. This I watched for an hour this morning. Would like a remedy for destroying them without injury to trees. By request of several citizens.

GEORGE A. MILES.

Ainsworth, Neb., June 6, 1893.

Reply by Professor C. V. Riley.—The specimens referred to by Mr. Miles were in extremely bad condition when received, but from the partially decayed remnants it is evident that they were a large species of plant louse belonging to the genus Lachnus and closely related to, if not identical with, *L. strobi*, Fitch, the condition of the specimens not permitting positive specific determination. This insect is known as the white-pine aphis, and is the commonest species of its family upon that tree in the Atlantic States. The lice congregate in colonies on the ends of the pine twigs, the bark of which they puncture. They are almost always accompanied by ants, which are attracted by the honey dew which the plant lice secrete from the little honey tubes referred to by Mr. Miles. The species has been observed in the past to be extremely abundant in certain years and comparatively rare in others. This alternation in the relative numbers of the Lachnus has been found to be due to the rapid increase of its natural enemies whenever the conditions favor and to the succeeding necessary decrease of the Lachnus itself. Later in the season a great many, if not the large majority, of the plant lice will be found dead, the dried remains clinging to the leaves and branches, and upon close inspection these dead bodies will be found to have a minute hole, from which a hymenopterous parasite has issued. Ladybirds, lace-wing flies, and syrphus flies are all active in preying upon them.

It is difficult to deal with any insect trouble of this kind upon large trees over extensive forests, but individual trees may be sprayed with ordinary kerosene soap emulsion diluted with from five to ten parts of water, and such spraying will undoubtedly have a good effect in destroying the bulk of the plant lice. Otherwise it is pretty safe to trust to the natural enemies which I have mentioned, and which will, in the course of the summer, effectually do their work. An interesting note has been published in one of the earlier numbers of *Insect Life* (Vol. II., No. 10, p. 314) upon the subject of the honey secreted by one of these pine-inhabiting species of Lachnus. I have sent Mr. Miles a marked copy of this bulletin for his information.

It is quite possible that some other agent is at work in the destruction of the pine timber referred to by Mr. Miles and that the Lachnus is only an incident. It would be well for him to have the trunks thoroughly examined for bark borers. Their presence may be known by the exuding pitch and by their exit holes, like shot holes, in the bark. Just now, also, another plant louse, *Chermes pinicorticis*, is proving very destructive to pines, especially white pines, in parts of Nebraska, and this is really more disastrous than the Lachnus. It is a smaller insect and attaches itself in more sheltered portions of the twigs and branches, covering itself with a flocculent material. There has been no experience on a large scale as to the best methods of ridding trees of either of these insects, so that the recommendation to use kerosene emulsion is from analogy as to its action on allied forms.

Nitro-glycerine Precautions.

To the Editor of the Scientific American:

In your issue of February 4, 1893, I note a communication from Mr. J. T. Pettee, of Meriden, Conn., on the subject of keeping nitro-glycerine and dynamite from freezing, thereby avoiding some of the terrible calamities frequently reported, where workmen are killed by an explosion which ensues consequent upon their thawing these substances out.

While, theoretically, Mr. Pettee is right in saying that nitro-glycerine and dynamite should be kept from freezing, the practical application would not, in many cases, work to a successful end. If the men who use these explosives cannot thaw them out properly, it cannot be expected that they will exercise anymore intelligence in keeping them unfrozen. But it is already an incontrovertible fact that it is extremely dangerous to transport nitro-glycerine in an unfrozen state.

Therefore, the proper point to aim at is to insist that, if frozen, it must be *thawed out properly*. Upon this point, the laws should be most stringent, and the responsibility for non-compliance should be placed, not upon the ignorant workman, who is only a machine, but upon *those who have the work in charge*.

Apropos of the subject under discussion, I will quote below from an able series of lectures by Prof. Charles E. Munroe, of the Columbian University, Washington, D. C., formerly chemist to the Torpedo Corps, United States Navy, whose practical experience and experimentation with and analysis of every known form of explosive for a period of over twenty years make him the best authority in matters of this kind:

"When frozen, nitro-glycerine may be conveniently and safely thawed by placing the vessel containing it inside another containing water not hotter than 100° Fah., but these precautions should be strictly observed, as most of the accidents which have occurred with nitro-glycerine and explosives of which it forms a part have resulted from foolish and criminally careless attempts to thaw the frozen material by other means. Frozen explosives should never be put into the vessel containing the water, or brought into contact with any heated surface, except as directed above. Nitro-glycerine and its dynamites are extremely tricky when pure and when fresh, and if kept at normal temperatures they are not liable to undergo decomposition; but when subjected to the extreme heat of summer, followed by the excessive cold of winter, for a number of years, they are very apt to become unstable, hence dangerous, unless handled and used with extreme care.

"Many foolish persons suppose that since it is reasonably safe to ignite a cartridge of unfrozen dynamite, it is equally safe to warm it upon a shovel, or in an oven, or in a tin vessel over a fire, or in various other ways, which usually lead to a verdict of *accidental death*, but would be more properly designated as *suicide* or *manslaughter*. It cannot be too strongly impressed upon the minds of those handling them that if dynamite or other nitro-glycerine preparations are gradually warmed up to a temperature approaching their exploding points, they become extremely sensitive to the least shock or blow, and once that point is reached they do not simply ignite, but they explode with great violence; and further, that owing to the poor conductivity of the mass, a portion of it which is in contact with the source of heat may become raised to this temperature, while the rest of the mass is much below it."

The proper way to prevent the loss of life occasioned by this careless way of thawing out nitro glycerine and dynamite would be, it seems to me, to embody the subject matter above in a set of formulated rules receiving the sanction and pressure of the law in each and every State, whereby the verdicts of *accidental death* would be changed to their proper signification, *suicide* or *manslaughter*—suicide where an individual is concerned, manslaughter where a corporation is responsible. SAMUEL RODMAN, JR.,
Late 1st Lieut., U. S. Army.

Chicago, Ill., June 1, 1893.

The American Association for the Advancement of Science.

The forty-second annual meeting of the American Association for the Advancement of Science is to be held in Madison, Wis., from August 16 to August 23, inclusive. By the courtesy of the Regents the sessions will be held in the buildings of the University of Wisconsin and in the assembly chamber of the capitol. Lanterns for projecting views and slides are provided in several rooms, and one room is kept for general lantern use. To it any section may adjourn when lantern facilities are required. The outline of the programme has been published and indicates a full employment of the time of the meeting. F. W. Putnam, Cambridge (office Salem), Mass., is the permanent secretary.

Paint for Iron and Steel.

The invention refers to a new material, called "siderosthen," for the coating of iron and steel surfaces, with a view to prevent the formation of rust upon them. The compounds used for the manufacture of this paint are the tar obtained from works producing fat gas, "goudron," which is a mixture of about 85 part of refined Trinidad asphalt and 15 parts of refined asphalt oil, or, instead of the "goudron," sulpburmay be used. If "goudron" be employed, this is dissolved in the gas tar, in suitable quantities, and this mixture can then forthwith be employed for the purpose in view. If sulphur be used, 8 per cent of it is mixed with the gas tar, and this mixture is then heated to about 100° C.