power of the wind is exerted. This will doubtless be the case at almost all times; should it ever be advisable to let the mill lie still, the vane can be changed to a position at right angles, and at once the shield is presented directly to the current of the wind, and the mill is entirely sheltered.

Much more elegant and expensive windmills can be built, and yet not be one particle more effective. Such a mill will run for years without a dollar spent for repairs; it runs at the utmost speed of a gale, and needs no checking.

At the average speed of the wind in New York a mill of this size is good for a steady half horse power; that is, it will give 84 hours of one horse power per week, for night and day, week days and Sundays are pressed into the service. If, therefore, the manufacturer has space on which he can build fifteen such mills, he has at his command the full force of his twenty horse engine. The expense of building them will not exceed $800.

Here, then, is our case. We have the wind wheels each driving its air pump leading to the receiver, and we have the steam engine similarly connected. We will assume that by the action of one or the other or both, we have the receiver stored with air at a pressure of 1,000 pounds. At starting work in the morning there is no occasion to think of steam, for there is on hand a reserve of force sufficient for the day's running, and the engine lies idle. The work goes on, but so do the wind wheels go on, for they take care of themselves and need no attention, and they never can make a revolution without adding to the stock of compressed air. When the factory shuts down at night, the chances are very strong that the pressure in the receiver is as great as it was at starting, or if not it will probably be fully up by morning.

A factory thus fitted will run with no outlay for current expense of power during a very large part of the year, and it certainly does seem as though the plan was worth a trial. It does not solve fully the problem of storing the wind power, but it may perhaps help us in that direction.

A.

ASPECTS OF THE PLANETS FOR NOVEMBER.

NEPTUNE

is morning star until the 12th, when he becomes evening star. He retains until that time his pre-eminence among the planets on the morning roll, being the first to make his appearance in the field. On the 12th, at 4 o'clock in the morning, the event in his synodic period most interesting to terrestrial observers takes place. He is then in opposition with the sun. As the word implies, he is opposite to the sun, rising when the sun sets and setting when the sun rises. He is at his nearest point to the earth; the sun, the earth, and Neptune being in a straight line, with the earth in the center.

An observer on the sun, endowed with visual power to take in the system at a glance, would behold the earth and Neptune, far beyond, directly in line. He would also find, just before the time of Neptune's opposition, six of the seven planets on one side of the sun, leaving Venus as the sole planetary representative on the other. The movements of the planets as seen from the sun would be far less complicated than they are as seen from the earth, who is herself traveling around the sun, and changing constantly her position in regard to the other members of the system. Neptune at opposition is under the most favorable conditions for being seen with the telescope. Though the third planet in size, he is too far distant ever to be visible to the naked eye. He is now among the small stars of the constellation Aries, near the boundary line of Taurus, and nearly west of Aldebaran, the only bright star in his neighborhood. A good telescope sweeping the field where he lies will quickly detect his presence. For a small, ill-defined sphere will suddenly spring into being, while the surrounding stars will remain mere points of light.

Neptunian astronomers have an advantage over terrestrial ones, and can find little difficulty in measuring the distance of the fixed stars. While the earth has 180,000,000 miles—the diameter of her orbit—for a base line, Neptune sweeps round the sun in an immense orbit whose diameter, or base line for measuring the distance of the stars, is 5,550,000,000 miles. But there are disadvantages to counterbalance this advantage. It takes Neptune 165 of our years to revolve once around the sun, and astronomers there must wait more than eighty years to make measurements in opposite points of his orbit. The sun as seen at this far away planet measures 64″ in diameter, a little more than the greatest apparent diameter of Venus as seen from the earth. Our glorious sun to the Neptunians is therefore but a brilliant star, giving only a thousandth part of the light we enjoy.

The right ascension of Neptune is 3 h. 12m.; his declination is 16° north; and his diameter is 2·6″.

Neptune rises on the 1st at half-past 7 o'clock in the evening; on the 30th he sets about half-past 5 o'clock in the morning.

SATURN

is morning star until the 28th, and then evening star. On the 28th, at 11 o'clock in the evening, Saturn is in opposition with the sun, the culminating point of his size and brilliancy for the present year. He will be a superb object for observation during the month, rising now an hour and a half after sunset, coming every evening earlier above the horizon, and shining so serenely in the evening sky that he needs no one to point him out as he travels on his way near the Pleiades and Aldebaran, with whom he has long kept company. Very clear sighted observers may see him in an elongated aspect, on account of his widely open rings. A telescope of moderate dimensions will give a surpassingly lovely picture of this unique planet, and every one interested in astronomy should make an effort to obtain a telescopic view of this wonder of the skies.

On the 1st, at midnight, Saturn is in conjunction with Alpha Tauri, or Aldebaran, the star being 3° 30′ south. This is the second conjunction of the same planet and star during the year, the previous one having occurred on the 13th of August, at almost the same point in the sky, with only a difference of 10′ in declination. Therefore Saturn is nearly in the same position in the heavens he occupied in August, although he has been wandering in his orbit in true planetary fashion, sometimes straight forward, sometimes backward, and sometimes stationary.

The right ascension of Saturn is 4 h. 29 m.; his declination is 19° 46′ north; and his diameter is 19″.

Saturn rises on the 1st at half-past 6 o'clock in the evening; on the 30th he sets a few minutes before 7 o'clock in the morning.

JUPITER

is morning star throughout the month, and when his regal head appears above the eastern hills star gazers pay involuntary homage to the brilliant planet that unerringly pursues his stately course in the star depths, and is visible through the entire night. Observers will not need to sit up late to obtain a glimpse of him, for he rises now at half-past ten o'clock, and, rising four minutes earlier every night, will be above the eastern horizon at half-past 8 o'clock at the close of the month.

On the 22d he is stationary near Praesepe, the same luminous cluster in Cancer that Mars immortalized by his passage through it in October. Those who desire to observe a planet in a stationary phase will find an illustration in Jupiter, who scarcely varies his position during the month.

The right ascension of Jupiter is 8 h. 25 m.; his declination is 19° 35′ north; and his diameter is 37·6″.

Jupiter rises on the 1st at half-past 10 o'clock in the evening; on the 30th he rises at half-past 8 o'clock.

MARS

is morning star, but contributes no incidents to the annals of the month. He is in the constellation Cancer, though he makes his way into Leo before the month closes. His increase in size and ruddy color is plainly perceptible, his apparent diameter having doubled since the 1st of October. As he rises 22 minutes after Jupiter, he can readily be found. Mars illustrates direct motion at present, that is, he is moving eastward according to the signs of the zodiac.

The right ascension of Mars is 8 h. 47 m.; his declination is 19° 18′ north; and his diameter is 14·6″.

Mars rises on the 1st ten minutes before 11 o'clock in the evening; on the 30th he rises a quarter before 10 o'clock.

URANUS

is morning star, and pursues his slow and solitary way among the insignificant stars of Virgo. He, like Mars, is moving in a direct course, but at present is an object of little interest.

The right ascension of Uranus is 11 h. 47 m.; his declination is 2° 5′ north; and his diameter is 3·5″.

Uranus rises on the first about 3 o'clock in the morning; on the 30th he rises a few minutes after 1 o'clock.

MERCURY

is morning star until the 26th, and evening star the rest of the month. On the 26th, at 1 o'clock in the morning, he is in superior conjunction with the sun, passing behind and below him, and reappearing on his eastern side as morning star. He takes no active part in the events of the month, but contents himself with pursuing the swift tenor of his way.

The right ascension of Mercury is 13 h. 38 m.; his declination is 8° 17′ south; and his diameter is 5·4″.

Mercury rises on the first about half-past 5 o'clock in the morning; on the 30th he sets about half-past 4 o'clock in the evening.

VENUS

is evening star during the whole month, the only planet that plays this part without change. She will not long remain at the foot of the list, but will soon put forth her claims to notice, when the other planets will hide their diminished heads. Though setting now forty minutes after the sun, at the end of the month she will be above the horizon a little more than an hour after sunset and can be easily seen. Her place will then be far south in the constellation Sagittarius, 2° 35′ south of the sunset point.

The righ ascension of Venus is 15 h. 9 m.; her declination is 17° 25′ south; and her diameter is 10·2″.

Venus sets on the 1st about half-past 5 o'clock in the evening; on the 30th, she sets about half-past 5 o'clock.

THE MOON.

The November moon fulls on the 14th at forty-one minutes after 11 o'clock in the morning, New York time. None of the planets lie near the moon's path until she nearly reaches the full, when she is in conjunction with Neptune, the planet being 15′ south. On the 15th, at noonday, she is in conjunction with Saturn, being 1° 2′ south. Observers in some localities between 28° and 71° south declination will see Saturn occulted, making the eighth occultation of this planet during the year. On the 19th the moon is at her nearest point to Jupiter; on the 20th she is near Mars; on the 23d she is near Uranus. On the 29th, the new moon is in conjunction with Mercury.

OCCULTATION OF BETA CAPRICORNI.

The moon the day before the first quarter occults Beta Capricorni, a star of the third magnitude in the constellation Capricornus. The immersion of the star takes place five minutes after 8 o'clock in the evening, Washington mean time. The emersion occurs four minutes after nine o'clock, Washington mean time. The occultation continues 59 minutes. The phenomenon is a beautiful one, is worth taking pains to see, and the hour of exhibition is convenient. As the moon travels with her dark edge foremost from new to full, her illumined side being next the sun, observers will see the star apparently blotted from the sky as it disappears behind the unillumined portion of the moon.

New Form of Electrical Accumulator.

Julius Elster and Hans Geitel show that Zamboni's dry piles can be used as accumulators. The copper pole of the pile is connected with the positive, and the tin pole with the negative poles of a Holtz machine. After the latter has been worked for a few minutes the dry pile is found to be charged. After repeated discharges the pile is found to contain a charge of considerable intensity. The authors recommend the following form of pile: The plates of the pile are strung by means of a needle upon a silk thread and then stretched between the poles of a Holtz machine. A pile of 11,000 pairs of plates of one square centimeter surface, after ten minutes charging, gave shocks one millimeter long and made a Geissler tube luminous. The light of the tube was continuous at first, but afterward became intermittent. Dry piles were also made of one metal. Plates of lead foil were coated on both sides with tissue paper by means of potash water-glass to which a little oxide of lead was added. A pile of 7,000 of the lead plates one square centimeter in section could be charged so as to exhibit strong polarization. A certain amount of moisture must be communicated to the piles. The superoxide of lead deposited electrolytically acts more powerfully than when deposited in any other way. A pile of 1,000 plates, coated on one side with chemically produced superoxide and on the other with protoxide of lead, gave proportionally much less tension. These piles are well suited to exhibit to a large audience the principle of Plante's or Faure's accumulator.—*Wiedemann's Annalen; American Journal.*

Preparation of Butylene.

Puchot says that butylene, C_4H_{10}, can be conveniently prepared from butylic alcohol obtained by fermentation, as follows: 100 parts of sulphuric acid are placed in a flask or retort, and 100 parts of butylic alcohol poured in carefully so that it will float on the acid. The flask is then placed in cold water and shaken until the two mix without much rise of temperature. Then 160 parts of gypsum and 40 of sulphate of potassium, both in powder, are introduced, still shaking the flask until the mixture is homogeneous.

On heating very gently the gas is given off. About 30 parts of butylene are obtained from 100 parts of alcohol, or nearly 40 per cent. The rest of the alcohol collects in the wash bottles, together with other interesting substances.

By the action of chlorine upon butylene in diffused daylight a liquid was obtained homologous with $C_8H_8Cl_2$, but in direct sunlight a substitution took place and formed $C_8H_4Cl_6$. If the flask was heated while chlorine was passing through, he obtained $C_8H_2Cl_8$.

Butylene is one of the constituents of illuminating gas, but its nature is so little known that we are not yet able to separate it from the other constituents of the gas.

A Steamer Comes into Port on Fire.

Late in the afternoon of October 22, the large iron steamship Heimdal, of the Thingvalla line, plying between New York and Amsterdam, came into this harbor with the signal, "I am on fire." Prompt assistance was rendered, the passengers and mails removed, and the ship saved. Including the crew, there were 350 persons on board. In the cargo were 1,000 cases of safety matches, consisting of brands manufactured in Norway, Sweden, and Denmark.

A smell of fire was noticed on the day preceding her arrival here, and upon investigation the matches, in the main hold, were found to be on fire. Steam from the boilers was turned into the hold, which reduced the heat.

The heads of these safety matches may consist of a pasty mass composed chiefly of chlorate of potash and sulphuret of antimony. They are lighted by being drawn across a surface on which is glued red or amorphous phosphorus mixed with very fine sand. This is generally put upon the outside of the box. It is considered probable that the fire was the result of spontaneous combustion.

THE new and thrifty town of Pullman, near Chicago, lies on a flat prairie, and the problem of drainage, which is so difficult to solve in a great many places, had to be met in Pullman. The following is the one adopted, and it is said to be satisfactory in its workings and profitable in its results: Sewers are built to empty into a sunken tank, from which the sewage is pumped through a twenty-inch main to a farm three miles away. The system cost $80,000; the farm yields a profit of $8,500 a year.

AT the beginning of 1882, Sweden possessed a mercantile navy of 4,151 vessels, measuring 530,000 tons, of which 3,397 were sailers, with 450,000 tons, and 754 steamers, with 80,000 tons. The number of sailing vessels had during the year decreased with 184 ships.

Steam vs. Water Power.

The minimum capacity and height of fall of some of the leading water powers of the United States is as follows:

Holyoke, fifty feet, 17,000 horse power.

Cohoes, No. 3, one hundred and five feet, 14,000 horse power.

Lewiston, fifty feet, 11,000 horse power.

Lowell, thirty-five feet, 10,000 horse power.

Lawrence, twenty-eight feet, 10,000 horse power.

Turner's Falls, thirty-five feet, 10,000 horse power.

Manchester, fifty-two feet, 10,000 horse power.

Paterson, thirty-five feet, 1,100 horse power.

Passaic, N. J., twenty-two feet, 900 horse power.

Birmingham, twenty-two feet, 1,000 horse power.

Fall River, with at least 500,000 more cotton spindles than any other town or city in the United States, is operated wholly by steam power.

Manufacturers have been heard to say they would not move across the street for the sake of substituting water for steam, considering the irregularity of most water powers. A more moderate statement is that of the manager of a prominent woolen mill on the seaboard, whom the writer asked if it would not be cheaper to run his mill by steam than by water. The answer was: "For a mill located as mine is, steam is the cheaper. I use half anthracite screenings and half culm coal from Nova Scotia. The average cost of both kinds of fuel landed on our wharf is $3.25 per ton, and at that figure steam is cheaper than water."—*Textile Gazette.*

Estimating the Value of Tanning Substances.

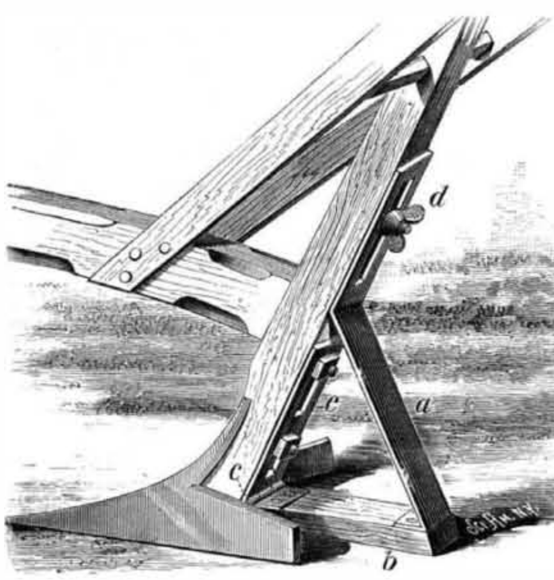
Prof. A. Vogel estimates the tannin in the following manner: 1 gramme of glue (gelatine) is dissolved in 100 c. c. of a solution of sal ammoniac, saturated in the cold, by the aid of heat. When cold it is standardized with tannin in such a way that 100 c. c. of the solution corresponds to 1 gramme of tannin.

Four grammes of the material to be assayed are cut up fine and moistened with water, left standing for 24 hours exposed to the air, then boiled in water, which is to be renewed three times, so that the total quantity of liquid will equal about 300 c. c. The previous moistening renders the extraction much more complete than when it is boiled at first.

When cold 20 c. c. of this solution is mixed with 20 c. c. of the cold saturated sal ammoniac solution, and into this mixture the glue solution is run from a burette, until on taking out a drop on a watch glass and adding a solution of tannin, a slight turbidity is noticeable. The precipitate settles so as to leave a clear solution above.—*Landw. Ver. Bayern.*

PLOW GAUGE.

The plowshare or cultivator shovel is attached to the foot of the stock by a bolt, so that the shovel fits in a recess in the stock, forming a shoulder that takes the thrust of the work. To the back of the stock is an apertured plate, *e*. Back of the plate is a block having a projection fitting in the aperture of the plate so as to form guides in which slides the plate. This projection is slightly thicker than the plate, so that the bolt may be tightened without binding the plate fast to the stock, to which the plate may be tightened by an upper bolt to secure the forward end of the shoe, *b*, at a proper level to suit the style of plowshare. The gaugeshoe, *b*, is wedge shape or vertically thinner at the front where it



HOLT'S PLOW GAUGE.

is connected to the plate by a hinge joint, thus allowing a free swing to the rear end, which is connected to the stock by a bent bar, *a*, held to the stock adjustably by a bolt passing through the stock and a block for guiding the plate. The bar is locked by the nut, *d*. The gauge may be adjusted as desired without loosening the connection of the share with the stock, and when it becomes necessary to change the stock it may be readily done by running off the nut, *d*, and swinging the bar and shoe forward on the hinge entirely free from the bolt connections of the plowshare.

This invention has been patented by Mr. Theodore Holt, of Lexington, Texas.

SHEEP GATE.

The design of this invention is to facilitate the feeding of sheep. The gate is constructed with journals upon the projecting ends of the upper bar, which work in slots in the upper ends of the gate posts, and is provided with a lever handle by which it may be raised. To the handle is secured a catch hook, B, which is placed over the pin, C, when it is expedient to keep the gate up. One end of the upper bar of the gate is extended, and from the end of the extension is hung the weighted box, E, so that the weight of the gate is counterbalanced; and as the upper part of the post swivels at A, the gate can be swung open to admit teams or large animals

SCOTT'S SHEEP GATE.

if necessary. The forward part of the slotted upper end of the post, D, is shortened, so that the longer rear part will serve as a stop for the journal of the bar to strike against when the gate is swung shut, thus preventing the journal from swinging over.

This invention has been recently patented by Mr. James W. Scott, of Uhrichsville, Ohio.

Death of a Japanese Student.

Prof. Max Müller, in the London *Times* of Sept. 25, gives the following interesting account of the exemplary life of a Japanese student at Oxford University, whose death is chronicled from his home in Japan.

Kenjin Kasawara was a young Buddhist priest who, with his friend Bunyiu Nanjio, was sent by his monastery in the year 1876 from Japan to England to learn English in London, and afterward to study Sanskrit at Oxford. They both came to me in 1879, and, in spite of many difficulties they had to encounter, they succeeded, by dint of hard, honest work, in mastering that language, or at least so much of it as was necessary for enabling them to read the canonical books of Buddhism in the original—that is, in Sanskrit. At first they could hardly explain to me what their real object was in coming all the way from Japan to Oxford, and their progress was so slow that I sometimes despaired of their success.

But they themselves did not, and at last they had their reward. Kasawara's life at Oxford was very monotonous. He allowed himself no pleasures of any kind, and took little exercise; he did not smoke, or drink, or read novels or newspapers. He worked on day after day, often for weeks seeing no one and talking to no one but to me and his fellow worker, Mr. Bunyiu Nanjio. He spoke and wrote English correctly, he learned some Latin, also a little French, and studied some of the classical English books on history and philosophy.

He might have been a most useful man after his return to Japan, for he was not only able to appreciate all that was good in European civilization, but he retained a certain national pride, and would never have become a mere imitator of the West. His manners were perfect—they were the natural manners of an unselfish man. As to his character, all I can say is that, though I watched him for a long time, I never found any guile in him, and I doubt whether, during the last four years, Oxford possessed a purer and nobler soul among her students than this poor Buddhist priest. Buddhism may, indeed, be proud of such a man. During the last year of his stay at Oxford I observed signs of depression in him, though he never complained. I persuaded him to see a doctor, and the doctor at once declared that my young friend was in an advanced stage of consumption and advised him to go home. He never flinched, and I still hear the quiet tone in which he said: "Yes, many of my countrymen die of consumption." However, he was well enough to travel and to spend some time in Ceylon, seeing some of the learned Buddhist priests there and discussing with them the differences which so widely separate Southern from Northern Buddhism. But after his return to Japan his illness made rapid strides. He sent me several dear letters, complaining of nothing but his inability to work. His control over his feelings was most remarkable.

When he took leave of me his sallow face remained as calm as ever, and I could hardly read what passed within. But I know that after he had left he paced for a long time up and down the road, looking again and again at my house, where, as he told me, he had passed the happiest hours of his life. Once only, in his last letter, he complained of his loneliness in his own country. "To a sick man," he wrote, "very few remain as friends." Soon after writing this he died, and the funeral ceremonies were performed at Tokio on the 18th of July. He has left some manuscripts behind, which I hope I shall be able to prepare for publication, particularly the "Dharma saugraha," a glossary of Buddhist technical terms ascribed to Nagârguna.

But it is hard to think of the years of work which are to bear no fruit; still harder to feel how much good that one good and enlightened Buddhist priest might have done among the 32,000,000 of Buddhists in Japan. *Have, pia anima!* I well remember how last year we watched together a glorious sunset from the Malvern Hills, and how, when the western sky was like a golden curtain, covering we knew not what, he said to me, "That is what we call the eastern gate of our Sukhavati, the Land of Bliss." He looked forward to it, and he trusted he should meet there all who had loved him, and whom he had loved, and he should gaze on the Buddha Amitabha—*i. e.*, "Infinite Light."

Bisulphide of Carbon a Cause of Insanity.

California physicians who have attended various cases of trouble arising from the poisonous properties of bisulphide of carbon, have become satisfied that the inhalation of the vapor of this substance will produce insanity. The bisulphide is used in Los Angeles County to prevent the spread of the grape disease, phylloxera. Several strong and healthy men who have been exposed to the fumes of the vile stuff have become insane. It may be a subject worthy of investigation whether other deleterious gases may not in like manner affect the human brain.

FENCE.

The fence shown in the accompanying engraving is cheap, yet strong and substantial, requires but little ground space, offers little or no obstruction to the clearing away of weeds from about it, and can be quickly and easily set up, removed, or repaired. The posts have the general form of a ʌ connected at top and bottom by brace bars, and are set in sockets of earthen tiles. The rails rest upon the upper brace bars, the overhang of the inner edges of the tops of the posts serving to lock the overlapped ends of the rails, thus doing away with special fastenings for this purpose. Around the overlapped ends of the top rails a wire is wound, and at regular distances the wire is bent upon itself so as to form eyes in which the clip wires for securing the ends of the lower rails are fastened. The wire hangers are provided for each side of the post, and the ends of the lower rails are kept apart, thereby saving the material that would be necessary if they overlapped, and also facilitating the removal of any particular panel. The ends of adjacent lower rails may

READ'S IMPROVED FENCE.

be connected by splice bars held in place by the clip wires, and in localities visited by violent winds the fence may be anchored by strong galvanized wires passed around the splice bars and fastened to plates firmly embedded in the ground. The fence may be constructed with only one hanger at each panel joint by attaching a double number of clip wires. The panels may be strengthened by crossed wooden or metallic braces. The metallic post shown at the left of the engraving leaning against the fence, may be substituted for the wood.

This invention has been patented by M. John W. Read, of West Salem, Ohio.