ASPECTS OF THE PLANETS FOR DECEMBER.

URANUS

is morning star, and holds the place of honor on the planetary record of December, for he is the only planet whose progress on the celestial track is diversified by a noteworthy incident. On the 20th, at 2 o'clock in the afternoon, he is in quadrature with the sun, having accomplished half his journey from conjunction to opposition.

Uranus has of late been in an exceptionally favorable situation for observations concerning his disk and figure. The last time he was in an equally favorable position was in the years 1842 and 1843. Professor Young has improved the opportunity for viewing him in the great Princeton telescope. He detected markings on his disk, shadowy resemblances of the belts on Jupiter's disk, and hopes to use them as the data for determining the time of the planet's axial rotation. Schiaparelli, of Milan, has employed the same favorable opportunity for making a series of observations on the figure of Uranus. His observations agree with those made by Professor Mädler in 1842 and 1843, and indicate that Uranus is the most elliptical of all the planets, excepting Saturn.

To those who have only seen Uranus through an ordinary telescope as a tiny sphere of a delicate sea-green hue, it seems almost beyond belief that a powerful telescope wielded by a practiced hand can bring to view belts on his disk and an elliptical outline to his figure.

The right ascension of Uranus is 11 h. 52 m.; his declination is 1° 36′ north; and his diameter is 3·6″.

Uranus rises on the first about 1 o'clock in the morning; on the 31st he rises a few minutes after 11 o'clock in the evening.

JUPITER

is morning star, the present being the last month in which he will play this part for some time to come. He will be the most superb object in the heavens on moonless nights throughout the month, appearing now above the horizon at half-past 8 o'clock, and rising earlier every night, until at the close of the month his shining face looms above the eastern hills at half-past 6 o'clock. It seems anomalous to call a planet that rises so early in the evening a morning star, but astronomers class the outer planets as morning stars from conjunction to opposition, without regard to the time of rising.

The famous red spot that for five years formed an interesting feature on the planet's disk faded rapidly away during the last winter and spring, and has not been seen since the middle of May, when it was exceedingly faint. No one can tell if it will be seen again, for no one knows the cause that produced it. If any vestige remains, it is safe to say that it will be found by some of the eagle-eyed observers who are diligently scanning the face of our giant brother.

Interesting telescopic observations have been made on the Jovian disk that give positive indications of an atmosphere enveloping the huge planet. Satellites and stars when occulted disappear and then flash up again. This phenomenon has been frequently observed, and can be explained by the intervention of clouds in the planet's atmosphere. In the case of occultations, clouds may intercept temporarily the light of satellites or stars, which may flash up again as soon as the clouds have passed. In the case of satellites eclipsed by the shadow of Jupiter, the flashing up at intervals of the light of the satellites may be caused by their passage through darker regions in the penumbra of the planet's shadow due to such clouds.

Professor Pickering, of the Cambridge Observatory, records a very interesting observation made by him on the 14th of last April. A star of the seventh magnitude was occulted by Jupiter a little more than two hours after midnight. For about two minutes before the final disappearance the star alternately disappeared and reappeared without any obvious reason, as if it were playing hide-and-seek with the clouds. The immersion of the star about twenty-eight minutes afterward took place in the most orderly manner without a single fluctuation of light. These little incidents are of great moment in the attempt to find out the constitution and physical conditions of the huge planet. It is by heaping up such observations in boundless measure that results bearing some impress of certainty will finally be reached.

Those who are unable to make telescopic researches concerning the Jovian planet can at least admire his stately and majestic appearance in the starlit sky, where he reigns supreme during nearly the whole time that darkness veils the earth.

The right ascension of Jupiter is 8 h. 27 m.; his declination is 19° 35′ north; and his diameter is 40·8″.

Jupiter rises on the 1st at half-past 8 o'clock in the evening; on the 31st he rises at half-past 6 o'clock.

MARS

is morning star. He may be readily recognized by his proximity to Jupiter, being a short distance southeast of his far more brilliant rival. Though comparatively small, he is not a planet to be despised, especially when within two months of opposition. He seems just now to be running away from Jupiter and to be running after Regulus, the bright star on the east of him. His short reign, however, will soon commence, when for a month before and a month after opposition, the culmination of his brilliancy for the present will be reached.

The right ascension of Mars is 9 h. 30 m.; his declination is 17° 25′ north; and his diameter is 10·4″.

Mars rises on the 1st about a quarter before 10 o'clock in the evening; on the 31st he rises a few minutes before 8 o'clock.

SATURN

is evening star. He has commenced his travel toward the sun and from the earth. He is therefore receding from us and growing less bright than when in opposition. But the diminution is not yet perceptible. As soon as darkness covers the earth, he takes his place among the stars, slowly receding from the neighborhood of the gentle Pleiades and ruddy Aldebaran as he makes his way over the celestial track. Every observer has a kind word for the planet so softly shining, and no one privileged to behold him in a large telescope will ever forget the magnificent picture.

The right ascension of Saturn is 4 h. 19 m.; his declination is 19° 24′ north; and his diameter is 19·4″.

Saturn sets on the 1st at a quarter before 7 o'clock in the morning; on the 31st he sets soon after half-past 4 o clock.

NEPTUNE

is evening star. He threads his course over the starry concave with snail-like pace, and is above the horizon nearly the entire night. As he cannot be seen, he is of little account to the ordinary observer.

The right ascension of Neptune is 3 h. 8 m.; his declination is 15° 46′ north; and his diameter is 2·6″.

Neptune sets on the 1st about half-past 5 o'clock in the morning; on the 31st he sets about half-past 3 o'clock.

VENUS

is evening star and will soon put on glorious apparel. Before the month closes, there will be no difficulty in finding the fairest of the stars in the western sky. She is now above the horizon about an hour after sunset, and must be looked for two and a half degrees south of the sunset point. At the close of the month, she is above the horizon two hours after sunset and must be looked for about two and a half degrees north of the sunset point. She will then set a few minutes after Jupiter rises, a charming sight for observers who can command a clear view of the eastern and western horizons.

The right ascension of Venus is 17 h. 48 m.; her declination is 24° 20′ south; and her diameter is 10·8″.

Venus sets on the 1st at half-past 5 o'clock in the evening; on the 31st she sets about half-past 6 o'clock.

MERCURY

is evening star and is swiftly making his way from superior conjunction to eastern elongation.

The right ascension of Mercury is 16 h. 42 m.; his declination is 23° 27′ south; and his diameter is 4·6″.

Mercury sets on the 1st not far from half-past 4 o'clock in the evening; on the 31st he sets at 6 o'clock.

THE MOON.

The December moon fulls on the 13th at 20 minutes after 10 o'clock, Washington time, 12 minutes later New York time, and 24 minutes later Boston time. On the 1st, at 27 minutes after 4 o'clock in the morning, the new moon of the 29th of November is in conjunction with Venus, being 5° 9′ north. On that evening the moon sets about two hours, and Venus one hour after the sun. Sharp-sighted observers may pick up the fair star and the slender crescent, though they will be beyond their nearest approach and not close together. This will be the first of a series of views in which during the winter we shall enjoy some of the most charming pictures ever painted on the celestial canvas—that of Venus and the young moon in conjunction.

On the 11th, the moon pays her respects to Neptune at a respectful distance north. It will be remembered that conjunctions among the heavenly bodies take place when the longitude or right ascension is the same, regardless of the difference in latitude or declination. On the 12th, the moon makes a close conjunction with Saturn, being 55′ south. In some positions in southern declination, between 18° and 71° south, Saturn is occulted by the moon for the 9th and last time during the year. On the 16th, the moon is at her nearest point to Jupiter; on the 18th, to Mars; on the 21st, to Uranus; and on the 31st, to Mercury.

On the 31st, she has made the circuit of the planets and swings round for the second time to the near neighborhood of Venus. The conjunction takes place at twenty-two minutes past 2 o'clock in the afternoon, when Venus is 6° 51′ south. Star and crescent will make a lovely picture on the early evening sky. The moon sets on that evening two hours and a half, and Venus two hours after the sun, and the charming exhibition of celestial glory can be seen without money and without price.

BACTERIAL DISEASE OF THE IMPORTED CABBAGE WORM.

Prof. S. A. Forbes, State Entomologist of Illinois, has found larvæ of *Pieris rapæ* (the imported cabbage worm) seriously affected around Normal, Ill., by a disease which in a few hours causes them to decay and reduces them to a black, almost fluid condition, dissolving at the touch. He finds the disease due to immense numbers of bacteria, excessively minute, and that they can be cultivated artificially in beef broth and thus introduced and propagated among healthy insects.

This black rot of the cabbage worm has been known to us for some years, and is quite widespread. We have made reference to it on page 70 of our *Bulletin* on the cotton worm (1881), in connection with some experiments with yeast ferment, in the following words: "An incident connected with these experiments which I made is, however, well worthy of being mentioned, because it shows how very easily single experiments may lead to false hopes and conclusions. A certain proportion of the last named larvæ (*P. rapæ*)—the proportion differing in the lots treated—perishing before, or while transforming to the chrysalis state. They became flaccid and discolored, and after death were little more than a bag of black putrescent liquid. I should have at once concluded that the yeast was a success had I not experienced the very same kind of mortality in previous rearing of this larva, and had I not, upon returning to the field from which the larvæ in question were obtained, found a large proportion similarly dying there.—*C. V. Riley.*

Copper Sulphide.

H. Schultze has recently published in the *Journal fur Prakt. Chemie* an interesting memoir on soluble antimony trisulphide, in which it is pointed out that perhaps other sulphides will also prove to be soluble. M. Spring, having to prepare pure sulphides and oxides which were needful in an investigation with which he was engaged, had the opportunity to observe that several of these bodies can easily be obtained in the colloidal state. The observations of Schulze concerning the solubility of antimony and arsenic trisulphide in pure water completely agree with the author's results. He finds further that copper sulphide is readily and completely soluble in pure water on proceeding as follows:

A dilute solution of copper sulphate in ammonia is treated with a current of sulphureted hydrogen until all the copper is thrown down as sulphide. The black precipitate is then washed by decantation with sulphureted hydrogen water. As soon as ammonia sulphate or hydrosulphate is no longer present in the washings, the sulphide passes gradually into solution, and there is ultimately obtained a black liquid with a slight greenish fluorescence. This black liquid passes like water through a filter. On examining it in a stratum of 2 centimeters in depth the colors appear brown and the presence of suspended copper sulphide cannot be admitted; the solution is clear. This solution can be boiled without decomposition, and if gently evaporated on the water bath, the sulphide is left as a black varnish. Small quantities of solution of salts quickly cause the black liquid to coagulate, especially when the liquid is hot. Precipitated copper sulphide, which is then readily taken up by water in the colloidal state, loses this property, even if dried in a vacuum at common temperature. The author adds that the pure dry copper sulphide thus obtained is not black, as generally asserted, but of a fine dark green. If submitted to a pressure of 6,500 atmospheres it forms blocks of a deep blue metallic luster. Manganese peroxide, obtained by treating manganous hydroxide with hypochlorous acid, passes when perfectly washed into a deep brown solution. The behavior of antimony trioxide, tin oxide, and tin sulphide is similar. The author has obtained more than 50 grammes of this body as a reddish brown transparent nitrous mass by evaporation in a vacuum of sulphuric acid.

How the Inventor Plagues his Poor Wife.

A facetious chap connected with one of our daily newspapers give the following amusing burlesque on the trials of an inventor's wife:

"It is all very well to talk about working for the heathen," said one, as the ladies put up their sewing, "but I'd like to have some one tell me what I am to do with my husband." "What is the matter with him?" asked a sympathetic old lady. "William is a good man," continued the first, waving her glasses in an argumentative way, "but William will invent. He goes inventing round from morning till night, and I have no peace or comfort. I didn't object when he invented a fire escape, but I did remonstrate when he wanted me to crawl out of the window one night last winter to see how it worked. Then he originated a lock for the door that wouldn't open from midnight until morning, so as to keep burglars out. The first time he tried it he caught his coat-tail in it, and I had to walk around him with a pan of hot coals all night to keep him from freezing." "Why didn't he take his coat off?" "I wanted him to, but he stood around till the thing opened itself, trying to invent some way of unfastening it. That's William's trouble. He will invent. A little while ago he got up a cabinet bedstead that would shut and open without handling. It went by clockwork. William got into it, and up it went. Bless your heart, he staid in there from Saturday afternoon till Sunday night, when it flew open and disclosed William with the plans and specifications of a patent washbowl that would tip over just when it got so full. The result was that I lost all my rings and a breastpin down the waste pipe. Then he got up a crutch for a man that could also be used as an opera-glass. Whenever the man leaned on it up it went, and when he put it to his eye to find William, it flew out into a crutch and almost broke the top of his head off. Once he invented a rope ladder to be worn as a guard chain and lengthened out with a spring. He put it round his neck, but the spring got loose and turned it into a ladder and almost choked him to death. Then he invented a patent boot heel to crack nuts with, but he mashed his thumb with it and gave it up. Why, he has a washtub full of inventions. One of them is a prayerbook that always opens at the right place. We tried it one morning at church, but the wheels and springs made such a noise that the sexton took William by the collar and told him to leave his fire engines at home when he came to worship. The other day I saw him going up the street with a model of a grain elevator sticking out of his hip pocket, and he is fixing up an improved shot-tower in our bed-room."

Dividing Profits with His Workmen.

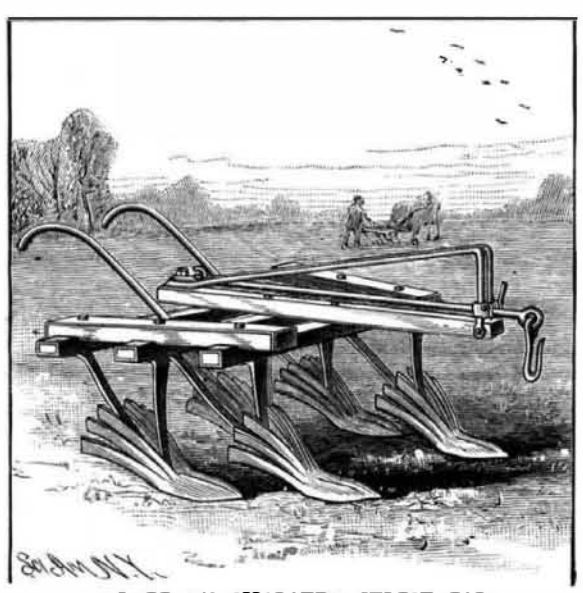
At the French Association for the Advancement of Science an interesting account has been given of the successful application of the system of admitting workmen to a share of profits in the large cotton printing establishments of M. Besselievre, near Rouen. The Pall Mall *Gazette*, referring to the subject, states that M. Besselievre does not, indeed, give his hands a share in the management and risks of his business. He keeps his books to himself, and pays them the wages ruling in the district, like ordinary laborers. But in addition to their wages he has since 1877 distributed among all the workmen who have been in his service for five years an annual bonus proportionate to his own profits, which has amounted on the average to 12 and in one instance reached 17 per cent of the wages earned by them during the year. Half of this bonus is paid to the men in cash, and half is retained to form a sick and pension fund and to provide for the family of the workman in the case of his death. This money is invested in the business at the rate of four per cent, but it is not confiscated if the workman is dismissed. To give the best of guarantees against capricious dismissal, moreover, the right to discharge a workman has been ceded by M. Besselievre to a committee, of which the majority consists of persons engaged in the factory. M. Besselievre has disbursed 80,000 francs in the last six years in these extra payments to his workmen, but considers himself to have been commercially the gainer by his liberality, owing to their increased devotion to their work and attachment to their employer. The success of such experiments wherever they have been tried ought to encourage more frequent imitation.

Enterprise in Dakota.

The following good story, which illustrates the rapidity with which towns are built up in new Territories, was told the *Northwestern Lumberman* by a gentleman who was looking around in Dakota recently. He was present when officials of the Chicago, Milwaukee & St. Paul road arrived at a point thirty miles north of Mitchell and planted a town which they called Woonsocket. At the time only one farm house was standing in the vicinity, and a car was used as a depot. This was on Thursday, and on Saturday of the same week there were twenty shanties, a livery stable, two stores, a saloon, a hotel, and three lumber yards. There are men who have loaded lumber on cars without knowing where it would be unloaded, and then run it to the first new town they hear of being started. But it is not best to imagine that all of the yards which are established so suddenly in the new Dakota towns have complete assortments or are models of neatness. A few hundred feet of lumber thrown down by the track constitutes a yard, which grows and is put into shape as the town progresses.

CULTIVATOR.

The plows, in the cultivator herewith illustrated, are made with angular forward parts, and have their rear parts cut into strips bent into the form of mould boards and twisted through a quarter of a turn, so that the soil may sift through while the weeds will fall to the ground from the rear ends of the strips. Each plow is connected to the frame by two standards of unequal length, so that they are firmly supported against the draught strain. The frame is formed of three cross beams connected near their ends by two side beams, and at the center by a beam projecting in front to serve as the draw beam, and to its forward end are secured two parallel rods, which extend nearly vertically upward for a suitable distance, when they are bent to the rearward and secured to that end of the beam. The draw rod passes



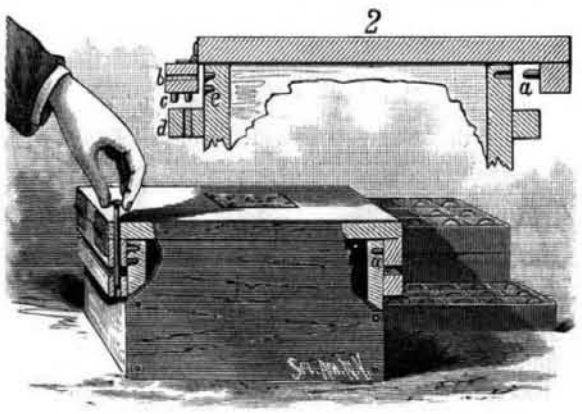
PLATTEN'S IMPROVED CULTIVATOR.

forward between the parallel or guide rods, and its forward end is provided with a hook for the attachment of the draught. The draw rod passes through a clamp, by which it can be held at any point on the upright parts of the guide rods, thus regulating the depth to which the plow works. The forward parts of the plows are made angular and nearly flat, and run beneath the surface, cutting off the roots of the weeds.

This invention has been patented by Mr. John Platten, Sr., of Fort Howard, Wis.

BOX FASTENER.

The object of an invention recently patented by Mr. James R. Morrison, of Oakdale, Ill., is to provide a fastening for the covers of egg cases or other boxes, whereby the cover can be held firmly on the box and can be removed easily and rapidly. One end of the box cover is provided with a fixed cleat having one or more dowels, *a*, and the opposite end has a hinged cleat, *b*, also furnished with dowels. The dowels in the fixed cleat are passed into holes in one end of the box, and those on the hinged cleat into holes, *e*,



MORRISON'S BOX FASTENER.

in the other end of the box. The hinged cleat is then locked in place by a pin or bolt, which is passed through the cover, the hinged cleat, and a fixed cleat on the end of the box, as shown in the perspective view. Fig. 2 is a section through the cleats and box.

BARREL PUMP.

The device is attached to the barrel by means of a bung tube, *d*, within the upper end of which fits a short tube, *a*, through which passes the pump tube, *e*, provided at its lower end with sharp points, *i*, that are to be embedded into

GUIGNON'S BARREL PUMP.

the barrel for staying the bottom of the pump tube and steadying the device while pumping. The pump and plunger are of the ordinary construction. The bottom of the tray, *h*, is made conical, so that the drain will be from center to circumference. Near the edge of the tray the bottom is provided with a short tube, *a*, through which the drip finds its way from the tray back into the barrel, thereby avoiding the use of a separate drip pipe. The detachable brace, *f*, is formed at one end with a sleeve, *c*, that fits upon the bung tube, and at the other end with a crosspiece that fits in the channel formed upon the bottom of the tray, serving to support the tray and prevent vibration. A guard with radiating arms is placed in the tray to prevent articles from falling upon the bottom. The vessels to be filled stand upon this guard. The pump is simple in construction, and is firm and steady while being operated.

This invention has been recently patented by Messrs. L. E. and E. E. Guignon, of Corry, Penn.

Conscience in Boiler Making.

We are sometimes very much annoyed by the want of good faith in boiler construction. There seems to be a feeling, certainly on the part of some, that a little departure from the correct thing is of little account if it will only pass. One of the tricks is to use thinner iron for the construction of the shell in places where the lap of the sheet is inside. For instance, if a boiler shell is constructed of three sheets in length, the outer sheets will overlap the center sheet and prevent the edges being seen unless one gets into the boiler. Now it is not unfrequently the case that this center sheet is of thinner iron than the other sheets. An inspector discovers this when making the internal examination.

In casting up the safe working pressure of a boiler, the strength of the weakest point must be the highest limit allowed for bursting pressure, and the factor of safety must simply reduce the pressure which would burst the boiler to a safe working pressure. Now the thinner the iron the less resistance it affords, and if the thin sheet is the weakest point, it must be made the basis for calculating the safe working pressure, which would be lower than would be allowed if the sheets in the boiler were of uniform maximum thickness. We call attention to this fact because the discovery of such practice has made serious trouble between the boilermaker and the steam user.

This business is sometimes carried so far that the edges of the plates are "upset" so as to appear thicker and heavier than they really are. We would not believe that there were men so blind to the duties and obligations which rest upon them as to resort to such practice, but the careful inspector finds all such defects, and in time we come to know whose work is carefully and honestly done, and whose is open to suspicion. In States and cities where inspection laws are in force that give the methods and rules by which the safe working pressure of a boiler is calculated, there is no alternative except to follow the rules; and if certain requirements regarding construction are a part of the law, there is no authority or right to depart from it, and yet there are boilermakers who try to force their boilers into such localities when their work is not up to the requirements of the law. Now this boiler making is pretty serious business, and inasmuch as some one must be blamed when accident occurs, it is important that all who have to do with boilers, from their construction to their care and use, shall be honest in all their work.—*The Locomotive.*

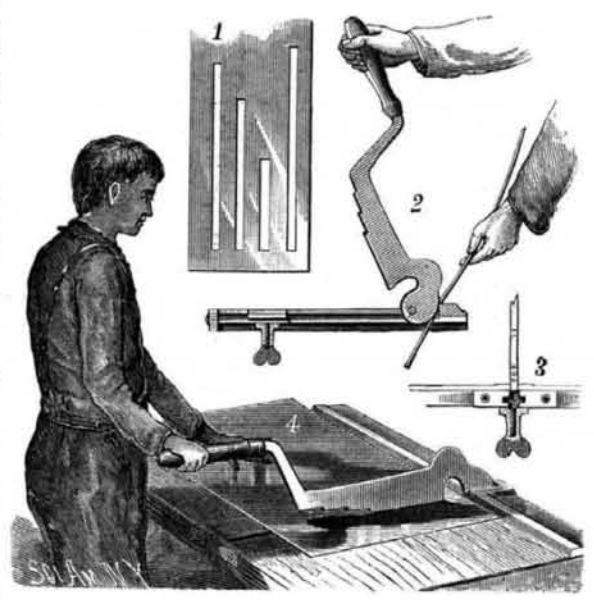
Transplanting Trees.

A writer in *Farm and Fireside*, in his directions respecting the treatment of trees before their removal, states as follows:

"A tree in full leaf may be compared to a powerful pump, the roots absorbing water from the soil, which is carried upward through the stem and exhaled from the leaves in the form of vapor. This exhalation from the leaves is really the primary operation, however, being simply a process of evaporation. If, now, the principal portions of the roots be cut away, and especially the fine rootlets which are farthest from the stem and through whose extremities nearly all the water is absorbed, the leaves, if allowed to grow, will exhaust the water from the stem and roots more rapidly than it can be supplied by the remnant of the latter, and the consequence will be the destruction of the tree. Hence, in transplanting trees the leaf bearing twigs should be cut away in proportion to the loss of roots, and it should be remembered that the root surface is generally equal to that of the twigs; consequently the safest rule is to remove nearly all the branches, trimming to bare poles. It is hard to do this, but the after-growth of the tree will be enough more rapid to compensate the apparent loss. In moving large trees it is an excellent plan to dig down and cut off a large portion of the roots a year before transplanting, removing a portion of the top at the same time. This will cause the formation of new rootlets near the stem, which may be preserved in the final transplanting."

SLOTTING SHEARS.

The slotting shears recently patented by Mr. Charles W. Crane, of Batavia, Iowa, are designed to cut slots in tin for any purpose. The shear blade is movable and is fitted to a stationary slotted die plate. The blade has a point near its pivoted end to punch through the tin to form one end of the slot, the sides of which are cut by the side edges of the shears. The slot will be limited by one of the series of ledges on the blade coming down in front of the end of a bit which is movable along the slot between the plates to be set for any ledge. The bit, shown in section in Fig. 3, has tongues running in grooves on the sides of the plates of the die. A single stroke of the blade, which is provided with a lever handle, will cut slots of different lengths. The sheet



CRANE'S SLOTTING SHEARS.

may be shifted sidewise to make slots wider than the blade. In order to sharpen the edges of the die plates and reset them closely to the blade, they are made separate and bolted to the table. By removing one of the die plates a straight cutter is formed. In Fig. 2 the device is shown adapted for cutting wire of all sizes. Fig. 1 shows a slotted sheet to indicate the work done by the shears. Fig. 4 shows the way of operating the shears. The apparatus is particularly applicable for making the slotted tin strips used in making the glass gauges for cream cans.