UPSETTING OF IRON.

The quality of movement of the particles of iron under pressure or percussion is a remarkable one, whether the change in arrangement is made while the iron is hot or when it is cold. Red hot iron can be pressed to fill a mould as clearly and exactly as so much wax could be, and the grain of the iron will certainly follow all the contour of the mould. Thus the heads of pick-axes and articles of a similar form can be shaped by pressure, the metal that is removed to make the hole for the helve being forced to form the projection of the adze-like head.

Cold iron can also be moulded into form by pressure, a method largely practiced to finish drop forged iron articles. The heading machine for making rivets, bolts, and wood screw blanks shows some surprising results in the compression of iron; a No. 6 one inch screw requires a piece of wire slightly more than one and a half inches long to form it. Yet the total length of the screw blank, headed, is just one inch. Of this the countersunk shaped head is one-eighth of an inch by five-sixteenths of an inch widest—or top—diameter. Now, it has been proved by experiments with shorter bits of wire, that less than five-sixteenths of an inch of the extra eight-sixteenths is required to form the screw head. What becomes of the remaining more than three-sixteenths of an inch in length of the original one and a half inches that makes the one inch screw blank? There can be but one answer—the iron is driven upon itself; in other words, three sixteenths of an inch of wire is compressed into seven-eighths of an inch (measuring under the head), so that one inch and one-sixteenth of wire is compressed into seven-eighths of an inch in length, without increasing the diameter of the wire.

ASPECTS OF THE PLANETS IN NOVEMBER.

NEPTUNE

is morning star until the 13th, when he becomes evening star. He wins a distinguished place among the shining brotherhood during the month, for he reaches the point in his career of the greatest importance to observers on this planet. If telescopes improve in power, and practiced eyes improve in ability to discern, this is the portion of his course when, in the future, there will be a possibility of making discoveries on his distant disk. It may be only a belt, it may be only an additional satellite, for little more can be anticipated from the observation of an object that when nearest is more than 2,600,000,000 miles distant. But every line discerned on the face of this far away planet is a triumph of human skill.

The great event in Neptune's career is his opposition with the sun. It takes place on the 13th, at 3 o'clock in the afternoon. He is then at his nearest point to the earth, and is seen in opposition, or opposite to the sun, rising in the east as the sun sets in the west, and passing from the sun's western side, where he has played the part of morning star, to the sun's eastern side, where he will play the part of evening star. The earth is then between him and the sun, so that a straight line drawn from the sun through the earth would, if produced, reach Neptune. The same conditions prevail at the opposition of every superior or outer planet, and with a little study one can easily keep the run of our outside planetary neighbors.

The four epochs in the revolution of the superior planets are opposition, quadrature on the eastern side of the sun, conjunction, and quadrature on the sun's western side. These epochs are partially illustrated during the month, as observers can prove for themselves. Neptune is in opposition, Saturn is approaching opposition, Jupiter is in quadrature, Uranus is approaching quadrature, and Mars is approaching conjunction. A bird's eye view of the solar family—if such a thing were possible—on the 13th would show the earth and Neptune in line with the sun, Saturn nearing the same goal, and Jupiter nearly half way advanced toward the same point.

Neptune is now in fine position for telescopic observation. He is in the constellation Taurus, about 7° southwest of the Pleiades, and is visible during the whole night. A telescope with an aperture of three inches will bring him out in favorable weather. But it takes a more powerful telescope to reveal his solitary satellite, a tiny point of light close to the primary.

There are many things to interest observers concerning this distant planet, ranking next in size to Jupiter and Saturn. If we could approach nearer to him, doubtless we should behold a grand spectacle, solve some of the mysteries revealed in his peculiar spectrum, comprehend more clearly the laws that regulate the apparently retrograde motion of his one moon, and, most to be desired of all, find out if planets hitherto unknown lie hidden in the remoter regions of space. It is not improbable that increased optical power will reveal some of these secrets from our present standpoint, especially when it is remembered that the existence of Neptune as an acknowledged member of the solar family dates from 1846—only 38 years ago.

The right ascension of Neptune on the 1st is 3 h. 21m.; his declination is 16° 35′ north; his diameter is 2·6″; and he is in the constellation Taurus.

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

JUPITER

is morning star, and passes an important epoch in his course. On the 26th, at 3 o'clock in the morning, he is in quadrature with the sun on his western side. He is then at the half way house between conjunction and opposition, 90° west of the sun, rises at midnight, and sets at noonday. With telescopes of small power and under ordinary conditions this superb planet presents the appearance of a large round disk. Higher magnifying power will show a slight flattening at the poles. But only the best telescopes in the hands of the best observers will bring out the magnificent belts with their changing tints and the spots that from time to time appear and disappear on his disk. Powerful telescopes when Jupiter is in quadrature will reveal the approach of the gibbous phase. For at common times he, as well as the other giant planets, appears like a round orb without phases, on account of the great distance. An observation of the Prince of Planets in gibbous phase is an astronomical feat difficult to accomplish. Sometimes there will be a slight shade on the limb farthest from the sun, and sometimes the observation is more satisfactory. It is recorded that in the clear atmosphere of Southern Australia the second and third satellites have been seen to emerge at a sensible distance from the limb of the planet, thus proving the reality of the gibbous phase.

Jupiter for six months to come will be in most favorable condition for observation, more so than he will be for several years. For his path now tends in a southerly direction; while the law is, the farther north the planet, the better is it situated for observation.

The right ascension of Jupiter on the 1st is 10 h. 18 m.; his declination is 11° 27′ north; his diameter is 33 2″; and he is in the constellation Leo.

Jupiter rises on the 1st at a few minutes before 1 o'clock in the morning; on the 30th he rises soon after 11 o'clock in the evening.

SATURN

is morning star. No incident enlivens his monotonous course. But he is superb to behold as he wends his quiet way over the celestial course, approaching with unswerving step the goal that has been reached by his more distant brother planet Neptune, shining with a serene light among his companion stars, and giving a foretaste of the phase he will present when a year hence he combines every condition from which the best views may be anticipated. In the telescope he is magnificent beyond description. We never behold him through the glass without wishing that for once we could see him pictured on the sky in these grand proportions, where every eye might behold the exhibition of surpassing grandeur and beauty.

The right ascension of Saturn on the 1st is 5 h. 32 m.; his declination is 21° 48′ north; his diameter is 18·8″; and he is in the constellation Taurus.

Saturn rises on the 1st about half past 7 o'clock in the evening; on the 30th he rises about half past 5 o'clock.

VENUS

is morning star, but no longer in the ascendant, for it is now her turn to hide her "diminished rays." She is getting every day nearer the sun, and increasing her distance from the earth, which those who wish can verify for themselves as they note the later time of her rising and the lessening brilliance of her disk. She is almost plunging southward in her swift course, reaching southern declination on the 3d, and recording nearly 11° south declination at the close of the month. Those who remember her glorious appearance as evening star high up in the north will perceive the contrast in her present phase. But she is lovely even in her fading luster, as, hanging low in the heavens, she is still the sun's bright harbinger.

The right ascension of Venus on the 1st is 11 h. 57 m.; her declination is 1° 48′ north; her diameter is 16·8″; and she is in the constellation Virgo.

Venus rises on the 1st at 3 o'clock in the morning; on the 30th she rises at 4 o'clock.

URANUS

is morning star. His path lies very near that of Venus at the beginning of the month. The two planets are in conjunction on the 4th at 6 o'clock in the morning, when Venus is 50′ north of Uranus.

The right ascension of Uranus on the 1st is 12 h. 4 m.; his declination is 0° 15′ north; his diameter is 3·6″; and he is in the constellation Virgo.

Uranus rises on the 1st at a quarter after 3 o'clock in the morning; on the 30th he rises at half past 1 o'clock.

MERCURY

is morning star until the 4th, when he takes his turn as evening star. He is in superior conjunction with the sun on the 4th at 3 o'clock in the afternoon. This means that he is in line with the earth and sun, beyond the sun, and that he passes from the sun's western to his eastern side. He is too near the sun to be visible, and is therefore of little account on terrestrial records.

The right ascension of Mercury on the 1st is 14 h. 28 m.; his declination is 14° 15′ south; his diameter is 4·6″; and he is in the constellation Libra.

Mercury rises on the 1st about half past 6 o'clock in the morning; on the 30th he sets about a quarter after 5 o'clock in the evening.

MARS

is evening star. He, too, is traveling south. Not long since every planet in the system was in north declination. At the end of the month Venus, Mercury, Uranus, and Mars are in south declination. Not long since all the planets were morning stars. Before November closes Mars, Mercury, and Neptune will be evening stars. Movements seemingly without order are in reality exemplifications of the unswerving laws that regulate the course of every member of the physical universe.

The right ascension of Mars on the 1st is 16 h. 10 m.; his declination is 21° 43′ south; his diameter is 4·4″; and he is in the constellation Scorpio.

Mars sets on the 1st a few minutes after 6 o'clock in the evening; on the 30th he sets at half past 5 o'clock.

THE MOON.

The November moon fulls on the 3d, at 36 minutes after 3 o'clock in the morning. The moon is in conjunction with Neptune on the 3d, and with Saturn on the 5th. She is at her nearest point to Jupiter on the 11th, and to Uranus on the 13th. She makes a charming appearance on the eastern sky in conjunction with Venus on the morning of the 14th, three days before her change, the waning crescent hanging 2° south of the morning star. On the 18th the new moon is in conjunction with Mercury, and on the 19th with Mars.

THE NOVEMBER METEORS.

The earth, as she swings her ponderous bulk in her orbit, encounters on the 13th the November meteor zone, and plunging headlong through the sparsely scattered cosmical atoms, and igniting those that impinge upon her atmosphere, she causes them to descend as falling stars. This gigantic hoop or meteor zone consists of a swarm of particles following Tempel's comet. The unfortunate visitor from the star depths venturing too near the planet Uranus was captured by the giant orb, forced to become a member of the system, and to travel henceforth within its boundaries. The event probably occurred in the second century of the Christian era. The perihelion of the November meteor zone is on the earth's orbit, at the point she passes about the 13th of November, and the aphelion is beyond the orbit of Uranus. The particles of the comet and the swarm of meteoroids have thus far scattered over but one-tenth of the zone, but in the course of time will fill the whole space. As the period of revolution is about 33 years, a grand display of fiery rain occurs only at those intervals. The next one may be expected in 1899.

Observers, however, who watch patiently on the nights of the 11th, 12th, and 13th will be rewarded by seeing a few meteors radiating from the constellation Leo, which are true Leonides, the name given to the members of this meteoric zone, because they seem to start from this constellation. Such is the delightful uncertainty of meteoric astronomy, that the earth may capture a larger number of these little bodies than is anticipated. Therefore it is well to keep a careful lookout.

Aerial Navigation.

In a communication by Monsieur D. Stapfer, engineer, to the *Genie Civil*, he maintains that whatever be the practical value of Captain Renard's aerial ship with electrical motor, it is interesting to note that he has demonstrated the possibility of calculating the elements of the aerial ship according to the formulæ used in water navigation. Thus the experiments of the 9th of August, 1884, have demonstrated that the resistance per square meter of midship section is in direct proportion to the densities of the fluids. That is to say, that the air having a density 800 times less than sea water, the engine which could propel 800 square meters section in the air could only propel 1 square meter immersed in the water. In fact, if to the air ship is applied the well known formula:

$$V = m \sqrt[3]{\frac{F}{B^2}},$$

We find $V = 5{\cdot}50$ m. per second = 11 knots per hour.
$F = 250$ kilogrammeters = 3·3 horse power.
$B^2 = 55$ square meters, or 0·0687 of water.

From which the coefficient m is found to equal 3·00, which corresponds to the factor used in a ship of full body. Monsieur Stapfer, therefore, concludes that in future it will be an easy matter to predict the velocity which an aerial ship can attain according to the gross power developed by the motor, save such changes as are due to fineness of form or disposition of motor. But it remains an acquired fact, that for an air ship of 2,000 kilogrammes of ascensional force it requires 3½ horse power to overcome a wind of 6 meters per second velocity, popularly termed "a good breeze for driving windmills." Thus, to overcome an aerial current of 9 meters per second, it will be necessary to develop 12 horse power, as Messrs. Renard & Krebs had predicted; and Monsieur Stapfer regrets that, having had an electric motor capable of developing as its limit 12 horse power for over an hour, they did not continue the voyage until they had exhausted their power, and were contented to develop only a little more than 3 horse power during 25 minutes.

The Smartest Old Man in the Country.

Seth Cook, of Rathboneville, N. Y., will be 103 years old if he lives until Jan. 10, 1885. On Oct. 16 he went alone to Cowanesque Valley, expecting to meet his son. When he arrived there, he learned that his son was at Gaines. There would be no train for that place until night. Centenarian Cook concluded it would be a waste of time to wait for it, and set out for Gaines on foot. The distance is seventeen miles. He walked the entire distance in six hours, arriving at his son's in good condition, and an hour ahead of the train.