

THE HEAVENS IN MARCH.

BY HENRY NORRIS RUSSELL, PH.D.

The finest constellations now visible are in the western sky. At 9 P. M. on March 15 Orion, the most brilliant of all, is well down in the southwest. Taurus, with the Pleiades and Aldebaran, is to the right of Orion, and Canis Major with Sirius on the left. Canis Minor is above the latter, and Gemini is still higher, almost overhead. Auriga and Perseus are northwest of the zenith, in the Milky Way.

The eastern sky has few groups comparable with these in brightness. Leo is well up in the southeast, two hours from the meridian, and Virgo follows him, her brightest star, Spica, having just risen. Hydra occupies most of the space to the south of these. But the most conspicuous objects in the eastern sky are the ruddy Arcturus, and, still brighter and still redder, the planet Mars.

Ursa Major is above and to the right of the Pole, Draco lower down, and Cassiopeia below on the left.

THE PLANETS.

Mercury is morning star throughout March, but is not well placed for observation, being south of the sun, and rising little more than an hour before him. On the 18th he is in conjunction with Jupiter, passing south of the latter at a distance of 1½ deg. With his brighter neighbor to point him out, he may perhaps be seen low in the southeast about forty minutes before sunrise.

Venus, being on the opposite side of the sun, and north of him, is well placed for observation. On the 1st she sets at about 7:30 P. M., and thereafter she is visible a little longer every night, till at the end of the month she remains in sight until 8:30. She is gradually growing brighter, though as yet she is not nearly as conspicuous as she will be in May. Mars comes to opposition on the 29th, and is visible all night long. He is in Virgo not far from Spica on line toward Regulus, and is moving slowly westward, in the direction of the latter star.

This present opposition is however an unfavorable one, as Mars is in the part of his orbit which is farthest from the sun and is 59,000,000 miles distant from the earth, as against 49,000,000 at the average opposition, and 35,000,000 at the most favorable. On these latter occasions he is more than three times as bright as at present, and is an exceedingly striking object. The next such favorable opposition comes in 1909. But even in his present diminished splendor, Mars is now the chief adornment of the midnight skies, surpassing in brightness all the fixed stars except Sirius. The most conspicuous markings on his surface are visible with small telescopes, but the study of the finer details demands the highest optical power. Though he will undoubtedly be carefully observed at this opposition, as usual, he is so far off that it is hardly probable that much that is new will be discovered concerning him. It is to be regretted that his satellites are only visible in the largest telescopes, as they are among the most interesting bodies in the solar system. They are the smallest bodies so far known to astronomy. Their diameters cannot be directly measured, but by comparing their brightness with that of the planet, it is calculated that they are about five and seven miles in diameter, the outer one being the smaller. Their orbits are much the smallest known. The outer satellite, Deimos, revolves at a distance of 14,600 miles from the center of Mars, while the inner one, Phobos, is but 5,800 miles from the center of the planet, and only 3,700 from his surface. Their periods are also very short, that of Phobos being the shortest of all the bodies of our system—7 hours 39 minutes. The apparent motions of these bodies, as seen from the planet's surface, are remarkable.

The period of rotation of Mars is 24 hours 37 minutes. That of Phobos is less than one-third as long, so that for an observer on the planets' surface it would seem to move eastward among the stars three times as fast as they were carried westward by the diurnal motion. It would consequently rise in the west, and set in the east, making rather more than two complete circuits of the heavens in a day.

The period of Deimos is longer than the Martian day, so that it rises in the east like other bodies. But as its orbital motion compensates for more than four-fifths of the diurnal motion, it rises only at intervals of five days. Both satellites are conspicuous objects as seen from the planet. Phobos must appear to be about one-fifth the diameter of our own moon, so that its phases would be visible to the unaided human eye, could we get into a position to see them. Deimos would be almost as bright as Venus, but its phases could not be detected without instrumental aid.

Jupiter is morning star in Aquarius, rising at about 4:40 A. M. at the end of the month.

Saturn is morning star in Capricornus, and rises about an hour and a half earlier than Jupiter.

Uranus is morning star in Ophiucus. On the 16th he is in quadrature with the sun, and is due south at 6 A. M.

Neptune is in Gemini, and is in quadrature on the 22d, being on the meridian at 6 P. M.

THE MOON.

First quarter occurs at 2 P. M. on the 6th, full moon at 7 A. M. on the 13th, last quarter at 9 P. M. on the 20th, and new moon at 8 P. M. on the 28th. The moon is nearest us on the 10th, and farthest off on the 22d. She is in conjunction with Neptune on the 7th, Mars on the 14th, Uranus on the 20th, Saturn on the 24th, Jupiter on the 26th, Mercury on the 27th, and Venus on the 30th. On the evening of the 8th she occults the fourth magnitude star λ Geminorum, the disappearance, as seen from Washington, taking place at 7:54 P. M. and the reappearance at 9:13.

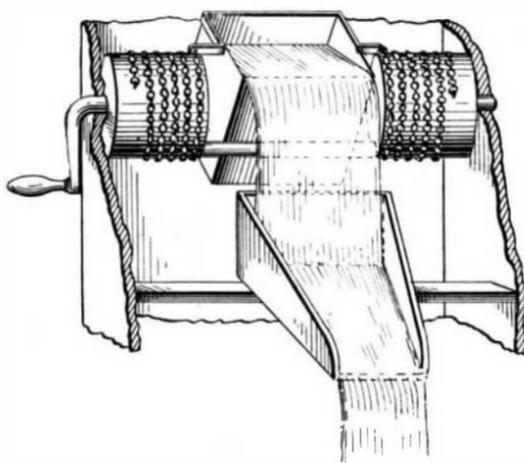
On March 28 there is an annular eclipse of the sun, invisible in North America except in Alaska, where a large partial eclipse may be seen shortly before sunset. The annular phase is visible in parts of eastern Siberia and Mongolia, and the partial phases throughout the eastern half of Asia.

Cambridge, England.

TRIPPING HOIST FOR WELL BUCKETS.

BY REV. LEWIS BOND.

It has been my privilege to reside for a score of years in the picturesque city of Monastir, which lies at the foot of the Pindus range of the Alps. The city is 2,000 feet above sea level, and a near mountain



CONSTRUCTION OF THE TRIPPING HOIST.

peak, which the Turks call the Dove, has an altitude of nearly 8,000 feet. Near the summit of this bold mountain banks of snow are ever in evidence, while a bit lower down there is a small crystal lake. Naturally, the water supply for Monastir is abundant and cool. The wealthy citizens indulge in private fountains, but the common people drink from wells.

The staple pump of this region is very crude. The affair is simplicity itself. The valves are made of cheap leather tacked to their places in very rude fashion. The upper valve is a cornucopia fastened to lower end of piston rod. The chief advantage—to the



CONVENIENT TYPE OF WELL IN MACEDONIA.

trade—of this style of pump is the facility with which the concern gets out of repair, and this accounts for the well curb in my door yard. It is nearly as simple as the native pump, but vastly more effective, more enduring, and much more easily operated.

The construction is as follows: At either end of the iron axle there is a wooden cylinder, 7 inches long and 8 inches in diameter. The space between the cylinders is 15 inches. The axle is bent at right angles, so as to bridge over this space; an incision being made for it in the end of each cylinder, thus leaving the space

free for manipulation of the bucket. The bucket is about 10 inches square, and holds over four gallons. It may be made of galvanized iron, though in this land of limitations I find tin quite serviceable. The handle is an iron rod fastened to the top of the bucket, bent forward at the upper edge on each side four inches and then turned out at right angles, projecting on either side five inches. The bucket is suspended from the winding cylinder by chains connected to the projecting ends of the handle. It will need a little weighting on the front side at the bottom. If all is properly adjusted, the bucket when lowered into the well will fill immediately, and on drawing it to the top the iron axle comes around under the front side of the bucket and tips it so that the water rushes out into the broad trough. A bit of chain is allowed to dangle from the ends of the bucket handle to act as drags in starting back the empty bucket when needed. A light brake controls descent. As careless servants may bring up the load with a slam, I have a small alarm bell which gives warning one turn before the final tip-over.

The machine has been in operation seven years. It may not be superior to all others, but it pleases my household immensely, and "astonishes the natives."

The Origin of the Modern Steel Frame Building.

The principle upon which the steel frame construction of buildings is based has been illustrated in single places, here and there, even in ancient times. The modern idea then is not the fundamental principle itself, but its application to building construction in such a way as to develop a type of structure, in which shall be embodied the principle of carrying all the weight of a building on a frame.

There is a bronze tablet on the Tower building, facing lower Broadway, claiming that it is the first building in which the construction embodies this principle. It states that the building was erected in the years 1888 and 1889. The statement it contains, that this is the first building of this sort, is not correct; but the statement would hardly have been made by men so prominent in building interests if it were not at least the first building in New York city to have embodied the principle of steel frame construction sufficiently to have warranted its classification as a building of that character.

Other buildings in New York about that time, particularly some erected by George B. Post, also contained portions of walls carried on steel columns, and other features closely allied to the general character of the construction of steel frame buildings; but the credit of developing this idea to constitute a class of structures by itself, and to be so recognized by architects and builders, belongs, without question, to the city of Chicago.

The Home Insurance building was erected in 1883, and the front walls, as well as the floors, are carried on columns.

The Tacoma building was erected in 1888 and 1889, at the same time that the Tower building was erected in New York. This building was designed by Holabird & Roach. The street walls and the floors of this building were also carried on columns.

The Rand-McNally building was built in 1889 and 1890. It was designed by Barnum and Root, and was the first building in the world to be built with steel columns. Many millions of dollars were spent in buildings of this particular type in Chicago during the next two years, so that in the World's Fair time in 1893, the great buildings of the city were one of the greatest attractions to outsiders.

At this time nothing at all had been done in New York to develop the steel frame building as a particular type of construction.

History will give to Mr. Jenney the largest measure of credit in this development, but D. H. Burnham, Holabird and Roach, and George A. Fuller share the honor with him in almost equal degree in creating and maintaining the idea that buildings could be built in this way profitably. The idea that this principle could be developed into a type of construction peculiar to itself belonged to the architects named and to George A. Fuller, more, probably, than to any other men.

German Prize Offer.

The Association of Thomas Phosphate Manufacturers (No. 4 Hafenplatz, Berlin), offers the following money awards for the best essays on researches in regard to enhancing the fruitfulness of the soil by means of the activity of bacteria and other microorganisms: First prize, 15,000 marks; second prize, 10,000 marks; third and fourth prizes, 6,000 and 4,000 marks, respectively.

In addition, the prize jury will dispose of 5,000 marks in awards for valuable scientific and practical results which may be submitted by farmers or scientists.

The essays or descriptions sent in must be written in the German language.