THE HEAVENS IN FEBRUARY.

BY HENRY NORRIS RUSSELL, PH.D.

The astronomical literature of the past month does not contain much of popular interest. It may, however, be mentioned that Metcalf's comet—discovered last November—has turned out to be a periodic one, moving in an ellipse of rather small eccentricity (for a comet) with a period of about eight years. It was about as near to us at the time of its discovery as it can ever get, its distance being some sixty million miles, and even then it was very faint, so that it can never be at all conspicuous.

This adds one more comet to the large family which is attributed to Jupiter. It may seem rather strange to speak of comets as belonging to the family of a planet, but we have good reason for the phrase. All the comets of short period—of which more than a score are known—move in orbits which pass close to that of Jupiter. This invariable rule cannot be the result of accident, and it is not hard to find an explanation for it.

If we follow back the motion of one of these comets and of Jupiter, we will sooner or later come to a time when the two bodies must have been close together. In such a case, when the comet is very near Jupiter, the planet's attraction on it will be very powerful, and may in some cases be much stronger than that of the sun. The result of such an encounter will be a complete change in the size and shape of the comet's orbit, while, since the comet is of very small mass, its attraction will not change the motion of Jupiter by a measurable amount.

Several such cases have been actually worked out, though an enormous amount of labor was demanded by the calculations, and it has usually been found that the previous orbit of the comet was much larger than its later one, and so remote from the earth's orbit that the comet must have been quite invisible to us. In at least one case a comet has been "lost" in this way—by having a small orbit enlarged—and we may never see it again.

Now a large majority of the comets that are discovered move in practically parabolic orbits, coming from an immense distance toward the sun, passing round it, and receding into space again. If such a comet happens to pass near Jupiter, its orbit will be changed, and it may be so altered that it becomes an ellipse of short period. There is good reason to believe that the known short-period comets have originated in this way, and so we speak of them as Jupiter's "family."

The other large planets have similar but less numerous families of comets, whose periods in all cases are roughly half those of the planet. For example, Halley's comet, with a period of 76 years, belongs to Neptune's family.

THE HEAVENS.

Referring to our map, we find that Auriga the Charioteer is right overhead, with his brightest star, Capella, northwest of the zenith. Southeast of this is Gemini, with the planet Jupiter (which lies close to the stars η and μ) making it more conspicuous. The Little Dog with the bright star Procyon is lower down.

Due south is the splendid form of Orion, below whom are the small groups called the Hare and the Dove. On the east is the Great Dog with the superbly brilliant Sirius. Below this is part of the ship Argo, a very large and fine constellation, which we are too far north to see properly. Its brightest star, Canopus, which has no superior save Sirius, is just outside our map, but can be seen, due south and very low down, by observers in Virginia and Kentucky and farther south.

Eridanus fills a large part of the southwestern sky, and then come Cetus the Whale and Pisces the Fishes, neither of which has any very bright stars.

The variable Mira (marked *o* in the map of Cetus) is now fading after one of the brightest recorded maxima. Taurus the Bull and Aries the Ram are due west, and Perseus, Andromeda, and Cassiopeia northwest, with Cepheus below the latter. The Dragon and the Little Bear are below the pole, and the Great Bear is coming up on the right.

Cancer the Crab, which is in the southeast, is only interesting for the star cluster called Præsepe or the Bee-Hive, but Leo the Lion is a full group with many bright stars and easy to recognize and remember.

The Hunting Dogs and Berenice's Hair, which are both rising in the northeast, are not very important. The Sea Serpent Hydra is a very large constellation, but we now see only a part of it, including the serpent's head and less than half his length, for it will be hours yet before his long tail drags itself clear of the horizon.

THE PLANETS.

Mercury is apparently close to the sun at the beginning of February, but soon passes out to the eastward and becomes an evening star. During the latter part of the month he is very favorably placed for observation, setting at about 6:40 on the 21st and near 7 P. M. on the 28th. He is in perihelion (nearest to the sun in actual distance) on the 27th, and is in consequence unusually bright, as he receives more light from the sun than at his average distance. On the 21st he is in conjunction with Saturn, at a distance of a little over 1½ deg. Mercury, which is the northernmost of the two planets, will be considerably the brighter.

Venus is morning star in Sagittarius, and rises at 4 A. M. in the middle of the month. On the 8th she is at her greatest elongation west of the sun, 47 deg. from him, and in the telescope appears exactly like a half-moon. She is still extremely bright, but is gradually fading as she recedes from us.

Mars is morning star in Scorpio, and rises at about 2 A. M. in the middle of the month. He is not yet conspicuous, but will be so in the summer.

Jupiter is the most conspicuous thing in the evening skies. He comes to the meridian at 9:25 P. M. on the 1st and 7:35 P. M. on the 28th, and is visible almost all night. Some unusually interesting phenomena of his satellites deserve attention. On the 1st, in the course of a single night, the second and third satellites are eclipsed behind the planet, while the first and fourth transit across his disk. On the 10th the shadows of the first and second satellites may be seen crossing the disk at the same time. On the 19th the first satellite is in front of the planet and the second behind it, while the shadow of the third appears on its disk. Finally, on the 26th, it is possible to watch while the second and fourth satellites pass behind the planet and the first and third, together with their shadows, cross its disk.

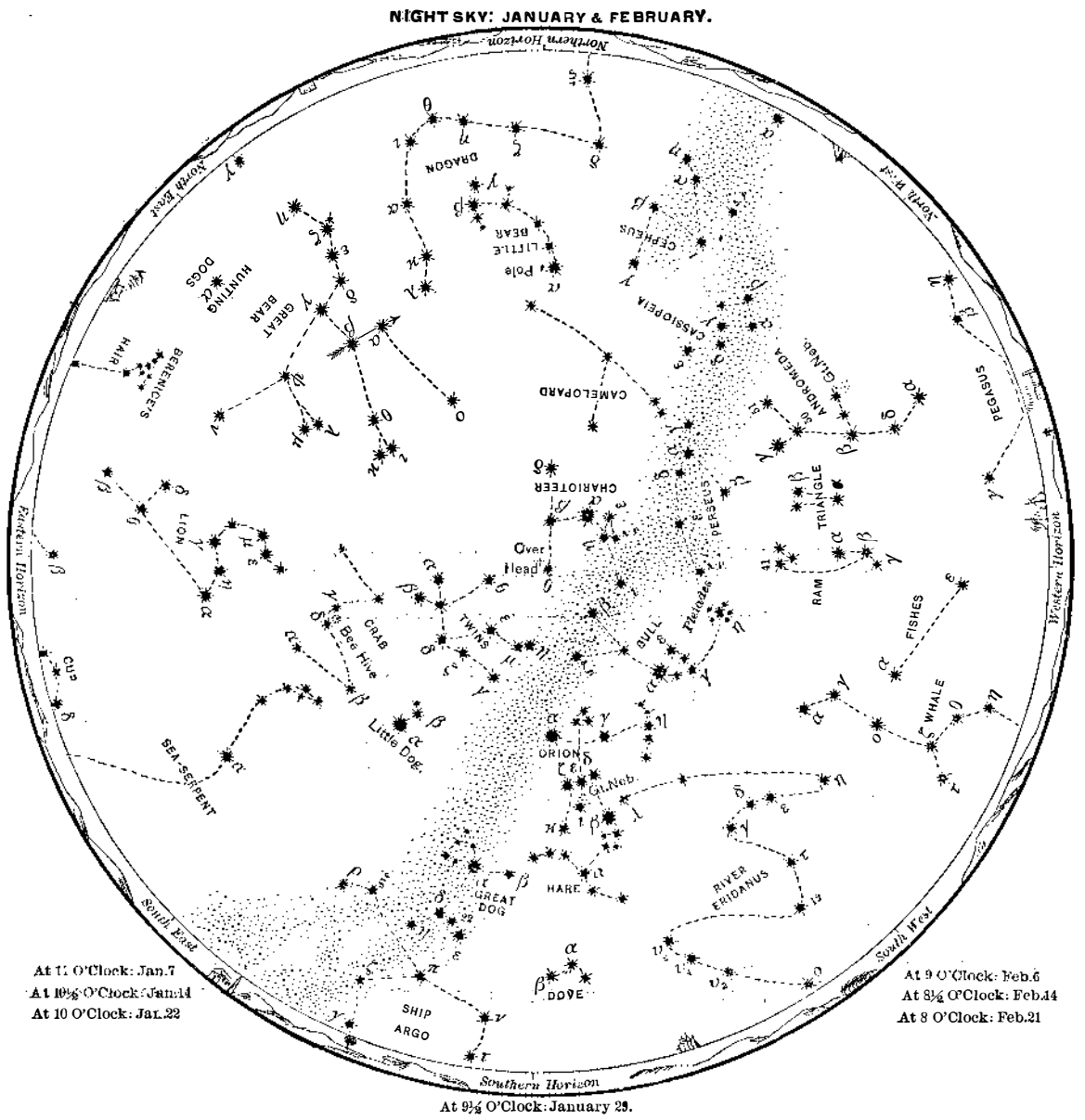
Saturn is evening star in Aquarius, and is only well visible in the earlier part of the month. On the 1st he sets about 7:30 P. M., while on the 28th he is on the horizon at 6 o'clock and is no longer to be seen.

Uranus is morning star in Sagittarius, rising at about 4:30 A. M. in the middle of the month. On the 17th he is in conjunction with Venus, being 3 deg. south of her. Neptune is in Gemini, not far east of Jupiter. His position on the 3d is R. A. 6h. 45m. 0s.; dec. 22 deg. 9 min. north, and on the 27th R. A. 6h. 43m. 10s.; dec. 22 deg. 12 min. north. It is hard to find him without an equatorial telescope with properly graduated circles.

THE MOON.

Last quarter occurs at 8 P. M. on the 5th, new moon at 1 A. M. on the 13th, first quarter at 11 P. M. on the 19th, and full moon at 1 A. M. on the 28th. The moon is nearest us on the 10th and farthest away on the 21st. She is in conjunction with Mars on the 6th, Venus and Uranus on the 9th, Mercury on the 12th, Saturn on the 13th, Jupiter on the 22d, and Neptune on the 23d.

Princeton University Observatory.



In the map, stars of the first magnitude are eight-pointed; second magnitude, six-pointed; third magnitude, five-pointed; fourth magnitude (a few), four-pointed; fifth magnitude (very few), three-pointed, counting the points only as shown in the solid outline, without the intermediate lines signifying star rays.

THE CORNU HELICOPTER.

The Cornu flying machine is one which is to enter the field to try to capture some of the aeronautic prizes. It is of the type known as helicopter, and has a pair of horizontal propellers which are worked by motors and are designed to lift the machine from the ground, and it also has a set of plane canvas surfaces which are to aid in the flight. The new machine is only in the experimental stage as yet, in the shape of a working model, but it seems to give good promise, if the recent reports are to be believed. A series of trials with the experimental flyer were made not long ago at Lisieux, France, where it had been constructed by M. Cornu. In these tests the apparatus was guided by a pivoted tube which served to hold it and prevent it from rising to a greater height than ten feet. The same device made the flyer describe a circular path of 100 feet circumference. In the first trial of the apparatus, it was found to rise in the air, with the planes disposed vertically. The two propellers were operated by a small gasoline motor of 2 horse-power size, but in this case it worked at only 1½ horse-power, since the ignition point was lowered. As regards the total weight which the propellers had to raise under these conditions, it is stated to be 30.47 pounds. There seemed to be no difficulty in making the machine rise in the air. During the second trial, the movable planes were inclined so as to receive the air which was sent to them by the lifting propellers, and as soon as the motor had been set running in the same conditions as above, the machine rose up again, and this time took a sidewise movement, proceeding to the limit of its course. In its movement it took, besides its own weight, the device which guided it. The present machine is a reduced model of a large apparatus which M. Cornu and son expect to build in the near future and they are to enter it for the Deutsch-Archdeacon prize of $10,000.

When natural gas was first brought into use in America there seemed to be a general idea that the supply was inexhaustible. It was sold at low rates and usually without measurement. This method encouraged waste in the consumption of gas, and was shortly abandoned by the larger companies. To-day nearly all consumption is sold by measurement. It is believed, says the Iron Age, that the time has now come when it is possible to procure statistics of the quantity of gas consumed, and next year this will be undertaken. The method will give such figures in the future that a more direct knowledge will be obtained of the capacity of gas areas to maintain a commercial supply of gas for a certain number of years.