THE HEAVENS IN OCTOBER.

BY HENRY NORRIS RUSSELL, PH.D.

Our map shows the heavens as they appear in the early evening to an observer lying on his back with his feet to the southward.

The Milky Way extends its great arch right across the heavens. Along its line are many brilliant constellations, for the most part familiar to us. Beginning in the southeast, we see Sagittarius, the Archer, just setting. Above it, past a region of great star-clouds, is the Eagle (Aquila) near which is the small group of the Dolphin. Almost overhead, but rather west of the zenith, is the fine cross of Cygnus, the Swan, west of which is Lyra.

Cepheus, which is not a bright constellation, comes next, just above the Pole, and then we reach Cassiopeia which is much more conspicuous. Below this is Perseus, whose most remarkable star, though not its brightest one, is the variable Algol, marked with the Greek letter β on the map.

Half-way between Cassiopeia and Perseus (though in the territory of the latter) is a bright condensation in the Milky Way, visible easily to the naked eye. This spot is one of the finest things in the sky to look at with a small telescope, for it is a great cluster of stars, some of which are bright enough to be seen separately with a field-glass, though not by the naked eye.

Still lower, on the northeastern horizon, Auriga, the Charioteer, has just risen.

The summer constellations are now disappearing from our view. Ophiuchus and Serpens are low in the west, and Hercules and the Northern Crown are but little higher up. Beneath them we still see a few stars of Boötes (the Herdsman) which are following their leader, Arcturus, which has already sunk below the horizon.

The Great Bear is at the lowest point of its circuit and lies flat on the northern horizon. Above it is the Dragon, whose head is still quite high, near Lyra. The two bright stars β and γ mark its eyes, and from them its body can be followed on long curves to a point below the Pole, between the Great and Little Bears.

The star α in this constellation deserves special notice. Though now remote from the Pole, it served the Egyptian astronomers as a pole star, for about 3,000 B. C. the celestial pole, in the course of its slow circuit about the pole of the ecliptic, passed very near this star, so that it was even closer than Polaris is now. This star is also noteworthy for another reason. The ancient and medieval astronomers always described it as of the second magnitude—that is, as bright as the Pole-star, or as the principal stars of the Dipper. It is now obviously much fainter, so that it would seem that it must have lost two-thirds of its former brightness within the last few centuries.

Turning now to the southeastern half of the sky we see, not far from the zenith, the great square of Pegasus. One of its corners belongs to Andromeda, but the other three are legitimate parts of the constellation from which it is named.

The western edge of this square, extended downward, points us to the planet Saturn, and going as far again to the bright star Fomalhaut, which belongs to the Southern Fish. Still lower down are some of the stars of the Crane, which can only be well seen from the southern part of this country. Capricornus, the Sea-Goat, and Aquarius, the Water-Bearer, lie above these constellations. The former is notable on account of the two double stars α and β, and the latter because Saturn is now within its borders.

The Fishes (Pisces) are not at all conspicuous, but the Ram (Aries) and the Bull (Taurus) are prominent constellations. The latter includes the Pleiades, which are now fairly well up, and the bright star Aldebaran, which is just rising.

In the southeastern sky the principal group is Cetus, the Whale. Its brightest star, β, is quite conspicuous, since it stands very much alone, some distance to the east of Fomalhaut.

The star marked o on the map is not visible at present. It is the famous variable Mira, which is usually to be seen only with a telescope, but which becomes visible to the naked eye for a month or so, at regular intervals of eleven months. Its next maximum is due toward the first of December.

THE PLANETS.

Mercury is evening star throughout the month, but it is only toward its end that he can be seen, and even then he sets less than an hour later than the Sun.

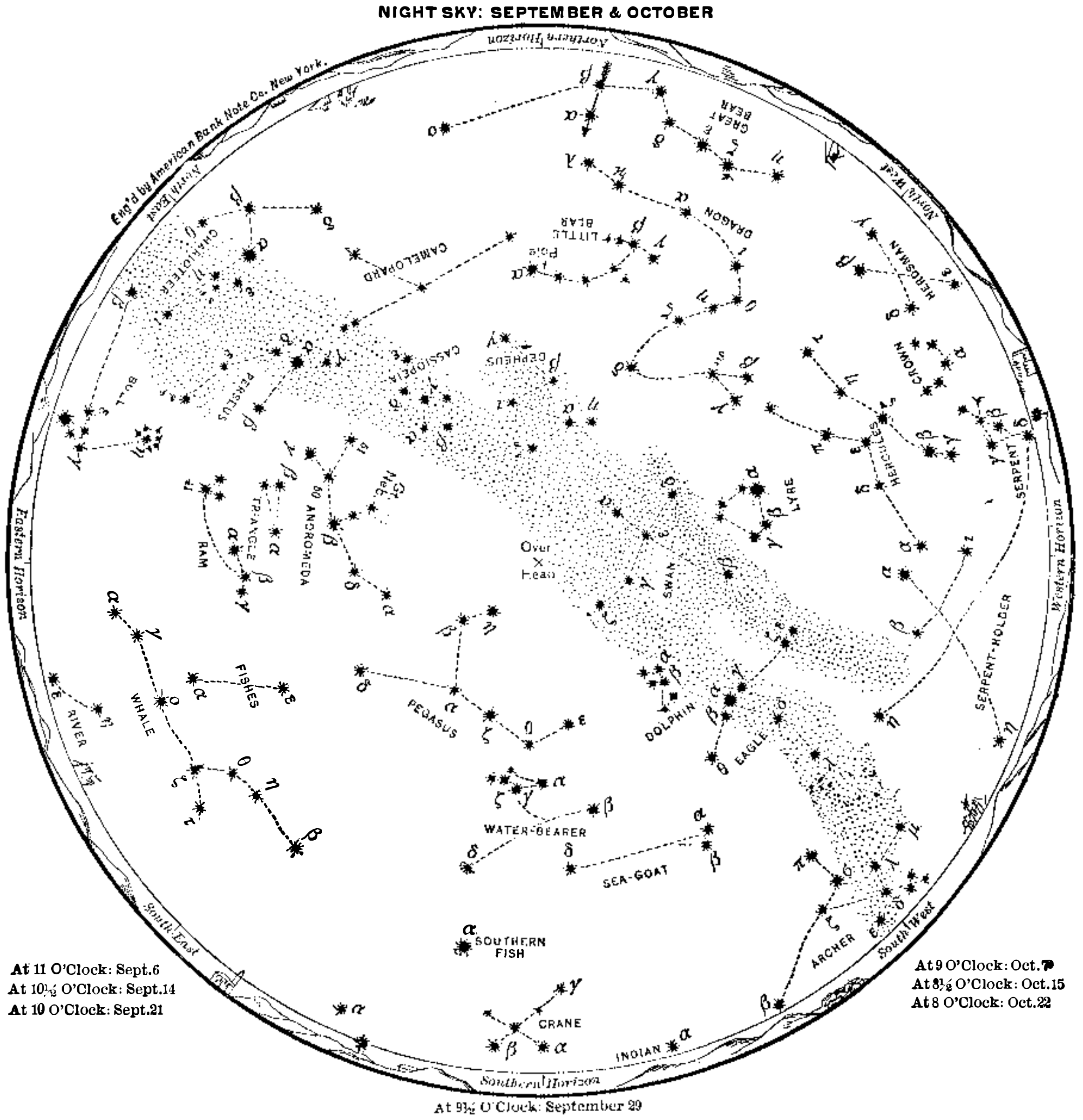
Venus is likewise evening star, and reaches her greatest brilliancy on the 25th, but she is very far south, and sets at about 7 P. M.

Mars is morning star in Leo, rising at 4 A. M. in the middle of the month.

Jupiter is in Gemini and rises about 10 P. M. Saturn is in Aquarius, and comes to the meridian about 9 P. M. on the 15th, so that he is well seen in the evening.

Uranus is in Sagittarius, setting at 9:30 P. M. on the 15th. Neptune is in Gemini and rises about 10 the same date.

NIGHT SKY: SEPTEMBER & OCTOBER



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 MOON.

Full moon occurs at 7:40 A. M. on the 2d, last quarter at 10:31 A. M. on the 10th, new moon at 5:34 P. M. on the 17th, first quarter at 8:42 A. M. on the 24th, and full moon again at 11:38 P. M. on the 31st.

The moon is nearest us on the 19th, and farthest off on the 7th. She is in conjunction with Jupiter on the 9th, Neptune on the 10th, Mars on the 15th, Mercury on the 18th, Venus on the 20th, Uranus on the 22d, and Saturn on the 27th, at 5 A. M. This last conjunction is pretty close, and an occultation of the planet is visible in Australia.

The United States Navy Department, in its recent power extensions to the New York navy yard, has, through its bureau of yards and docks, adopted Westinghouse-Parsons steam turbines, which will be installed in building 41. The present installation will comprise two 500-kilowatt units, operating under 150 pounds steam pressure, 28 inches vacuum, and on superheated steam at 100 deg. F. The power plant supplies three-phase alternating current at 2,300 volts, and 60-cycle frequency, to machine shops, drydocks, and other general purposes about the New York yards, including lighting of buildings.

Nitrification of Sewage by Shallow Filters of Fine Particles.

Dr. George Reid presented before the Physiological Section of the British Association, a paper on "Nitrification of Sewage by Shallow Filters of Fine Particles." The author stated that he had always advocated fine-grain sewage filters, used as percolating filters, not as contact-beds; but he had not until recent experiments known that the reduction in the size of the particles allowed of the construction of much shallower, and therefore less costly filters. The Local Government Board did not pay any regard to the size of particles, nor to the depth of the filter, so long as the minimum depth of 4 feet was provided, the sole governing principle being cubic capacity in relation to sewage flow, irrespective even of the strength of the sewage. If nitrification were dependent upon the activity of aerobic organisms, it would seem that we should give as large a surface for bacterial growth as possible by reducing the filter particles to the smallest size compatible with free aeration and practical working conditions. He had obtained the best results with filter particles of ⅛ inch, while the usual practice was in favor of particles of from 1 inch to 3 inches or 4 inches. Recently he had had an opportunity of experimenting with some filters which had for four years invariably given high-class effluents. The plant comprised a straining chamber, three detritus tanks, a septic tank—which, together with the detritus tank, gave a period of quiescence of 27 hours—and a ¼-acre percolating filter, 4 feet 6 inches deep, formed of ⅛-inch hard non-friable particles. The septic tank effluent was applied to the filter at the rate of 200 gallons per superficial yard by means of a power-driven apparatus, distributing the sewage at intervals of five minutes. In the filters he had embedded four trays, at 1-foot intervals, in such a way that there were no two trays in the same vertical line, in order to separate the effluents from different depths of the filter. He had found that the suspended solids were practically retained by the surface layers where the organic portions were liquefied. Within the first foot the organic matter was almost completely oxidized, the free ammonia being reduced from 1.71 to 0.03 part in 100,000; the albuminoid ammonia from 0.34 to 0.05; and the oxygen absorbed from 2.18 to 0.32; the oxidation of the carbonaceous matter was practically complete. Thus a very high-class effluent resulted from filtration through 1 foot of filter, and very little work was left for the lower strata of the filter. The loss on calcination of the filter particles was at the depths of 6 inches, 1 foot, 2 feet, 3 feet, and 4 feet: 3.25, 0.99, 0.65, 0.53, and 0.53 per cent. There was, however, an increase of free ammonia in the lowest tray. But the general conclusion seemed to be justified that, given fine particles and good distribution, filters might be constructed much shallower than hitherto, and that it was better to increase the area than to deepen the filter.

The technical college in which the future engineer is to be trained has several important characteristics to maintain. First, to educate scientifically and technically those who shall lead the march of the coming civilization in industrial lines; second, to educate the public to a true sense of the value of applying scientific principles to industrial processes; third, as the university has for one of its functions the extension of human knowledge in any and all lines, so the technical colleges will recognize that the investigation of questions relating to applied science is within their own sphere of usefulness. While the university asks no questions about the usefulness of the information gathered within its walls, the technical college must make its investigations in fields that are distinctly useful.