dend on preferred stock of over 11 per cent, and nearly 8 per cent all round. It is quite open to say that the German company receive 7 per cent of the 8½ per cent in subsidy, and the P. & O. 10 per cent out of the 11 per cent. Both mail services, however, are in consequence of this subsidy run in a more extravagant manner than a purely commercial line would be, and the mileage comparison shows that the English company give the greater value for their subsidy than the German, or in other words the latter probably apply a much larger proportion of their subsidy to dividend purposes than the English company. It is only by means of this state assistance that Germany has been able to compete with England in the mail trade in the East—since Great Britain had such a firm monopoly that other than subsidized lines could not have run against them profitably. German competition, however, has not affected the English trade, but has rather developed it. Other European countries do not subsidize their steamship lines in the way that Germany does. Russia grants special subsidies to certain lines, which, however, chiefly trade within the Russian empire. There is also the volunteer fleet which plies between the Black Sea and eastern Siberian ports. This line calls at some Eastern ports, but carries little cargo, and is chiefly devoted to government political purposes. Japan grants general subsidies upon construction, mileage runs, and also special subsidies to the Nippon Yusen Kaisha to India and Europe, and the Toyo Kisen to San Francisco. The subsidy of the Nippon Yusen Kaisha averages an amount equal to two-thirds of the expenses per voyage, a very large subsidy. Austria grants a subsidy on shipping which, assuming that the freights earned covered expenses, would permit an average dividend of about 15 per cent to be distributed. The bounties of France are equal to about 12½ per cent on the value of the mercantile marine. It is a curious fact, however, that in none of these European countries is the state subvention regarded with satisfaction. Germany, which has been lavish in this direction, is indeed looking forward to the day when traffic with the East and Australasia will be sufficiently remunerative to enable the subsidy to be withdrawn. Such a state of affairs is very remote, however, at present, since English trade in those parts is so secure that the German competition has no effect upon it, whatever. Germany, in fact, has to create a new and special trade for her steamships, and the work is proving difficult, since the English lines offer more frequent services, and, on the whole, are much faster than the German boats plying between Europe and the East.

THE HEAVENS IN MARCH.

BY HENRY NORRIS RUSSELL, PH.D.

As we regard the evening sky at the present season we cannot help being impressed by the greater brightness of the western half in comparison with the eastern. Following the Milky Way up from the northern horizon we pass in succession the zigzag line of Cassiopeia, the bright group of Perseus, the irregular pentagon of Auriga, the parallel lines of Gemini, the lonely Procyon, and the brilliant Sirius, till we reach the southern horizon among the stars of Argo.

Below Auriga and Gemini to the west lie Taurus and Orion, perhaps the most familiar constellations of all. Aries and Andromeda are just setting in the northwest below Perseus.

The brightest stars in the eastern sky are Arcturus, in Boötes, and Spica, in Virgo. At our usual hour of 9 P. M. in the middle of the month they are both low down in the east. The former is the brightest star, except Sirius, in our skies, and may at once be recognized by its reddish color.

The sky east of the meridian is occupied by three large constellations. Ursa Major is the northernmost, extending north and east from the zenith. Leo comes next, with its familiar "sickle," and the bright star Regulus. The head of Hydra is midway between Regulus and Procyon, and from it the long line of the constellation stretches southeastward toward Spica. A small but conspicuous group to the right of the latter star forms the constellation of Corvus, or the Raven.

In the circum-polar sky Cepheus is below the pole, and Draco and Ursa Minor are east of it.

The most interesting recent astronomical news has to do with the nebula which surrounds the new star in Perseus, of which we spoke a few months ago. Traces of it have been discovered on a photograph taken at the Lick Observatory last March, which, like those obtained last autumn and winter, shows that the nebula has been steadily expanding, starting from the star itself at the time of its outburst. It is now nearly equal to the moon in apparent diameter, and is still growing. Recent observations also show that the star has no sensible parallax; that is, that it is by no means one of our nearest neighbors.

The enormous rate at which the nebula appears to move has been very simply explained by Prof. Kapteya, an English astronomer, as follows: Suppose that the new star is surrounded by a great cloud of meteoric dust, or something of that sort. The light sent out by the star during its short period of brilliancy will light up this dust as it travels through it, so that it will appear, when seen from a great distance, as a faintly luminous ring surrounding the star. This ring will appear to move outward in all directions with the velocity of light—186,000 miles per second—which is certainly fast enough. The irregularities of the nebula as photographed can be accounted for by assuming that the dust is thicker in some places than in others.

On this hypothesis the distance of the Nova may be calculated from the apparent size of the nebula. We give only the results here, referring for the proofs to a letter by Mr. W. E. Wilson in Nature for January 30.

It appears that the new star is so far off that it takes its light about 250 years to reach us. Its actual brightness, during the few days when it was at its best, was about 10,000 times that of the sun. It still gives out ten times as much light as the sun does, though it is now invisible to the naked eye. Finally, the outburst which we saw last year must have taken place about the year 1650, its light having taken all the intervening centuries to reach us.

THE PLANETS.

Mercury is morning star in Aquarius, rising about an hour before the sun. On the 16th he reaches his greatest western elongation. He is farther from the sun than usual, but, being south of him, is not as easy to see as he was at his recent evening appearance. Venus is also morning star, and is in a situation very much like Mercury's, but farther from the sun, so that she rises from one and a half to two hours before sunrise. She is rapidly growing brighter, and on the 20th is at her greatest brilliancy, being once more easily visible in the daytime, if one knows just where to look for her. Mars is within a few degrees of the sun, and therefore cannot be seen. The sun, whose apparent eastward motion among the stars is faster than his, overtakes him on the 29th, and he becomes a morning star, though he will not be visible in that capacity for some time to come.

Jupiter and Saturn are morning stars in Sagittarius. On the 15th the former rises over two hours before the sun, and the latter nearly three.

Uranus is morning star in Scorpio. On the 12th he is in quadrature with the sun, and is due south at 6 A. M. Neptune is in Gemini. On the 19th he is in quadrature, but since he is 90 deg. east of the sun, while Uranus is 90 deg. west of him, the two planets are in almost exactly opposite parts of the heavens.

THE MOON.

Last quarter occurs on the morning of the 2d, new moon on the afternoon of the 9th, first quarter on that of the 16th, full moon on the evening of the 23d, and last quarter again on the night of the 31st, or, properly speaking, on the morning of April 1, since the phase occurs at 1 A. M.

The moon is nearest us on the 13th, and farthest off on the 1st. She is in conjunction with Uranus on the 3d, Saturn on the 5th, Jupiter on the 6th, Venus on the afternoon of the 7th, Mercury the following night, Mars on the 11th, Neptune on the 16th, and Uranus again on the 30th. None of these conjunctions are close except that with Venus, which will be about 1½ deg. south of the moon.

At 8 A. M. on March 21 the sun enters the sign of Aries, and, according to the almanac, "spring begins."

Princeton, February 18, 1902.

EARTH TELEPHONE EXPERIMENTS OF M. DUCRETET.

M. E. Ducretet, a well-known electrician of Paris, has been making some interesting experiments in telephonic transmission by using the earth alone as a conductor. The transmitter in this case consists of a microphone and a few cells of battery connected directly to two earth plates of considerable surface and buried 6 feet below the ground. The plates are placed facing each other and only a few yards apart. For the receiver he makes use of a quarry well about 60 feet deep which communicates below with the Catacombs. The orifice terminates at the ground level by a cast-iron pipe 4 inches in diameter and 12 feet long. An insulated conductor descends in the vertical well and brings a metal sphere 3 inches in diameter in contact with the soil of the Catacombs. On coming out of the well the wire is fixed to one end of an ordinary telephone receiver, whose other end is connected with the iron pipe at the surface of the ground. The two earth circuits which are thus made are separated by a building with cellars and thick walls, and therefore the layer which separates the two parts is considerable. When the microphone is spoken into, all the vibrations of the voice, even the feeblest, give rise to variations of current in the circuit which is closed through the earth, without any metallic connection between the two parts, and in spite of the multiple variations of the currents and the nature of the medium, earth, which is used, the reproduction of the voice is made at the receiving end with remarkable sharpness, and besides, there are none of the extraneous noises which are so common in the ordinary circuits. The dynamos which are working in the neighboring building, both continuous and alternating current, have no effect upon the circuit. It is difficult to give a satisfactory explanation of this phenomenon of earth transmission, but M. Ducretet thinks that the current is diffused from the transmitting station by derivations from the principal circuit between the plates, and that this current is sufficient to operate a certain number of receivers placed at different distances. With the arrangement of circuits described above, the experimenter was able to send through the earth a current sufficiently strong to operate a relay and electric bell. If the sphere which rests upon the soil of the Catacombs is raised from the ground, all reception ceases, but recommences when the contact is again made with the earth, which, it should be remarked, is dry. M. Ducretet is continuing his experiments over greater distances and under varying conditions.

SCIENCE NOTES.

The North German Lloyd steamer "Krefeld" has just brought to Germany 175 ancient Chinese bronze guns, which formerly stood on the walls of Pekin, and, according to inscriptions upon them, were cast between 200 and 250 years ago in Chinese arsenals under the superintendence of the Jesuits. It is stated that the more highly ornamented pieces of cannon are to be placed in the Naval Museum, while the remainder are to be melted for the sake of the bronze.

M. Sibillot, a Parisian aeronaut, has devised a new principle of aerial navigation which, he anticipates, will solve the problem of traveling through the air. He has completed the plans of a new dirigible balloon which, he maintains, will be manageable in any weather. He proposes to carry in his aerial machine a refrigerator and a heating apparatus. By simply pressing a lever of the former he thus reduces the temperature of the gas, the condensation causing the balloon to descend. On heating the hydrogen the gas expands, and thus the balloon ascends. By this alternative heating or cooling of the gas in his balloon he can rise or fall at will without allowing any of his hydrogen to escape.

Australia is proving a formidable rival in the butter industry of the world, and the rapid growth of the export trade of that country has advanced steadily during the past few years. From the colony of Victoria alone there were exported to Great Britain during 1899-1900 17,107 tons, representing a gross value of $8,023,000. The export of butter from Victoria commenced in 1889. During the first year the quantity exported was 369½ tons, representing a monetary value of $255,000. In the following year it had risen to 759¼ tons, of a value of $495,000. The remarkable growth of the industry continued during the succeeding years, and as the demand for the article is so great there is every appearance of the colonial produce supplanting that of other countries, especially when the rich and extensive pastoral resources of Victoria are remembered. For the ten years during which the trade has existed the total exports of butter have reached 79,426 tons, aggregating a value of $38,533,475.

Dr. A. Wynter Blyth, barrister-at-law and medical officer of health for Marylebone, had a startling proposition to make in his capacity of new president of the Incorporated Society of Medical Officers of Health, who held their annual gathering at the Hotel Cecil. In his presidential address he discussed the subject of "Ventilation" in all its bearings, says the London Chronicle. To improper ventilation he attributed the low state of public health, which conduced to the spread of tubercular and other maladies. After dilating upon the atmosphere and excellent ventilation of the tube railway, he said it was within the possibilities of modern science to make the deepest mine not only habitable, but agreeable and healthy. It might be hereafter a contribution to the solution of the housing question to build downward in the depths instead of upward on the mountain. One could imagine a Jules Verne cavernous city, where the sky was the ever-white, changeless chalk, where no rain fell, where no frost penetrated, where the light never failed, and where dry, warm, filtered, purified, ozonized air bathed the lungs and fanned the cheeks of the denizens in the constant white glare of a never-dying summer's day. In tenement-houses and workplaces it was better to deal with each individual room and give them their own ventilating system. With regard to the ordinary tenement-house it was doubtless at the present time hopeless to suggest any mechanical appliance. They must seek the great factor in the propagation of tubercle in the constant breathing of bad air added to close contact of the healthy and diseased. If some of the great expert talent now employed in the investigation and discussion of problems relating to sewage and sewage-disposal were diverted to the study of ventilation, our factories and workshops would put out more work in a given time, and the mean duration of human life in the country would be appreciably lengthened.