

Venus Now in Western Evening Sky

Astronomy

By JAMES STOKLEY

Three planets in the western evening sky during February afford one of the best displays of these earth neighbors that we have had lately. If you look to the west after sunset you will see a very brilliant star low down, near the horizon. This is Venus, of the minus fourth magnitude, as reckoned on the astronomer's scale. It is a little to the north of west. Above, and to the left, is another bright star about minus 1.7 on the magnitude scale, of less brightness than Venus, but brighter than any other stars in the neighborhood. This is Jupiter, largest of all the planets in the solar system. It is about the same magnitude as Sirius, in the Little Dog, which shines in the southern sky, but the sparkling rays from the star are quite different from the steadier, and duller, glow of the planet. The reader is referred to this week's "Classic of Science" on page 87 for more details about this interesting planet.

Mars appears in the constellation of Taurus, still higher than Jupiter and farther to the south. It is about zero magnitude, brighter than any star except Sirius. Its steady red light affords a means of identifying it.

If you have access to a small telescope, magnifying perhaps thirty or forty diameters, look at Venus through it. You will find that, when magnified, it is not round, but semi-circular, like the moon at first quarter. By next month a telescope would show it as a crescent, two months ago it would have appeared in a gibbous phase, like the moon when not quite full. In other words, Venus under-

goes phases like the moon, but the planet is so much farther away than the moon that a telescope is needed to make the phases evident.

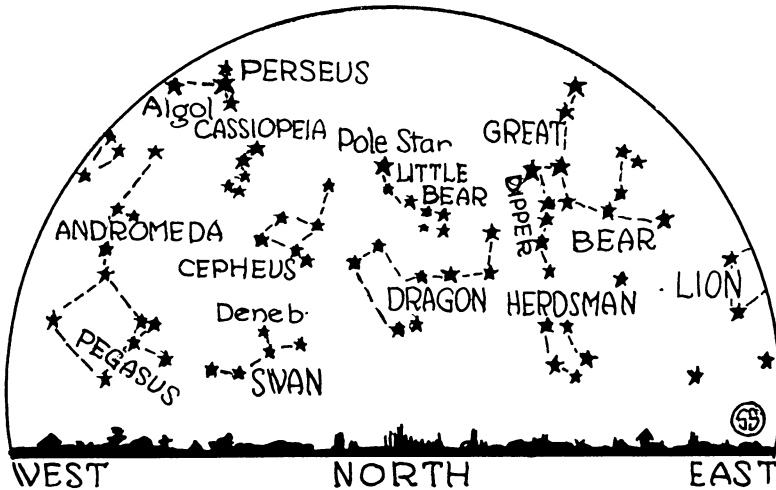
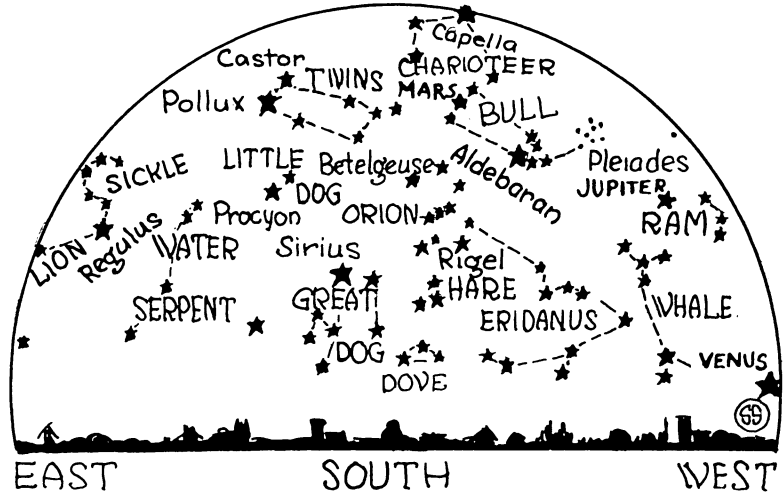
The discovery that Venus imitates the moon in its phases was one of the first to be made at the dawn of the modern era of astronomy. Though men had been watching the stars since the earliest times, in the year 1609 they had no better means of seeing them than had the early Sumerian astronomers 6,000 years before. At both times, men could only see stars with the unaided eye.

In 1610, a Dutch spectacle maker, by the name of Jan Lippershey, in the little town of Middlebourg, noticed that when he held two convex lenses in line at a certain distance from each other and looked through them, distant objects appeared close, though upside down. He hit on the idea of mounting the two lenses at opposite ends of a paper tube, and so

made the world's first telescope. The States-General of Holland issued a patent to him for it, but it was principally regarded as a scientific novelty. Uses for it in warfare were foreseen, but it occurred to nobody that there was anything in the heavens that could be seen with it, that could not be seen otherwise. At least, it occurred to no one except an Italian scientist—Galileo Galilei, a Florentine, generally known, like Napoleon, by his first name only.

Galileo did not see one of Lippershey's telescopes, but he heard reports from Holland, in the autumn of 1610, of the invention of this remarkable instrument, made by the combination of lenses, that made distant objects appear close. He realized what a wonderful thing it might be for the study of the heavens, and from his own knowledge of optics, he, too, made a telescope. It was somewhat different from Lippershey's, for instead of two convex, or magnifying, lenses, he used one convex and one concave, or reducing, lens. The magnifying lens was nearest the object at which he looked, and the reducing lens near the eye. Together they gave a magnified view, and one that was right side up. This same combination of lenses, known ever since as the Galilean telescope, is used today in opera glasses.

Galileo lost no time before turning his little telescope on the heavens. He saw Jupiter and four of the moons revolving around it. These moons of Jupiter had been performing their gyrations from time immemorial, but Galileo was the first to see them. Then (Turn to next page)



HOLD THESE MAPS IN FRONT OF YOU. The upper then shows you the southern and the lower the northern sky as it appears on February evenings

February Evening Skies—Continued

he looked at Venus, night after night, and found that it sometimes appeared as a crescent, sometimes as a semi-circle and still other times as a disc.

At that time, the astronomical world was much divided over ideas of the solar system. The orthodox belief was that the earth was at the center of the universe, and that all the other heavenly objects revolved around it. But in 1543 a Polish astronomer, Nicolaus Copernicus, published his great work, "De Revolutionibus," which set forth the then radical idea that the sun was at the center and the earth merely one of a family of planets revolving around it. Galileo, in 1610, was in favor of the Copernican theory, which adherence brought him into conflict, on several occasions, with the church authorities.

It was perfectly well known what caused the phases of the moon. The moon revolved around the earth, nearer to it than the sun, and so it was sometimes on the side of the earth away from the sun. Then it presented a full disc, and was "full". At other times it was at ninety degrees from the sun, we only saw half

the illuminated side, and it appeared as a half moon. Then, at still other times, when it was on the same side of the earth as the sun, we saw only a thin sliver of the bright side, and the crescent was the result.

Venus is a round globe, and comes between the earth and the sun, sometimes, when we see a crescent, and at other times is on the other side from the sun and we see the entire illuminated disc. We know this now, but before Copernicus, men thought that the sphere on which Venus revolved was outside that of the sun. Accordingly, Venus could never get between the sun and earth, and could never show a crescent phase. Therefore, when Galileo announced his discovery that "The Mother of loves (Venus) imitates the phases of Cynthia" (the moon), as he expressed it, it became apparent that something was wrong with the old theory. This helped pave the way for the eventual adoption of the Copernican theory universally.

On the seventh of the month Venus is in the quarter phase. After that it will become a crescent, gradually narrowing until April 20. Then it will be directly on line with the sun,

and lost to the evening sky. Shortly thereafter it will appear on the other side of the sun as the morning star.

February brings with it a fine display of first magnitude stars, shown on the map. In the south is Orion, with Rigel (lower) and Betelgeuse (upper). Farther east is Sirius, in the great dog, Canis Major. Still farther east, and higher, is Canis Minor, with the brilliant Procyon. High overhead is Capella, in Auriga, the charioteer; somewhat less bright, and to the southeast of Capella, is Pollux, the brighter of the two twins, Gemini. To the west of Orion is Taurus, the bull. In this group is the reddish star Aldebaran, marking the eye of the Bull. In the eastern sky is the familiar Sickle, of Leo, the lion, turned on its back, with first magnitude Regulus at the end of the handle.

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A Thousand Years Ago

Sociology

CLIVE DAY in *A History of Commerce* (Longmans, Green):

A village tried to produce everything it wanted, to be free of the uncertainty and expense of trade. We find, then, that almost all of the people of a village were agriculturists, and these raised the necessary food supply by methods which were always crude, and were very often cumbersome and wasteful. The stock was of such a poor breed that a grown ox seems to have been little larger than a calf of the present day; and the fleece of a sheep weighed often less than two ounces. . . .

Diseases now almost unknown to the civilized world, like leprosy or ergotism or St. Anthony's fire, were not infrequent. The food at best was coarse and monotonous; the houses were mere hovels of boughs and mud; the clothes were a few garments of rude stuff. Nothing better could be procured so long as everything had to be produced on the spot and made ready for use by the people themselves. Finally, these people were coarse and ignorant, with little regard for personal cleanliness or moral laws, and with practically no interests outside the narrow bounds of the village in which they lived. So we read of kings and princes always on the road, travelling with court and retinue from one manor to another, eating up the surplus that had accumulated and then moving on.

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