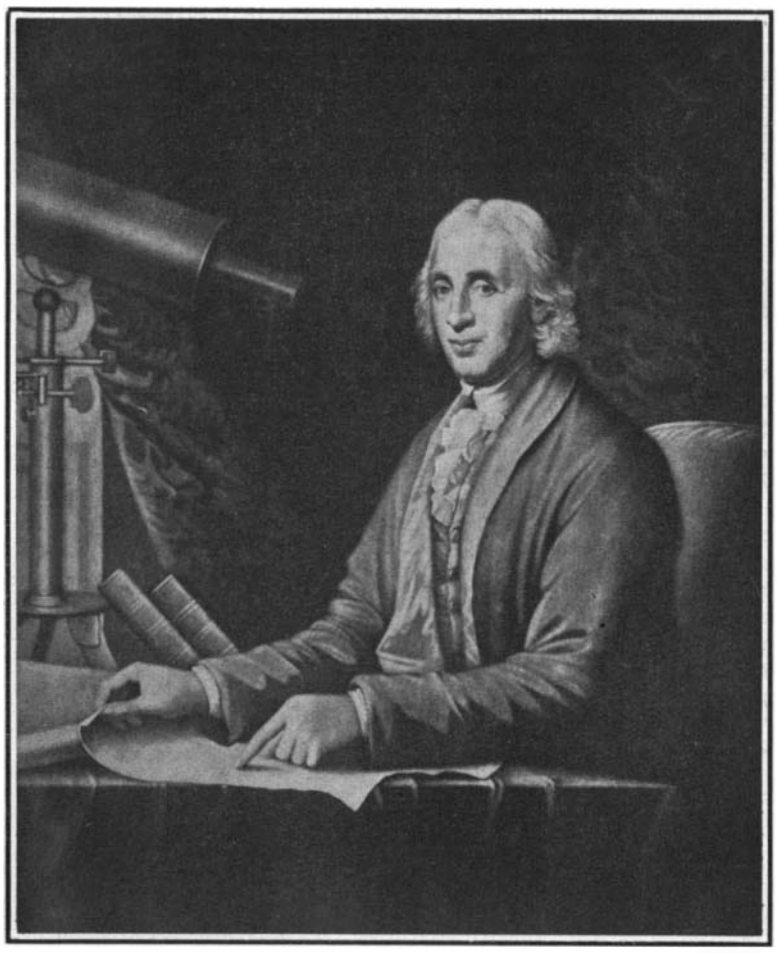
A FORGOTTEN MASTERPIECE—THE RITTENHOUSE ORRERY—AND ITS MAKER.

For one hundred and thirty years the University of Pennsylvania has possessed an ingenious scientific toy which, though long forgotten, at the time it was made created a furor through several colonies, and attracted the admiration and envy of scientists in Europe. This is the orrery constructed by David Rittenhouse, and the instrument and its maker are alike worthy of being remembered. Rittenhouse, like Franklin, Fulton, and others, was a self-taught investigator, and earned his fame by making a distinctive mark at a time when the colonies were dependent on Europe—and particularly on England—for many things which they yearned to produce at home. His family name is known as that of the oldest paper-making firm in America. His father, however, left the mill for the land, and it was as a farmer's son that David Rittenhouse was born in Germantown in 1732. At the age of fourteen or earlier, he followed the plow, but the work suffered, for he would sit down at some flat stone, and with a piece of chalk cover it with intricate calculations. It was soon evident that he had neither liking nor the physique for farming, and he drifted into mechanics, choosing clockmaking for a livelihood. He was soon prosperous, and clocks bearing his name are still to be found in many old Pennsylvania families.

Rittenhouse was a sanely balanced American. Inclined to delicacy, and perhaps emphasizing his weakness by overstudy, he was a deep student and thinker, and a religious man. But business did not suffer at his hands. With a pride in his craft, and a determination to produce no unworthy work, he asked good prices, and did much of his business in elaborate clocks for "gentlemen of respectability and taste." These clocks of his not only showed the changes of the moon and movements of the planets, but often contained a music box, which played at intervals. A curious blending of the enthusiast and the business man peeped out when he commenced work on his orrery. So enmeshed was he in his calculations that he had to refuse urgent orders for clocks, but he "ventured to promise them after harvest, for ready money." At this time a planetarium, or apparatus for showing the relative sizes and positions of the various members of the solar system, was a common possession of people of wealth who aspired to be art patrons. These toys were known as orreries, after a British Earl of Orrery who had financed the making of one.

When Rittenhouse decided to make one he intended to make a reliable scientific instrument; or, as he sarcastically said, "one which will not differ several degrees from the truth in a few revolutions, as is common with orreries." His biographer ingeniously says that not even people of skill and intelligence can fully grasp the beauty and intricacy of this instrument from any diagrams or written description; and the only description extant seems to be that of Rittenhouse himself. He describes the machine as "intended to have three perpendicular faces, that in the front to be four feet square (Fig. 1), made of sheet brass curiously polished, silvered, and painted in proper places, and otherwise ornamented. From the center rises a gilded brass ball intended to represent the sun.



David Rittenhouse, A.M., President of the American Philosophical Society, and Maker of the Orrery.

Round this ball move others to represent the planets. They are to move in elliptical orbits having the central ball in one focus; and their motions to be sometimes swifter, and sometimes slower, as nearly according to the true law of an equable description of areas as is possible without too great a complication of wheel work. The orbit of each planet is likewise to be properly inclined to those of the others; and their aphelia and nodes justly placed; and their velocities so accurately adjusted as not to differ sensibly from the tables of astronomy in some thousands of years.

"When the machine is put in motion, by the turning of a winch, there are three indices which point out the hour, day, and year; answering to that situation of the heavenly bodies then presented; and so continually for a period of 5,000 years forward or backward.

"In order to know the situation of a planet at any period, the indices are first adjusted to the time. Then a small telescope, made for the purpose, is applied to the central ball, and directing it to the planet, its longitude and inclination will be seen on a large brass circle, properly graduated, representing the zodiac, and having a motion of one degree in seventy-two years, agreeable to the precession of the equinoxes. Similarly, the position of a planet in regard to the earth may be found.

"Of the lesser faces (Fig. 2), one shows all the appearances of Jupiter and of Saturn, with their attendant satellites. And the other all the phenomena of the moon, particularly the exact time, quantity, and duration of her eclipses and those of the sun occasioned by her interposition." Such is a condensed account of the orrery as outlined by Rittenhouse.

The orrery was commenced in 1767 and completed in 1770. A competition for its possession at once arose between Princeton College and the College and Academy of Philadelphia. Much to the disgust of the latter, Princeton stole a march on them, and for £300 became the possessor of the treasure. Philadelphia was wildly jealous, hinted that Dr. Rittenhouse had not been loyal to his own colony, and felt that only the aberration of genius could account for his action in letting the masterpiece go "to a village." Rittenhouse remained calm under the excitement and suggested that he could make a second and a better one for the College and Academy of Philadelphia. This appeased the city, and the £300 requisite was raised largely by lectures. To a friend Rittenhouse sagely remarked that, having made one, a second would be easy, and hinted at the possibility of "the other colonies catching the contagion."

This second orrery was completed within twelve months. People came to gaze on its multitude of little wheels, its polished brass, even its mahogany case. But troublous times were ahead. The British and American troops successively occupied Princeton and Philadelphia, and the souvenir hunters of two armies carried off little wheels and ivory balls, the Princeton orrery suffering much more than that in Philadelphia. After the trouble was over, Rittenhouse was approached to restore his masterpieces, but from ill health or other causes he never did so.

For many years the Philadelphia orrery figured on the seal of the University of Pennsylvania, and the orrery itself was its chiefest possession. Now the seal has been changed, and the machine is a forgotten curiosity.

In 1769 Rittenhouse was one of a little band of astronomers who observed the transit of Venus. In 1791 he succeeded Dr. Franklin as president of the American Philosophical Society. Eight years later he died, having lived to sixty-seven in spite of a chronic weakness caused by overstudy when young. As a good American, his ambition was that his country should lead the world alike in science and in manufacture, and in his own particular line he achieved his wish.

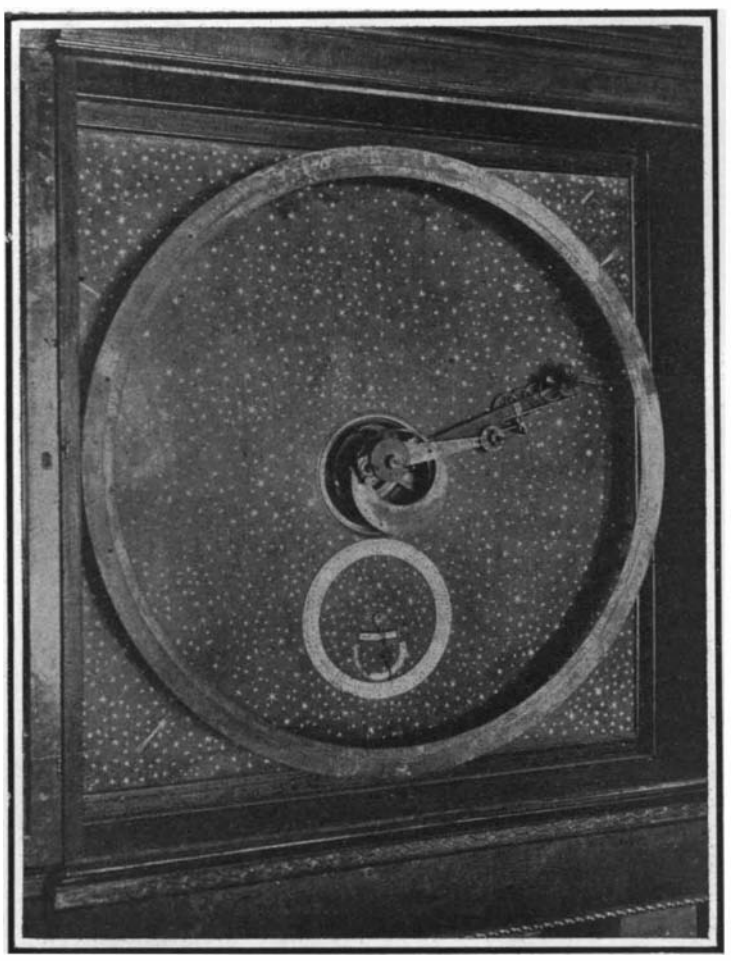


Fig. 1.—The Large Face of the Orrery.

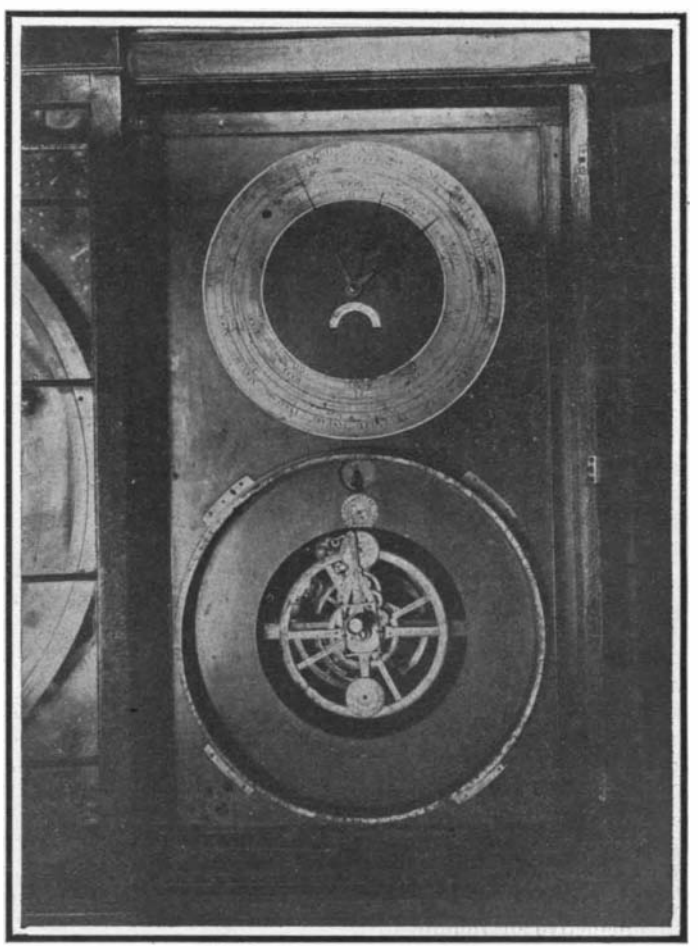


Fig. 2.—The Smaller Faces of the Orrery.

A FORGOTTEN MASTERPIECE.

Steam Turbines in the German Navy.

In view of erroneous statements in the German daily and technical press, that steam turbines find no favor in the German navy, it is interesting to record the extremely satisfactory performance of the torpedo boat G137, recently launched from the Germania shipyards, Kiel.

This boat, which has been equipped with a set of Parsons turbines, attained a speed of 37.78 knots in the official tests made on August 10. This result is the more remarkable, as it was obtained with an average displacement of about 580 tons; while by the conditions of the contract, a speed of 30 knots with an initial displacement of 571 tons was all that was required.