THE ASTROLABE OF REGIOMONTANUS.

BY CHARLES A. BRASSLER.

The subject of our present article, which we shall endeavor to describe as well as illustrate, is one of those intensely interesting instruments used by our forefathers for taking the altitude of the sun and stars at sea. It is the astrolabe of Regiomontanus, and it may still be seen in the Germanic Museum at Nuremberg. Who was this Regiomontanus? Johannes Müller by name, he was born at Königsberg in 1436, and he became an astronomer and mathematician of repute, in fact one of the greatest astronomers of the time, and like the great men of the day he affected the name of his native city, conferring thereby fame upon his birthplace, and assumed, therefore, the appellation *Regiomontanus,* meaning a Königsberger.

In connection with Bernhard Walther he built, in 1472, the first German observatory, where he conducted a series of the most exact observations with the beautiful instruments of his own invention and make, to which this astrolabe also belonged. A number of instruments of the kind that were employed upon shipboard sprang from his fertile brain; and it is certain that Columbus made use of the astronomical tables, compiled by Regiomontanus, for the determination of his whereabouts during his voyages and they must have played an important part in the later discoveries of the bold Genoese. It was Regiomontanus, too, who first studied the distances and motion of the comets.

Before the telescope was discovered, and it only came into use in 1610, all the practical astronomers busied themselves exclusively with measurements. To-day the telescope and the measuring instrument are combined and in this form the most exact observations of the stars are made possible; then the so-called *diopters* were employed and they had to be pointed at the stars. These were either tubes having small openings in either end through which one could see the star, or rulers of wood or metal, that carried at their lower end a perforated board and at the upper end a similar board used as a sight.

This method of observation, far from complete, required large and carefully-divided circles, that is, quarter circles or quadrants wherewith the height of the stars above the horizon or the distance between two stars could be measured; for the larger these quadrants the farther apart were the divisions representing degrees and as a consequence the more exactly was the operator enabled to read them off. Tycho Brahe, the great Danish astronomer of the sixteenth century, had worked with one of these large measuring instruments. According to Bürgel he had a huge quadrant let into a wall, called a wall quadrant, with a radius of more than three meters; the whole circuit of this immense instrument was nigh on to twenty meters. He was successful in obtaining very exact results with this. The astroblades were, however, much smaller, and also the results were greatly inferior to those obtained with the huge quadrants and octants. Indeed, they were never intended for the finest measurements. Since they were light and easily carried about, being from twenty to thirty centimeters in diameter, they were peculiarly adapted for seamen and travelers.

A clever observer such as Regiomontanus might obtain very exact measurements with a carefully-constructed astrolabe such as the one we show in the cut. The astrolabe was a sort of universal instrument. Not only could the height of a star above the horizon be measured by it and its distance from the zenith, but also many measurements, particularly the position of the sun, from which the local time and also the sidereal time could be obtained. When in use the astrolabe was suspended by the ring at the top or held freely in the hand so that the white line we see drawn across the face of the disk should fall exactly upon the horizon and in that way form the artificial horizon, while the vertical lines should be perpendicular to it. From this it is easy to see that an imperfect suspension of the instrument would lead to grave faults in the calculations.

ASTROLABE OF REGIOMONTANUS.

The large disk, upon which the divisions of degrees are engraved, was made of metal; so also were all the other parts most carefully worked out of metal. *Mater* is the name given to the large disk divided into degrees. Inside of this is set a second metal plate, the so-called planisphere, and we can recognize it by the engraved net work. This net work comprises the degree-divisions of the heavens carried out upon a plane surface, hence the name (*sphaera,* the Latin word for a sphere, and *planum,* signifying a plane).

Above the planisphere lies the neatly cut out and decorated "rete" carrying upon its circular interior the constellations of the ecliptic. The pole of the ecliptic and the positions of some of the stars are also given.

Turning upon the axis of the whole we finally find the *diopter rule,* called also the "Alhidad rule," the pointed ends of which serve as indicators for reading off the degrees on the outer circle. Slightly removed from the ends and approaching the center we see the little sighting boards with their holes for vision. If now we desire to find the local time we must proceed as follows: Hang up the astrolabe so that the plane of the mater coincides exactly with the plane of the sun's rays. Then, looking through the two holes in the diopter rule, turn it until the sun can be seen. Upon the extreme circle the height of the sun may now be read in degrees at the point of the diopter nearest the eye.

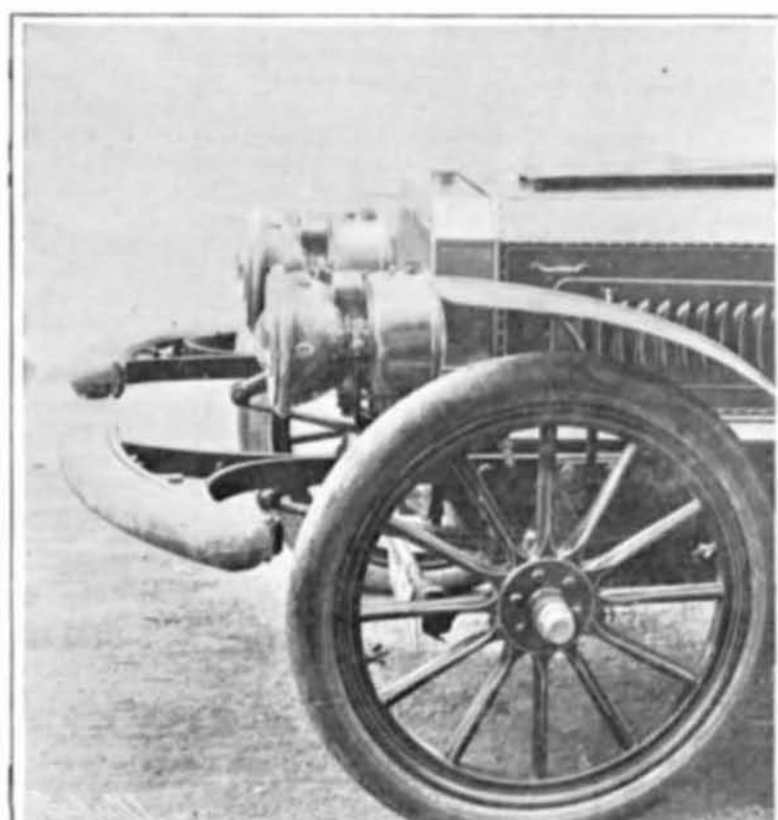
Now look up in the tables the position of the sun, the sun's longitude for this day in the ecliptic, and, by turning the "rete," bring the point on the ecliptic of the sun given for this day into coincidence with the height of the sun as measured by the diopter rule on the outer scale. A special pointer on the "rete" will now indicate a figure engraved upon the disk, which will correspond with the sun's time at the moment of the observation. The astrolabe in its positive form was invented by Hipparchus in the second century before Christ and until the beginning of the eighteenth century it was occasionally used, even though it did not give very exact results.

A SAFETY BUFFER FOR AUTOMOBILES.

Collisions by an automobile, either with stationary or moving objects, nearly always result in a certain amount of damage being inflicted upon the motor vehicle. As a rule it is the front lamps, mudguards, and, occasionally, the front wheels which suffer. With the object of minimizing this danger, and also for protecting the obstacles with which the car happens to collide, a novel safety buffer has been introduced by the Simms Motor Manufacturing Company, of London. As will be seen from the accompanying illustration, the device consists of two short rim segments attached either to the front or side members of the chassis of the automobile. To this rim is fixed a short length of pneumatic cushion, fully inflated. Being placed well in advance of the front of the vehicle, the lamps, mudguards, and wheels are adequately protected, and the curved nature of the buffer tends to transform the impact into a glancing blow. Owing to the bracket carrying the buffer being of stout construction and fashioned in the form of a spring, there is little possibility of the buffer collapsing or buckling by the force of the impact with another object.

The device has been subjected to several tests when fitted to a 20-horse-power car. The working of the buffer is well shown in the accompanying illustration.

Car Equipped with Buffer Striking a Delivery Tricycle.



A Near View of the Buffer.

A NOVEL PNEUMATIC SAFETY BUFFER FOR AUTOMOBILES.