ciated Lines standards, and is fitted with a 9,000-gallon water-bottom tank. The capacity for oil is 2,850 gallons. The trucks under both the locomotive and tender are equipped with "Standard" solid forged and rolled steel wheels. The detail parts of this locomotive have, where possible, been designed in accordance with existing standards of the Associated Lines. The engine is practically equivalent, in weight and capacity, to two large Consolidated type locomotives, and in spite of its great size, presents a pleasing and symmetrical appearance.

$200 in Prizes for the Best Garden.

If you have a small garden and you are proud of it, the readers of American Homes and Gardens want to know all about it. For the encouragement of those who have converted an unsightly lot into a lovely, blossoming piece of ground, however small, the Editor of American Homes and Gardens offers cash prizes aggregating $200.

The prizes are offered for the best-planted, developed and successful village or suburban gardens. The Editor and the readers of American Homes and Gardens want to know how you planted your garden and what success you had with it. You need not be a skilled writer to compete.

The unusual opportunity offered in the Garden Competition should call forth immediate and practical results. It is a project that should appeal alike to the owners and creators of gardens, and to those who want helpful hints and suggestions on the making of a small garden. For it is the home garden, the inexpensive home-grown garden, for which these prizes are offered. In other words, the gardens of the people, as distinguished from the gardens of the gardeners. Everyone may have a small garden, even if it be but a front yard, and it is precisely these home gardens which are made and tended by the family that are sought in this competition.

The Garden Competition raises the plain question, Who has the best garden? And the readers of the Scientific American are invited, with the utmost cordiality, to answer this question.

If your garden is a small one, so much the better. No garden is too unimportant for consideration in this competition, for the award of the prizes will be based on the merits of the gardens as gardens, and not on their size and cost.

This competition affords a splendid opportunity to give many persons pleasure by making known the beauties of your own garden to them; but it should help and stimulate others in new and other garden work, by giving them some detailed information as to the successful gardens others have created. And if one garden is good, two are better and three more so, until a whole community may be alive with this richest of rural treasures. The practical questions are, How is it done, and what can be done? These two questions, it is hoped, will be abundantly answered in the material sent in for this competition. We invite our subscribers and readers, and their friends, and the friends of their friends, who have gardens that they think of real interest and beauty, or who may possess choice bits of garden loveliness, to enter this competition

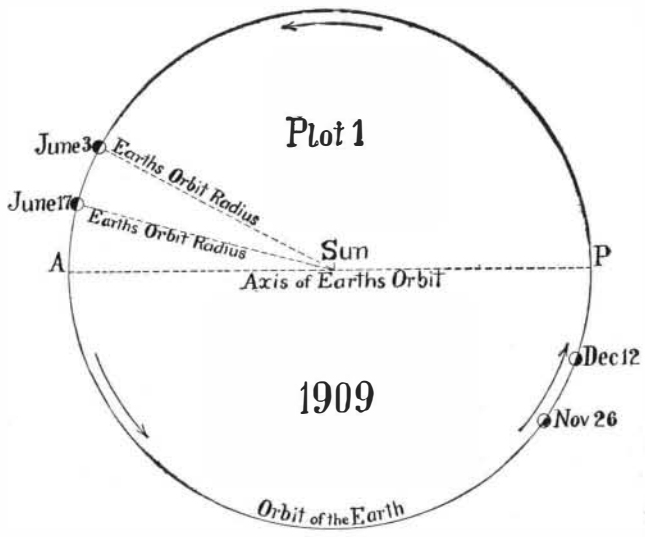
The full conditions of the contest will be found in the May number of American Homes and Gardens.

THE LUNAR AND SOLAR ECLIPSES IN JUNE, 1909.

BY PROF. FREDERIC R. HONEY, TRINITY COLLEGE.

The gradual advance of the dates of eclipses was clearly illustrated in the year 1908, which included narily, the line of nodes comes into line with the radius of the earth's orbit twice each year, and an eclipse is possible only when the moon is at or near one of the nodes. In nine years the plane of the moon's orbit makes one-half a rotation; and as a consequence, one more eclipse season is included in the number which belongs to this period.

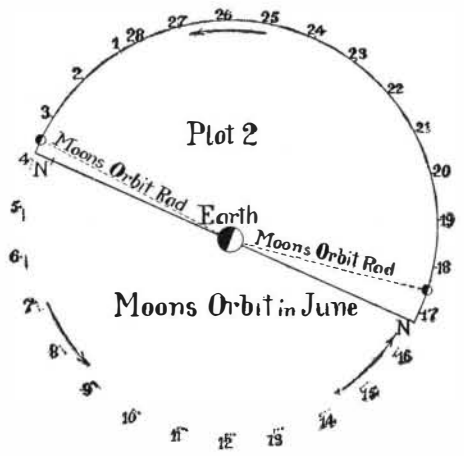
In the year 1909 there will be two eclipses of the



Position of the earth at the time of the ecl.

sun and two of the moon—on June 3rd, a total eclipse of the moon; on June 17th, a central eclipse of the sun; on November 26th, a total eclipse of the moon; and on December 12th, a partial eclipse of the sun. The position of the earth at the time of the eclipse is shown for each of these dates in Plot 1.

Plot 2 is a plot of the moon's orbit for the month of June. That part of the orbit which is above the plane of the ecliptic is represented by a full line. The position of the moon is shown at Greenwich noon for



The moon's orbit for the month of June.

each day from the 1st to the 28th and also for the 3rd and 17th at the time of the eclipse. In each case the projection of the moon's orbit radius on the plane of the ecliptic would coincide with that of the earth if the two plots were combined in one drawing. Since they are shown separately, they are respectively parallel; and the line of nodes *N N'* is shown in its position relatively to the orbit radii of the earth and moon.

Figs. 1 and 2 are projections of the earth on a plane which is parallel to its axis and perpendicular to the plane of the ecliptic at the dates of the eclipses. In these projections more than one-half of the visible hemisphere is illuminated between the dates of the vernal equinox and the summer solstice. This area gradually diminishes as illustrated in the figures, which may be compared with the positions of the earth shown at the corresponding dates in Plot 1.

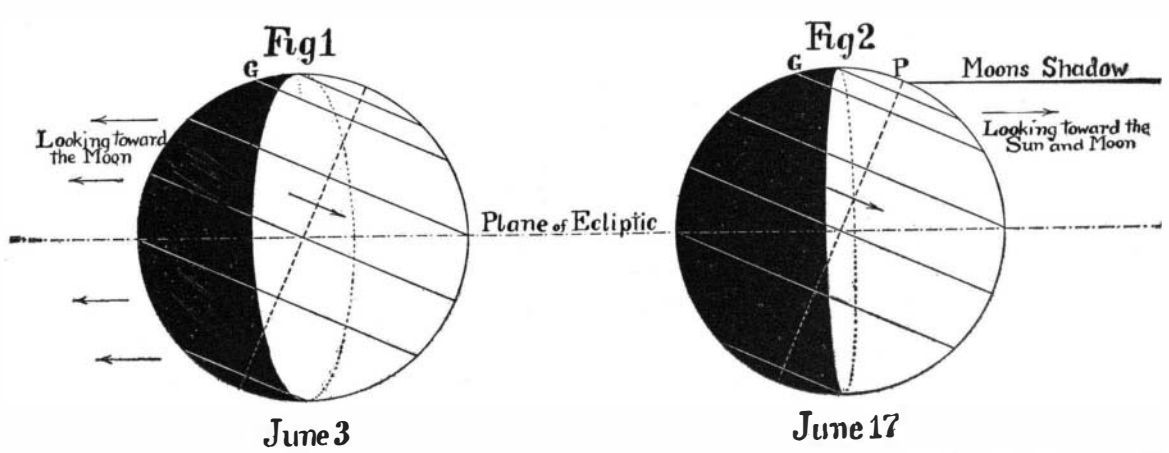
On June 3rd, 13.5 h., when the moon will be near the descending node *N'*, she will come wholly within the earth's shadow. The eclipse, seen in the direction of the arrows, will be partly visible at Washington, the moon rising eclipsed. The beginning of the eclipse will be visible in South America, Africa, Europe, and southwestern Asia. The end will be visible in Africa, central and western Europe, South America, and nearly the whole of North America.

During the interval between the two eclipses the moon's orbit will be below the plane of the ecliptic, as shown by the dotted line. The eclipse of the sun on the 17th (17 d. 11.5 h.) will occur some time after the moon has passed the ascending node *N*. The distance from the ecliptic will be so great that the vertex of the moon's shadow will pass very near the north pole. (Fig. 2.) The path of the moon's shadow is shown in Fig. 3, which is an enlarged projection of a portion of the earth's surface near the pole on a plane which is perpendicular to its axis. In this projection the position of the meridian of Greenwich, and of one from which a central eclipse will be visible at noon, are shown. The latter, in Fig. 2, is indistinguishable from the great circle which represents the earth, which is approaching the summer solstice, when the meridian at noon will coincide with *a b*, the plane perpendicular to the ecliptic which will contain the earth's axis. The central eclipse between latitudes 51.5 deg. N. and 64.25 deg. N. will be total; and beyond these limits it will be annular. In Fig. 3 the path of totality is limited by arrowheads. A central eclipse shows that the vertex of the moon's shadow reaches the earth where the eclipse is total; and that it does not quite reach it beyond these limits; i. e., the length of the shadow does not differ very much from that of the moon's orbit radius, which at the date of the solar eclipse will be about 236,000 miles. As a partial eclipse it will be visible in nearly all North America, Greenland, Iceland, Japan, north Philippines, China, Siberia, and a small part of northern Europe. It will be visible at Washington, the sun setting eclipsed.

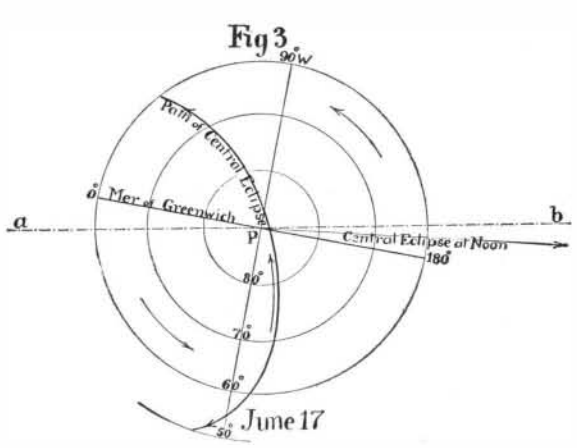
A $10,000 Aviation Prize for America.

With a view to encouraging inventors to complete their machines and make flights this summer at New York, the Aeronautic Society has decided to offer a prize of $10,000 for a flight of 100 miles. This prize will be divided into five sections, the first of which—$2,000—will be awarded to the aviator who makes the fastest circuit of the Morris Park race track—1¾ miles—at the first 1909 exhibition and meet of the Society on the 29th instant; or, if no machine makes the flight on that date, to the first one that accomplishes it upon any subsequent exhibition-flight day, which will probably be Saturdays throughout the summer. Proportionate amounts will be given for a flight less than a complete circuit on May 29th. As soon as the first section has been won, announcement will be made of the flight required to win the second section, etc.

The offering of so liberal a prize *for flying machines only* at this time should make it worth the while of wealthy sportsmen to aid inventors to a considerable extent financially, with the object in view of winning it. Besides flying for the cash prize, each aviator can at the same time set up a record for the Scientific American Trophy—a record which, if unsurpassed during the year, will entitle the holder to be declared the winner for 1909 and to have his name and record inscribed upon the trophy. Any aviator winning it



Projections of the earth on a plane which is parallel to its axis and perpendicular to the plane of the ecliptic at the dates of the eclipses.



The path of totality.

THE LUNAR AND SOLAR ECLIPSES IN JUNE, 1909.

three eclipse seasons; the first occurring in the month of January and the last in December, the average interval between eclipse seasons being less than six months. The plane of the moon's orbit makes one complete rotation in a direction contrary to her orbital motion in a little over eighteen years and a half. Ordi- three times in three different years will become the permanent winner.

To encourage its members, over a score of whom are building aeroplanes, the Aeronautic Society has offered three $250 prizes for the first three machines making a flight of 500 feet at Morris Park.