If in connection with diurnal waves we wish to record sunshine, or to note the rise and fall of stars or distant objects as seen through a telescope at the time of large earth waves, the station should command, especially in an east and west direction, a fairly extensive horizon.

Inasmuch as an observer may, as a means by which "air tremors" can be destroyed, require in one of his rooms a copious ventilation with a minimum of dampness, a precaution of some importance is not to ignore the hygrometric conditions of a locality.

A good site having been found, the remaining requirements for a seismological observatory are small. All that is necessary is a small one-storied structure. It should contain one or two large rooms in which to place some half-dozen instruments, and three small rooms to be used respectively as an office, a workshop and a dark room.

In Italy there are fifteen observatories of this order, and a very large portion of the work is to record movements of the earth's crust, which can be equally well recorded in England. At Strassburg, which is as free from earthquakes as any town in England, a seismological observatory, costing 3500*l.*, with an annual grant for maintenance of 275*l.*, is being erected. Austria and Germany are establishing stations, whilst the great work which for years past has been carried out in Japan is too well known to require restating.

In conclusion, when we consider that the observations made at a seismological laboratory are connected with those made by the meteorologist, the geologist and the astronomer, that they suggest problems to the elastician, shed light upon perturbations of magnetic needles, are of direct importance to the cable engineer, and in the interpretation of certain telegrams, and that in many other directions they are of value both scientifically and practically, it seems strange, especially in the face of the hearty co-operation we have received from abroad, that this country is yet without a definite centre at which these observations can be carried on.

JOHN MILNE.

SATURN'S NINTH SATELLITE.

ON Saturday last, March 18, the astronomical world, somewhat recovering from the excitement incident to the discovery of the remarkable asteroid now named Eros, was again pleasantly surprised by the news of another "find," distributed by telegram from the Central Astronomical Bureau at Kiel. This time it is the planet Saturn which supplies the feature of interest, in that an addition to its already numerous family of attendant satellites has been discovered by Prof. William H. Pickering, assistant astronomer at Lowell Observatory, Flagstaff, Arizona. The name of this station will be familiar to all in connection with the many notable observations of the planet Mars which have been made there by Mr. Lowell, its director, with the 24-inch refractor. Most of this work is so delicate as to need the best conditions for seeing, and it is only the extremely favourable situation of this observatory which has rendered them possible. This is probably to be attributed to the extreme transparency of the air consequent on the high altitude above the sea-level.

The new satellite has been run to earth, as it were, by photography. On examination of four photographs of Saturn, Prof. Pickering found traces on each of a very faint object, the behaviour of which led him to consider it to be a satellite of the planet. The little stranger is estimated to be of the 15th magnitude, so that it is unlikely that it would ever have been discovered by visual observation, even in the huge instruments now at the disposal of our leading astronomers. Measurements of the coordinates of its position from the four plates have furnished the data for computing its period or time of revolution round the parent planet, and this is found to be about *seventeen* months. This indicates that it will take its place as the outermost of the nine satellites, the period of Japetus, the furthest from Saturn of the known ones, being only about 79⅓ days. While the distance of Japetus is 2,225,000 miles, that of the new moon will therefore be about 7,500,000 miles, and this, combined with its extremely slow motion, all tended to diminish the chances of its detection by the usual method of tracking non-stellar objects by the elongated trails they leave on the photographic plate, the stars being shown as symmetrical round dots.

It is interesting to note how the gradual discovery of the attendants of the various planets has influenced the compounding of the "laws" which from time to time have been found to approximately represent the positions of these bodies in the solar system. From the first discovery of Jupiter's four satellites by Galileo in 1610 to the recognition of the already known eight of Saturn by Huyghens, Cassini, and Sir W. Herschel, no regular relationship was perceived. When, however, in August 1877, Prof. Asaph Hall discovered the two moons of Mars, Deimos and Phobos, with the newly-erected 26-inch refractor of the United States Naval Observatory at Washington, it was seen that all the then known satellites were grouped in a geometrical progression, reckoning outwards from the Earth. Thus the Earth had one, Mars two, Jupiter four, and Saturn eight. This seeming regularity was broken by the discovery on September 9, 1892, of a fifth satellite to Jupiter by Prof. E. E. Barnard at the Lick Observatory. This last discovery of a ninth satellite for Saturn will furnish a reason for a new series being formed, as counting from the Earth outward from the Sun, the numbers of satellites to the planets Earth, Mars, Jupiter, and Saturn are now 1, 2, 5 and 9 respectively, and these numbers are very nearly proportional to the distances of those planets from the Sun.

No information is yet to hand as to the diameter of this newly-found member of the solar system. From its brightness it may be from 100–200 miles, but its measurement will be extremely difficult.

The importance of photography in astronomical research is very well illustrated in the case of this event. Although it might be possible to see the satellite under good conditions, it is easy to understand how many times such an insignificant object might be passed over among so many more prominent ones. Once it has impressed its image on a photographic plate, however, it is caught, and its detection is sure, sooner or later, on complete examination of the negative. Then the possibility of duplication removes all doubt of personal error of any kind. Another advantage of the photographic plate over the eye is that the longer it is exposed, so much fainter objects will it record; while, on the other hand the eye only becomes more fatigued the longer it is used in the search.

It should be instructive to notice how most of the astronomical discoveries of late years hail from across the Atlantic. Whether it is that the love of science is more generally developed there, or that the liberal endowment of a scientific institution is considered the most serviceable way of handing one's name down to posterity, it is certain that in the establishment of the Harvard College, Lick and Yerkes Observatories the American people have placed themselves ahead in astronomical matters; and there is little doubt that they are well satisfied with the results obtained by means of their liberality.

A later telegram to the *Standard* states that the discovery was made with the Catherine-Bruce telescope, an instrument of large aperture and short focal length.

C. P. BUTLER.