

been discussed anew, according to the method of least squares, and the work is left in such a form that the observations of all observatories, particularly those of Washington and Greenwich, on account of the complete form in which they are given to the world, can be used from year to year, for the continued improvement of the elements of the planets. The perfection of the places of these planets is the more important and valuable that they are used very constantly in lunar distances by the navigator, and their errors are highly magnified at the time they are best seen and most useful, by the greater relative change in their distances from the earth than in those of the other planets employed in this way.

In preparing the ephemeris of Jupiter and that of Saturn, as well as in those of the preceding planets, all the errors and alterations pointed out by Professor Airy in the introduction to the Greenwich Planetary Reductions, have been corrected and adopted and the tables of Bouvard and Lindeman have been entirely remodelled and reconstructed for the convenience of computation. But it is well known to astronomers that the theory of Jupiter and Saturn demands a thorough revision; and their combination presents a case of peculiar difficulty, which has been ably treated by Professor Hansen. To prepare Hansen's theory for use in practical computation, is a work of time. It will be entered upon immediately, and will probably be completed in the course of two years.

In the case of Uranus, there are no tables which can be relied upon. Professor Pierce's theory, combined with the researches of LeVerrier, will, for the first time, form the basis of the new ephemeris of Uranus.

With regard to the new planet Neptune, the world has already accepted with grateful acknowledgments the labours which American astronomers have conferred upon it with illustrious success. The computation of the tables of the perturbations of Neptune, by Professor Pierce, and the computation of the elliptic elements of Neptune, by Mr. Sears C. Walker, have resulted in the preparation of an ephemeris, by the last named gentleman, which admits of no sensible correction.

The ephemeris of the fixed stars has also been improved by the introduction of the latest and most approved constants of precision, nutation, and aberration.

The general list of occultations has been very much extended, in order to make it especially useful to geographers in general, the boundary and other surveyors of the government in the interior, to the coast survey of the United States on both oceans, and the explorers of unknown parts of the continent.

Other changes regarded as improvements might be recited. The astronomical part of the ephemeris has been adapted to the meridian of Washington; sidereal dates have been introduced; what is believed to be a more correct obliquity of the ecliptic has been adopted; and more convenient forms and a better typographical execution are kept in view. A work comprising such a multiplicity of details may admit of many similar amendments.

To the above it should be added, that an entirely new reduction has been made of the early Greenwich observations of Mars, by Bradley, Bliss, and Maskelyne, preparatory to a new theory and to new tables of this planet.

A new method, with new tables, of clearing lunar distances will be given in the future number of the almanac, in which improvements are presented leading to the correction of errors of ten, fifteen, or twenty minutes in the longitude, common to the methods at present in use; which errors may, in rare cases, amount to a whole degree.

There are two other signal advantages to be derived from the

publication of the Nautical Almanac, the mention of which should not be omitted: they concern the navigator, surveyor, astronomer and geographer.

One of these is a more complete, full, and accurate table of latitudes and longitudes, particularly of American latitudes and longitudes, than is now anywhere to be found.

These positions also embrace in their number the most conspicuous towns and trigonometrical stations, with their magnetic and astronomical bearings, along both sea coasts, and as far in the interior as the operations of the coast survey extend. When, therefore, the American surveyor or astronomer of a boundary commission opens the almanac for the requisite astronomical data of his observations, he may find also such terrestrial data as will answer for the proper basis of his field work, and at the same time as the standard of accuracy to his own independent computations. To meet his wants, some additional constants will be occasionally inserted,—as height of station above the sea, mean barometric pressure, variation of the needle, &c. And as a separate list of the latitudes and longitudes of the principal observatories of this country and in every quarter of the globe is a customary part of the almanac, so the stationary astronomer will, in turn, find his purposes served. An assistant is employed in verifying the positions in the world generally, given in the best European lists; and a suitable selection will be made from the determinations of the offices of hydrography, topography, and the coast survey, to enrich the American table with the best and most numerous list of American geographical positions extant.

Similar tables are published in the French almanac; but no such tables, with the exception of the observatories, are given in the British. This, therefore, is regarded as another improvement in the American almanac upon the latter.

The other signal advantage spoken of, relates to the subject of the tides. The conduct of a general system of tidal observations, their reduction, and their scientific discussion, by which is evolved the rules for the prediction of the tides, are all the property of the hydrographical and astronomical departments of the coast survey. But it is the province of the Nautical Almanac to present the results of these various labours in a manner suited to answer the practical demands of navigation and engineering.

It will not perhaps be irrelevant to cite a single case under the general problem of the tides. In order to be able to give rules practically useful to the pilot, engineer and seaman, for applying to the ordinary tides, corrections depending on the moon's varying distance and declination, it is necessary to know to what meridian passage, or southing of the moon the tide is due; or, what the distance is from the land of the general tide wave that causes the local tide which the observer is actually registering; or, in fine, what is the age of the tide when it arrives at any particular part of our coast. This knowledge is the result of the careful study of a large number of observations made at various points. The age of the tide at London differs from that at Key West; and that of Key West again from that of New York, or Hampton Roads.

Our exclusive dependence upon European authority for that knowledge of our coasts which no European authority can, from the nature of the case, supply, has been a disadvantage and a reproach. Both the disadvantage and the reproach the American Nautical Almanac will help to remove by making use, as it has been authorized to do, of the materials in the records of the coast survey, for furnishing a tide table founded on the actual observations of tides in our own northern and southern harbours, and their subsequent reduction and discussion in the office of that institution.

One consequence of the announcement of the preparation of