trate, and that the worst abuses of railroad wars have their origin in the desire to force rival roads to a combination. Against the first of these points we may cite the testimony of Mr. Sterne, — certainly no prejudiced witness, — that the actual abuses have been lessened rather than increased when the trunk-line pool was in operation. We may cite the uniform experience of Europe, that only where pooling contracts were made permanent has it been possible to bring discrimination under control; so that men as widely distinct in their views as Gladstone and Bismarck have both sanctioned the system by their active countenance. With regard to the motive for railroad wars, we may show that it is regularly the weaker party who is the aggressor, rather than the stronger party. And finally, as a counter-argument against Mr. Hudson, it may be shown that his scheme has been found impracticable. It was tried and abandoned at the outset, as he himself admits. Every subsequent change in railroad administration has rendered the difficulties of its application greater instead of less. Both by theory and by experience, it may be shown that the attempt to treat the railway as a public highway has done some harm and no good in the past, and must grow even less possible with the increasing complication of railroad business.

OPPOLZER'S TREATISE ON ORBITS.

OPPOLZER'S treatise on the determination of the orbits of planets and comets is so well and so favorably known to students of astronomy, that, in calling attention to the French translation of the first volume (which will be found welcome by those who do not read German with ease), we might have confined ourselves to the briefest notice, if the translator had reproduced the German edition without modification. M. Pasquier has, however, introduced, together with several minor changes, the mode of counting longitude and time recommended by the Washington international meridian congress of 1884: that is, longitudes east from Greenwich are regarded as plus, and west as minus; and the astronomical day is made to begin with mean midnight. This innovation is in accord with the ideas of Dr. Oppolzer, who is known as one of the strongest and most distinguished of the advocates of the new plan. M. Pasquier says that the change has been made in response, also, to the wishes of the majority of astronomers and of governments. It is difficult to see upon what ground such a conclusion is drawn in regard to the wishes of astronomers; the opinions published during the past year are far from indicating a majority in favor of the change; and diplomatic action, even if ratified by the countries represented, can scarcely be expected to influence astronomers in such an important matter. The course adopted by M. Pasquier we are inclined to regard as somewhat premature, and it may interfere with the general acceptance and usefulness of the translation as a text-book; but he has taken care to indicate in his preface the corrections which must be made in the text and tables, if one prefers to reckon the astronomical day from mean noon (the present custom) instead of using universal time. To quote a recent comment, "a glance at these corrections will show astronomers some of the troubles that are in store for them, should they make the change which the Washington conference has recommended."

The typography of the volume is good (we are always sorry, though, to meet with the flat-topped figure three (3), an abomination when it is found on divided circles and micrometer heads, and scarcely more legible in print), and especial pains have been taken to insure accuracy in the tables and formulae. The tables, we are told, were revised three times while the work was going through the press.

Traité de la détermination des orbites des comètes et des planètes. Par THEODORE D'OPPOLZER. Tr. by Ernest Pasquier. Vol. i. Paris, *Gauthier-Villars*, 1886. 4°.

THE fourth volume of the 'Publications of the Washburn observatory,' which we have just received, seems to bring to a close the work undertaken at Madison by Professor Holden. The greater part of the volume is taken up with the work of the Repsold meridian circle for 1884 and 1885, — the observation of the 303 stars which are to serve as reference-points for the southern zones of the *Astronomische gesellschaft*. A casual glance shows a satisfactory performance of the instrument; but we regret with Professor Holden, that, under the circumstances, it has been possible to give merely the "results of observation, instead of accompanying them with the thorough discussion they seem to deserve." We note particularly the creditable part taken in both observations and reductions by Miss Alice Lamb, who appears in the *personnel* as one of the 'assistant astronomers.' A valuable piece of astronomical bibliography will be found in the seven pages devoted to a reference-list of the original sources from which errata have been taken in systematically correcting the star-catalogues contained in the observatory library. Some thirty pages are occupied with the results of meteorological observations; and a brief discussion is given of a longitude campaign undertaken, in co-operation with a government surveying party, to determine the western boundary of Dakota.