

forms of electric discharge from the clouds, it is none the less unsatisfactory to be told that atmospheric electricity arises from the earth's possessing a constant positive charge. Again: the theory that the sun is only one of a *chapelet de grains brillants* originally fused by a powerful current like the globules formed by a melting wire, and that "the incandescence of the solar globe, prolonged during a long series of ages, is itself only a spark of short duration in the infinity of time and space" (p. 250), is not worthy to stand in connection with the account of his many remarkable investigations. These furnish no basis for such a speculation, and scarcely more for the theory that "whirlwinds and cyclones are the powerful electro-dynamic effects produced by the combined forces of atmospheric electricity and terrestrial magnetism" (p. 229).

In conclusion, M. Planté says, respecting the nature of electricity, that it "may be considered as a motion of ponderable matter, — motion of transport of a very small mass of matter, animated by a very great velocity if an electrical discharge is considered, and a very rapid vibratory motion of the molecules of matter if its transmission to a distance under the dynamic form, or its manifestation under the static form, at the surface of bodies, is considered" (p. 314). Without adopting this view, we may say that many of Planté's experiments strongly support it.

#### THE CHILIAN LANGUAGES.

*Chilidúgu sive tractatus lingue chilensis.* Opera BERNARDI HAVESTADT. Editionem novam immutatam curavit Dr. JULIUS PLATZMANN. 2 vols. Lipsiæ, Teubner, 1883. 952 p. 12°.

THIS is the general title of Platzmann's neat facsimile reprint of an important publication of the eighteenth century which had become quite scarce. Havestadt was a Jesuit, born in the environs of Cologne, on the Rhine, and a man of considerable learning, — a fact which appears not only from the fluent and elegant Latin style in which his manuals are composed, but also from the few leaves which he devotes to an autobiographic notice. The travels performed by him (1751–52) in his Chilian diocese on the western slope and in the higher valleys of the Andes are described in vivid colors by himself, and illustrated by a quaint map, which fully deserves the attention of ethnographers. The missionary's work was originally published (in 1777) with several sub-titles, which are faithfully reproduced in the reprint with all the saints' images, heraldry, etc., and embrace the

following parts: Chilian grammar; three vocabularies; catechism, with Latin translation, and hymns in Chilian, to which music-notes are added; and a diary.

The phonetic system of Chilidúgu (*dúgu*, 'language') is described with laudable accuracy by the padre, who marks forty different sounds as constituting its alphabet. The language evinces some tendency towards nasalization of the consonantic elements, but is of an easy and harmonious pronunciation, and shows some general resemblance to Quichhua and Aymarí phonetics. A peculiarity not very often found in American languages is the dual, which here pervades the verb and pronoun as well as the noun. According to the custom of his epoch, Havestadt arranged the forms discovered in this southern language wholly after the pattern of the Latin grammar. He found six cases in the noun; but his paradigms conclusively show that his nominative is identical with his accusative and vocative, his dative the same form as his ablative. Whether these cases are formed by postpositions, or by real case-affixes, remains to be examined. The verb inflects with remarkable regularity, forms five tenses and an intricate array of verbals (nominal forms of the verb, gerunds, etc.), has an interrogative, affirmative, negative, and passive form, together with an extensive system of transitions. A large number of suffixes serves to form derivatives, verbal as well as nominal, from verbal and nominal bases. In his rich collection of conversational phrases, the author has given a powerful and safe guide for the study of this sonorous tongue, which he extols in such a manner as to make it "surpass in excellence and graphic power all other languages of the world." The vocabularies given by Havestadt are more copious than that of Febres and the other authors who have written upon the Chilidúgu. The dialect of Chilidúgu, treated by Havestadt, is that of the Molu-che tribe.

#### THE IRON AND STEEL INSTITUTE.

*The journal of the Iron and steel institute.* Vols. i. and ii. London, Spon, 1883. 10+484, 405 p. 8°.

THE proceedings of the Iron and steel institute cannot fail to be of interest to the general scientific public, and especially so to the workers and manufacturers of iron and steel, since the society numbers among its active members such men as Sir Henry Bessemer, Mr. Sidney G. Thomas, and Mr. I. Lowthian Bell. The late C. W. Siemens was one of the prominent members and contributors. The