found in the chapters on electro-metallurgy, a subject that is discussed with great detail, too much so, however, for a general treatise. The author has evidently been at no little pains to collect the numerous tables he gives, and in some instances they are the results of his own experiments. There is also a freshness and originality in the treatment of the sections on resistance and electromotive force that make us regret Mr. Sprague did not submit his theoretical views to some scientific friend before sending his work to the press. If the author had confined himself to the practical part of current electricity we should gladly have recommended his book to our readers.

OUR BOOK SHELF

Anales del Museo Publico de Buenos Ayres para dar a conocer los objetos de Historia Natural nuevos o poco conocidos conservados en este establecimento. Por German Burmeister, M.D., vol. ii. (Buenos Ayres and London: Taylor and Francis.)

IN previous numbers of NATURE (vol. iii. p. 282, and vol. vii. p. 240), we have given some account of the important work which the well-known German naturalist, Dr. Burmeister, is now carrying on at Buenos Ayres.

The number of the *Añales* now before us completes the second volume of this remarkable work, and gives us additional proof of the extraordinary richness of the extinct Mammalian Fauna of the Argentine Republic, to which Dr. Burmeister has devoted so much attention. The Monograph of the Glyptodonts, or extinct gigantic fossil Armadillos, which is now brought to a conclusion, is certainly one of the most valuable contributions to palæontological science that has been produced of late years, and deserves the hearty commendation of all naturalists. This is more especially the case when we consider the difficulties under which the work has been carried on—in a new country, where every man *avidus lucri* is striving to advance his own material interests, and science and all that pertains to it are at an utter discount. On one occasion, we have been told, when one of the most perfect of these Glyptodont skeletons came into the market, the authorities of the National Museum were unwilling or unable to raise the necessary funds to secure it, and it would have left the country and been lost to Dr. Burmeister and his Monograph, had not an English friend found the money. Then, again, the necessity of having the plates lithographed in Europe must add greatly to the difficulties of the undertaking. Under these circumstances we may fairly congratulate Dr. Burmeister and science on the occasion of the second volume of the Annals of the Public Museum of Buenos Ayres having been brought to a successful conclusion.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*]

Peculiarities of Stopped Pipes, Humming-tops, and other Varieties of Organ-pipes

THE peculiarities of a stopped organ-pipe as compared with an open organ-pipe are many and suggestive, and are of the utmost importance to the investigator both to know and to interpret. Without entering deeply into the principles of the craft of organ-building, there are certain matters of fact very necessary to be known before the full bearing of a theory can be estimated or its consistency be judged with true understanding.

By far the greater portion of an organ consists of pipes of the structure called "flue-pipes," or, as here named, "air-reed" pipes, and these are of two classes, the open and the stopped; also they are of two kinds, wood and metal. We have to notice how differently these two kinds are constructed to attain the same ends. In the metal pipe every part is to all appearance immoveable. In the wooden pipe the under-lip, or technically the "cap," is the only adjustable part, and is fixed in position by two or more screws. Within the mouth there is a platform filling the space beyond the windway; it is called the "languid," and it is by varying relatively the level of the edge of the cap to the edge of the languid that the direction of the stream of air is determined; if the cap is set low the angle of flow outward is increased, contrariwise it is lessened, and the art of the voicer decides to the finest degree what is requisite for the quality and speech of each particular pipe. If the wind is much thrown outwards, the speech is slow; if more inward, the speech is quickened; if too much inward, the octave sounds instead of the ground-tone; if too much outward or inward, the pipe will not speak at all. One more power of adjustment remains—the width of the narrow slit through which the wind issues is capable of being varied by alteration of the inner surface of the cap; a wide windway gives a stiffer air-reed, a fine windway gives a thinner one. In a metal pipe we have precisely the same capability of variation, only that we effect our purpose by pressure; the languid is moved higher or lower, not the cap. By means of a rod introduced at the foot or at the top of the pipe, we tap or press the languid into the desired relation to the edge of the underlip. We can also press the upper lip forward or backward; we can, by a like process, reduce the windway or enlarge it as easily. Very simple, yet very beautiful, compensations. In the variations of construction, nothing is done without purpose, nor can you make any one of these minute changes without causing at the same time a flattening or sharpening of the pitch, or a diversity in intonation or quality.

The above details all tend to one point, which I wish to press upon your attention; one distinctive feature belongs to the stopped pipe: the languid is lower than in an open pipe, else the pipe does not attain its proper speech. Consider it well, for it is a fact full of meaning. A necessity of an opposite kind exists in the nature of an open pipe; its demand is that the current shall have determination more to an outward flow. The cause of so essential a distinction between the two classes of pipes will be explained in another paper.

Stopped pipes when they are deep-toned are called "Bourdons," the name the French give to the Humble Bee for its "drowsy hum." Our plaything, "the humming-top," is a true bourdon, is a revolving organ-pipe, has a vibrating air-reed, its principle of action is "suction by velocity," the abstraction of air particles by velocity of *rotation* causing a partial vacuum just as in the stationary organ-pipe by velocity of *passage* of a current of wind.

Bearing in mind the working power of the air-reed, we are brought to consider the effects of the dimensions of the pipe and consequently of the form as well as the extent of the air-column whereon this power is impelled to act, and it is necessary to recur in passing to the question of length. Scientific writers affirm that the length of an organ-pipe for a given note corresponds to the length of the wave in air with an absolute relation, thus expressed. Prof. Tyndall says: "The length of a stopped pipe is one-fourth that of the sonorous wave which it produces, whilst the length of an open pipe is one-half that of the sonorous wave." Prof. Balfour Stewart says, in his "Elementary Lessons in Physics": "In an organ-pipe of this kind, the upper end closed, the primary note is that of which the wave length is twice the length of the pipe . . . the wave length of the sound produced by an open pipe is equal to the length of the pipe, so that it is only half of that produced by a shut pipe of the same length." (One is curious to know why there is this difference of statement from two leading teachers of men; perplexing to the student in want of a leader). Prof. Tyndall demonstrates his affirmation, showing that a stopped tube resounds to the note mid C of 256 vibrations per second; the wave length in air of this note he states to be fifty-two inches; then in proof he measures the jar or tube, and says, "by measurement with a two-foot rule I find it to be thirteen inches, precisely a fourth of the wave length." He then proceeds to affirm the same of organ-pipes, and proves it by tuning-forks and by sounding the pipes to the same note, and believes he has justified his assertions. His hearers do him that justice, and go home believing also. The proof is, however, altogether illusive. No speaking organ-pipe of that length ever gave the note of that pitch. Let us put the assertion to the test. My object lies beyond the recti-