obliged if those having opportunities of examining banks of dry and fine sand, inclined at 31°, in the arid regions of the West, will report through your columns whether they yield deep sounds when disturbed. H. CARRINGTON BOLTON.

Cairo, Egypt, April 10.

Rainfall and Latent Heat.

IT is probable that no element engaged in the increase of energy in storm-formation, according to ordinary theories, exceeds in importance that of heat set free in the condensation of vapor. Professor Espy was one of the first to enunciate this principle, and to insist upon its entire adequacy to account for all the phenomena even in the most violent tornadoes. Professor Ferrel has said, "Even if any part of the atmosphere should receive such an [primitive] impulse as to produce a most violent hurricane, friction would soon destroy all motion, and bring the atmosphere to rest. Hurricanes, then, and all ordinary storms, must begin and gradually increase in violence by the action of some constantly acting force. . . . This force may be furnished by the condensation of vapor ascending in the upward current in the middle of the hurricane, in accordance with Professor Espy's theory of storms and rains. According to this theory, all storms are produced by an ascending current of warmer atmosphere saturated with moisture, and this current is kept in motion by the continual rarefaction of the atmosphere above by means of the caloric given out of the vapor which is condensed as it ascends to colder regions above."

Professor Mohn gives this calculation of the effect of latent heat set free on Oct. 5, 6, and 7, 1844: "The Cuban hurricane has used for the moving of the air which was rushing in during those three days at least 473,500,000 horse-power; that is, at least fifteen times as much as all wind-mills, water-wheels, steam-engines, locomotives, man and animal power, on the whole earth produce in that time. Whence comes this immense power? From the latent heat of the vapors which rise in the middle of the hurricane, and are condensed during this process. A rainfall of one millimetre (.04 of an inch) per day on a circular surface eight geographical miles in radius would be sufficient to produce, by the liberating of the latent heat in the vapor, the force which the Cuban hurricane displayed in the air-cylinder mentioned above."

These examples will serve to show the views held by two of the most prominent writers on this subject. I have examined the writings of more than twelve scientists, and find that all, without exception, emphasize the importance of this effect. Diligent search has been made in all quarters for a quantitative determination of this effect, but without success. It has seemed of some importance to make a beginning at such analysis, even though, as will readily be seen, the subject is an exceedingly difficult one to elucidate. The following proposition is presented: —

There can be no considerable condensation from saturated air as long as latent heat is set free from it. A short computation will show that the condensation of a grain of water will set free enough latent heat to raise a cubic foot of saturated air about seven degrees in temperature. Let us imagine it to be possible to condense one-seventh of a grain of moisture out of a cubic foot of saturated air at 80° without changing its temperature: latent heat would immediately be set free, and would just re-evaporate the moisture. It would seem at first sight as though this would always be the result, and hence that no precipitation could ever occur without the intervention of some other force. At all events, the proposition above seems abundantly proved.

Suppose, however, that we try to abstract enough heat to lower the temperature one degree. We shall find, that after abstracting enough heat to lower the temperature one-third of a degree, and to condense .111 of a grain of moisture, the rest will be needed to balance the latent heat evolved by the condensation. We shall then have our air saturated at 79.7°, and a precipitation of .111 of a grain. It might be thought that this process could continue indefinitely, but this is not the fact. If we inquire how the above cooling has been possible, we find at once that it has been brought about by heating the surrounding air. I think we can best see this by imagining two cubic feet of air at 80°, side by side and yet distinct. Suppose that, instead of raising the surrounding air, all the heat abstracted in cooling the first cubic foot be passed into the second. We shall then have one cubic foot of saturated air at 79.7°, and another of unsaturated at over 80°. If, now, we mix these, we shall have two cubic feet of unsaturated air at over 80°, and this will need quite a cooling before any further precipitation.

Of course, in nature no such sudden transitions as these occur, but the principle seems to be the same in all cases. The results following such a process are far-reaching and most important, but there is no space here for dilating further upon the question. It seems to me, after a most careful study of the problem, that we have virtually, in an ascending current, an analogous effect to that in mixing two bodies of air at different temperatures. In the latter case it is admitted by all meteorologists that no considerable precipitation can ever occur. If this computation be true, we have a most important deduction, and have apparently wiped out at a single stroke one of the main-stays of theoretical meteorology as now taught. I confess to great diffidence in advancing this computation; but if it shall result in the development of the true principles involved, and a quantitative determination of the effects in many other theories now on an exceedingly unsubstantial basis, I shall be only too glad to be proved in error. H. A. HAZEN.

Washington, D.C., April 29.

"Alphabetic Law" and "World-English."

MR. MATTHEW MONROE CAMPBELL, a retired teacher, resident in Boulder, Col., has issued a series of open letters, advocating the official establishment of "Alphabetic Law" in the writing of English, under the direction of a government bureau. "Alphabetic Law," Mr. Campbell says, "requires (1) a single sign or letter for each sound; (2) a single sound for each sign or letter; (3) a joint name for each sign and its sound (its own sound must be the name for a letter); (4) to ortho-graph, or right-write a spoken word, is simply to change each sound in the word for a letter named after it; (5) to ortho-ep, or right-voice a written word, is simply to change each seen letter back to its unseen sound; a letter, then, cannot have two values, and a letter can never be silent, for a letter is a seen sound."

The idea of enforcing such principles, however excellent, in government printing, or by the authority of a State department, is not likely to meet with favor. The "Alphabetic Laws" are certainly good, so far as they go; and I would point out that they are strictly carried out in the scheme of "World-English." In the latter case, however, they are not proposed for adoption in common orthography, but merely for facilitating the acquirement and the world-wide diffusion of our language. Any thing like a proper and complete phoneticism of ordinary literature is not to be looked for in our day. ALEX. MELVILLE BELL.

Washington, D.C., May 7.

Ayrton and Perry's Secohmmeter.

SCIENCE of April 26 contains a description of Ayrton and Perry's secohmmeter, an instrument consisting of two commutators fixed on the same axle. In your article it is stated that an electrolytic cell will not polarize with rapidly alternating currents, and that consequently the secohmmeter may be employed to measure the resistance of electrolytes in a manner described. May I call your attention to a paper of mine, published in 1882 in the "Transactions of the Royal Society of Canada" (Sec. III. p. 21), in which this method of determining the resistance of electrolytes was, I think, first described? My experience in developing it showed that the electrodes of an electrolytic cell do become polarized, even with very rapidly alternating currents, and that consequently the method which is sketched in your article cannot be trusted to give accurate results. I found, however, that the double commutator, employed in the manner specified in your article, was useful as keeping the polarization at a very small value, and I was able to eliminate the error due to it in the measurement of resistance by introducing two electrolytic cells of the same section, but of different lengths, into two adjacent arms of the Wheatstone's bridge, an adjustable resistance being included also in the arm containing the smaller cell, and by making the other arms consist of wires of equal resistance. J. G. MACGREGOR.

Dalhousie College, Halifax, N.S., April 30.