The writer's attention was first attracted to the place through receiving several small specimens of the selenite from sheep-herders, who had discovered the deposit while searching for feeding-places, and who claimed to have found a mine of mica, which they called "isinglass." Their disgust was great when assured, by the conclusive experiment of holding a bit of the material in the flame of a candle, that the stuff was not what it seemed. I first visited the place in April last, and my rapture at the superb display of crystal beauty was checked by the evidences of vandalism on every hand. Some of the finest crystals had been hacked and carved, and cow-boys' initials were scratched and cut on almost every prismatic face which the light could reach. Visiting the place again six months later, I found that still greater destruction had been waged, and, becoming convinced that good crystals would soon be difficult to obtain, I took steps to secure legal claim to the land, and proceeded to remove the remaining crystals of greatest value to a place of safety. Under the auspices of the Deseret Museum of Salt Lake City, the work of removal is still in progress. Already over twenty tons of most beautiful crystals have been taken out and shipped to this city.

Fig. 3.

Prisms of perfect form and varying in length from one to five feet, and in weight from ten to one hundred pounds, are of frequent occurrence. One of the most regular yet taken out is four feet long, and the widest faces are six inches across. Cleaved slabs are obtainable six feet in length, and two and a half feet in breadth. One of the longest perfect prisms yet obtained extends fifty-one inches, and from one of its faces nineteen smaller crystals sprout. Twins are common, as are also compound terminations of very complicated structure. A magnificent group, weighing over six hundred pounds, was removed from the floor of the cavern; it was set up on the outside and photographed (see Fig. 4).

As to the habit of the crystals, in the midst of such variety it is difficult to specify. Prisms short and stout, also long and comparatively slender, are numerous; and of twins, the "swallow-tail" vie with the cruciform and penetration varieties in points of abundance and perfection. Some of the crystals are of perfect transparency, and cleaved slabs of this quality are common. Sometimes the prisms inclose sand and clay, which is so distributed as really to add to the beauty of the crystals in the eyes of all save the mineralogist. When fracture planes are made visible by striking a crystal containing such impurities, the particles appear on the internal planes as on shelves of glass.

Some of the finest specimens will probably be on exhibition in Chicago next summer.

THE FUTURE OHM, AMPERE, AND VOLT.

BY HENRY S. CARHART, ANN ARBOR MICH

Since the International Congress of Electricians in Paris in 1881, the most eminent physicists have been agreed as to the theoretical values to be assigned to the three fundamental units of electrical measurement; but it has been a matter of ten years' labor on the part of many distinguished investigators to embody these theoretical definitions in practical units for universal use.

Up to the date mentioned the two units of resistance in use were the British Association (B.A.) unit and the Siemens unit. Only the former represented an attempt to construct an ohm corresponding to the theoretical definition. The B.A. unit has served a useful purpose, but it is now known to be 1.34 per cent too small.

The "legal ohm" was provisionally adopted in 1883 by an international committee to which the Congress of 1881 had committed the subject. It was in the nature of a compromise, and fixed the practical ohm as the resistance at 0° C. of a column of mercury one square millimeter in cross-section and 106 centimeters long. Competent investigators, like Lord Rayleigh and Professor Mascart, contended that a column 106 3 centimeters in length was nearer the true value; but a few smaller values obtained by some well-known physicists decided the adoption of the mean value 106 centimeters. This conclusion satisfied no one, and the "legal ohm" was never legally or officially adopted by any European or American government.

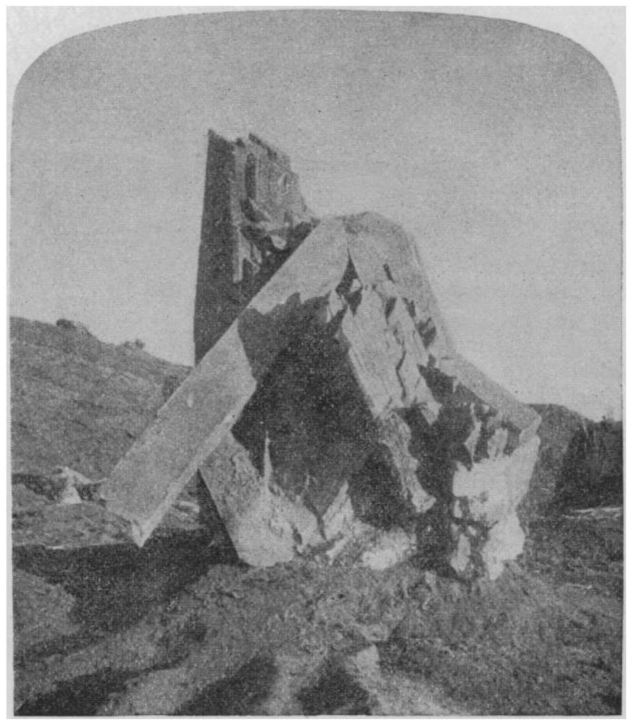

Fig. 4.

Subsequently, Professor Rowland came forward with his determination of 106.32, and errors were found in the data of some who had contended for the lower values. Hence the number 106.3 has been tacitly accepted for two or three years already, and it is now believed that this does not differ from the true value by more that two units in the fifth figure; that is, the length of the mercurial column representing the true ohm is not less than 106.28 and not more than 106.32 centimeters.

Somewhat over two years ago a commission was appointed by the British Board of Trade to draft an "Order in Council" as a legal settlement of the units to be employed by the Board of Trade Electrical Bureau, and hence as the legal electrical units for Great

Britain. After this committee had made its report, but before the "Order in Council" had been signed by the Queen, an intimation was received from Professor von Helmholtz that something might be done toward international agreement if the order were delayed till he could communicate in person the results of the most recent determinations in Berlin. Accordingly von Helmholtz and some others were invited to be present at the British Association last August, and to sit with the famous B.A. "committee appointed for the purpose of constructing and issuing practical standards for use in electrical measurements." The report of the committee, recently published, says: "During the Edinburgh meeting the committee were honored with the presence of Dr. von Helmholtz, M. Guillaume of Paris, Professor Carhart of the United States Dr. Lindeck and Dr. Kahle of the Berlin Reichsanstalt. These gentlemen came by invitation to consider the question of establishing identical electrical standards in various countries." The committee had two long sessions, and there were present Professor Carey Foster, chairman, Lord Kelvin, Professors Ayrton, Perry, and Sylvanus Thompson, Dr. Oliver Lodge, Mr. Glazebrook, secretary, Mr. Preece of the Post-Office, Major Cardew of the Board of Trade Bureau, and others.

The most important results of these conferences were the abandonment of the time-honored B.A. unit, the disregard of the "legal" ohm, and the adoption of the mercury standard of 106.3 centimeters. The reports from Berlin and Paris showed most conclusively that mercurial standards, set up with the precautions recently adopted, agree with surprising accuracy. The uncertainty of the relation between the centimeter and the gramme was avoided by defining the mass of the mercury column of 106.3 centimeters in length, which has a resistance of one ohm. It is 14.4521 grammes. This corresponds to a specific gravity for mercury of 13.5956. "In reality the square-millimeter cross-section remains the elementary definition, but with the specification that this is arrived at by mercurial weighings."

Standards of resistance for industrial purposes in solid metal will still be made as heretofore. But it must be borne in mind that such resistances, especially when made of alloys, should be kept at a temperature near the one at which they have been standardized; otherwise small changes take place in the resistance, due perhaps to a kind of annealing and recrystallizing process.

It was further agreed with regard to the unit of current that the number 0.001118 should be adopted as the number of grammes of silver deposited per second from a neutral solution of nitrate of silver by a current of one ampere. This corresponds to 4.025 grammes per hour. The silver voltameter, with the proper manipulation, becomes, therefore, a secondary standard for the determination of the unit current.

The electromotive force of the Clark standard cell has been re-determined both in Berlin and Cambridge, England, within a year or two; and the results are in rather surprising agreement. A comparison of these determinations led the B.A committee to decide upon 1.434 as the number of volts representing the electromotive force of the old form of Clark cell at 15° C. containing a saturated solution of zinc sulphate and crystals in excess. This is .001 volt lower than the value heretofore assigned to this cell. It was not determined to adopt this form of cell as the standard, but only to decide upon its voltage when set up by competent persons in accordance with certain specific directions. My own form of Clark cell is perfectly portable, has an electromotive force of 1.44 volts at 15° C., and its change of electromotive force with temperature is only half as great as that of the old Clark cell containing crystals.

We have as yet in this country no bureau where concrete standards of resistance and standard instruments for other electrical units are preserved. Such a bureau, under federal control, is greatly to be desired. Germany has its Reichsanstalt, under the direction of von Helmholtz, in Berlin; England has not only the standards of the British Association in the keeping of Mr. Glazebrook at Cambridge, but also the Board of Trade Bureau in London, under the directorship of Major Cardew. Mr. Glazebrook undertakes the comparison and certification of standard coils for the English-speaking world, while the bureau in London issues certificates of instruments for commercial purposes in Great Britain.

Government bureaus mean certified standards and legally adopted units. The decisions of the B.A. committee last August were with the full concurrence of Professor von Helmholtz, and it is understood that the German government will adopt the B.A. proposals. The committee appointed by the Board of Trade in London has already made its supplementary report in accordance with the conclusions of the B.A. committee, and these units will doubtless very soon acquire a legal character in England. The coming electrical congress in Chicago will afford an opportunity for official delegates to adopt these same units for their respective countries, and official ratification will then naturally follow. Lord Kelvin (Sir Wm. Thomson) predicted at the close of the Edinburgh meeting that the system of units adopted by the B.A. committee will become thoroughly international. It should be the duty and pleasure of all electricians to contribute toward this result.

THE CLASSIFICATION AND NAMING OF IGNEOUS ROCKS.

BY W. S. BAILEY, WATERVILLE, ME.

THE discussions of Mr. Iddings[1] relating to the crystallization of lava have led him to conclusions that will undoubtedly prove of vast significance in the attempt to ground the study of rocks in a firm and sure foundation. Heretofore, most petrographers have busied themselves with descriptions of rock-types, confining their discussions principally to the mineralogical composition and the structure of the specimens studied, and to their similarity to other specimens assumed as types. Such work as this is of course absolutely necessary to the right treatment of rock classification. It is evident that we must first know the characteristics of bodies to be classified before we can hope to separate them into genetic groups. But the time has now come when students of rocks must seek for a generalization that will do for their science what the atomic theory has done for chemistry or the theory of evolution for the biological sciences, viz., elevate petrography from the position of a descriptive science to that of a philosophical one. Mr. Iddings's recent studies in the causes producing the differences noted in different lavas emanating from the same volcanic centre, and the generalizations drawn from them, will go far toward affording a philosophical basis for rock classification, and, consequently, toward the inception of a broader study of rocks in their relationships to each other than has heretofore been possible.

The rocks on the surface of the earth all tend toward the production of a few simple types, in which tendency may be traced the action of chemical laws, under the definite conditions existing at the surface, producing from unstable compounds those that are most stable under these conditions.

Mr. Iddings believes that the relation existing between chemical action and the conditions under which it occurs is discoverable not only in the breaking down (degradation) of rocks, but also in their construction. He believes that the intimate gradations in composition and structure that are known to exist between the types of eruptive rocks are due to the action of chemical laws under changing but definite conditions — conditions that are determined largely by the position of the magmas from which the rocks are derived. If this be true, petrographers have at last a thread to which they can tie the results of their investigations: they have offered them a conception as to the *cause* of the existence of eruptive rock-types, whose discussion *pro* and *con* will compel them to study not simply rock-specimens, but rather rock-masses, in the attempt to learn just what relations exist between their various parts, with respect to composition and structure, and to discover the conditions under which these parts were formed. In other words, *petrography*, as the result of this discussion, will become *petrology*, just as "natural history" has become "biology."

[1] J. P. Iddings, The Origin of Igneous Rocks, Bull. Philos. Soc., Washington, vol xii, 1892, p. 89.