lower than 75° F., and here either placed on shelves or piled one on the other on the floor. In some cases the rice is sprinkled with water and left standing in baskets several hours before it is distributed on the trays. In other cases the trays are not placed in the warm room until toward evening of the second day (the day after sowing the 'tane'), and they are then left undisturbed until early in the morning of the third day. When the rice is not moistened the trays are left standing only four or five hours, when the contents of each must be thoroughly stirred by hand, which process is repeated after another four hours of rest. At this stage the fungus grows rapidly and much heat is evolved; the grain becomes opaque, assuming a fibrous texture and becoming somewhat sour in taste. After from four to ten hours the trays are emptied of their contents and the rice spread thinly on mats to cool. It is then 'koji.'

There is a loss of weight during the process of from ten to twelve per cent of the rice used. This is due to the evolution of carbonic acid, which makes the ventilation of the room necessary in order to make it possible for the men to remain in it. The usual mode of ventilation is to insert a perpendicular flue, which can be opened or closed at pleasure, extending from the ceiling to the outside air, and an inclined or horizontal flue which discharges fresh air near the floor.

ELECTRICAL SCIENCE.

A New Diffusion Photometer.

MR. J. JOLY has brought out a new photometer which is simple and sensitive. One form consists of two parallelopipeds of paraffin of equal dimensions, planed smooth so they can be laid accurately together on similar faces. Putting these together with the plane of discontinuity at right angles with the line joining the lights to be compared, the compound block is moved toward one or the other of them until the fine line of division between the two pieces almost or wholly disappears. The distances from the lights to the plane of discontinuity are now measured, and the relative intensities reckoned as inversely as the squares of the distances. In the case of lights of dissimilar colors the appearance of the photometer is no longer uniform, but that of two softly glowing substances of different colors. Even under these circumstances, if the colors are not greatly different a point of minimum distinctness of the line can be found with considerable accuracy, The greater sensitiveness of this photometer over some of the other forms used is due to the fact that we have to concentrate all of our attention on the line of junction only, not on two images at some distance apart. Instead of paraffin, glass of a transluency approaching that of paraffin may be used, and the effect may be heightened by interposing between the two pieces a sheet of silver foil. The dimensions that Mr. Joly finds best are 20 by 50 by 11 millimetres for each parallelopiped. They are laid together on two of the larger faces, the parallel external faces being ground smooth, but left unpolished. The surface under observation during the experiment is ground smooth and polished after joining the parallelopipeds. The most important points to be attended to in their construction are fineness of division line and uniformity in thickness. Should there be any difference in the translucency of the parallelopipeds a check observation might be made by turning over the photometer so that the halves change places relatively to the lights, taking the mean of the observations. This is, however, rarely necessary. This compound block is mounted in the same way as an ordinary Bunsen photometer, and the same precautions are necessary in using it.

ELECTRIC TRACTION ON THE UNDERGROUND ROADS IN LONDON. — Nowhere can electricity be more easily employed for traction work than on the underground roads that are to London what the elevated roads are to New York. The rational method of employing it is to use motors supplied from an overhead wire, the electricity being generated at stations along the lines. The objections sometimes urged against the overhead system for use on city streets cannot apply here, and there would be little doubt of the economy of the system, besides the great advantages it would possess as far as ventilation and comfort went. Instead of using a direct current, however, it is proposed to employ storage batteries on the train. The motors are to have a capacity of 600-horse power, and when one considers the difficulties that have been experienced in getting a battery of reasonable weight that will give a maximum output of ten or fifteen horse power for ordinary tramway work, it would seem that the plan is almost certain to fail. A hundred tons of battery might be sufficient, but with the initial cost of it, its deterioration, and the power that must be expended to draw it, the chances for the economical working of the system are small.

TRANSFORMERS BASED ON ELECTROSTATIC INDUCTION. — M. Doubrava has described a method of reducing currents of high potential and small quantity to those of low potential and great quantity by means of electrostatic condensers. He first charges a condenser of comparatively small capacity to a high potential, then disconnects it from his line and discharges it into a condenser of great capacity, thereby lowering the difference of potential between the coatings, and finally he discharges the large condenser into the lamp-circuit which he wishes to feed. By performing this operation fast enough a practically continuous current is obtained in the latter circuit. While the general idea of using condensers for transforming high to low potential currents is not new, and while methods have been proposed which seem as promising as that of M. Doubrava, yet his system has in it some elements of novelty. The difficulty lies in the great capacity of the condensers that will be required. Taking the charges and discharges as rapid as seems practicable; the condensers — supposing the distribution is at 200 volts — would have to have a capacity of about 1,000 micro-farads for every horse-power transformed. Now a condenser of 1000 micro-farads capacity is enormous, and would be expensive to build and too large to conveniently store. The efficiency of the system would be, probably, very high, but it would require rotating apparatus of some description, which, with the fact that house to house distribution at high potential would be dangerous, would necessitate the distribution of the low-potential currents from sub-stations. When one tries to imagine a sub-station distributing 500-horse power, with a condenser of a capacity of 500,000 micro-farads, the system will seem a doubtful one.

ALLOYS FOR ELECTRICAL RESISTANCES WITH NO TEMPERATURE CO-EFFICIENT. — Mr. Edward Weston has discovered an alloy whose specific resistance is high and whose resistance is not affected by temperature changes within ordinary limits. This is valuable for electrical resistances, and will doubtless have an extended use. The alloy is a mixture of copper and manganese. It may be made from copper and ferro-manganese in the proportions, copper 70 parts, ferro-manganese 30 parts. A still more curious alloy is made from copper 65 parts, ferro-manganese 25 to 30 parts, nickel 2½ parts. This possesses the remarkable property of decreasing in resistance as its temperature rises, a peculiarity heretofore ascribed to carbon and electrolytes only. This last alloy can be used with ordinary copper or German silver coils in such proportion as to cause the total temperature co-efficient to be zero. It is to be hoped that these substances will be carefully studied and their properties at high and low temperatures determined.

CHEMICAL ACTION IN A MAGNETIC FIELD. — Since 1881, when Professor Remsen discovered that the deposition of iron was affected by a strong magnetic field, experiments have been tried to determine the nature of the effect of magnetism on chemical action. The latest and most satisfactory contribution on the subject is that of Prof. H. A. Rowland and L. Bell, in the current number of the *American Journal of Science*. Their general method was to take two pieces of the metal to be experimented on, put them in circuit with a galvanometer, and immerse them in an electrolyte between the poles of a powerful magnet. The two pieces were covered with wax except at two opposite points, where they were bare, and by changing the shapes of the uncovered portions the condition of their surfaces with respect to the rate of change of magnetic force could be varied. For instance, in the first experiment that was tried pieces of iron were immersed in dilute nitric acid. One of the bare surfaces was flat, the other filed to a sharp point. If there was no deflection of the galvanometer when the circuit of the magnet was made, there was a sharp throw immediately on making the circuit, the needle then gradually returning to zero and going past to the other side. The throw was in a direction as if the sharp point was copper and the flat surface zinc. When the point was

filed off, there was no throw. Thirty substances were tested as electrolytes. They in general showed the above phenomena, excepting that the acids which evolve hydrogen when electrolyzed showed it very feebly. Experimenting to find the cause of the gradual reversal of the deflection after the first throw, it was found that any agitation of the liquid produces the same effect, and that when diffusion was prevented, by using fine sand in the vessel or by using gelatine with the solutions, the first throw only remained. The small effect with the hydrogen-evolving acids is probably due to the mechanical protection of the point by the bubbles of gas. Cobalt and nickel were tried and found to give similar effects but smaller. From their experiments the authors come to the conclusion that the particles of magnetic material on the plates are governed by the general laws of magnetic attraction and are held in place against chemical action as they would be against a mechanical force. The rate of change of force at a point is, of course, greater than that on a plane surface, hence the metal on the point is to some extent protected against chemical action, and acts as the electro-negative metal in the circuit. The general rule stated is as follows: When the magnetic metals are exposed to chemical action in a magnetic field, such action is decreased or arrested at any points where the rate of variation of the square of the magnetic force tends to a maximum. The authors criticise a paper on the same subject by Professor Nichols of Cornell, whose results are directly opposite to their own, as far as the two experiments touch. They claim that besides giving no explanation of or drawing any deduction from his results, he has in some cases mistaken disturbances for the real phenomena. The paper seems to explain the phenomena simply and naturally without the help of new relations or hypotheses.

BOOK-REVIEWS.

L'art et la Poésie chez l'enfant. By BERNARD PEREZ. Paris, Ballière. 8°.

THE English translation of Perez's 'First Three Years of Childhood' has familiarized the English-reading public with the general plan of work and method of treatment of this French psychologist and educator. M. Perez is imbued with the idea that the unfoldment of mental processes that goes on in every child and is so often the subject of literary effort can yield material for the scientific study of an important chapter in psychology. This psychogenesis in part changes its character with the relative importance of the natural and the artificial elements in the child's education, with the nature of the civilization that forms its environment, with hereditary and individual characteristics. These varying conditions affect differently the various psychological elements that go to the making of a human being, and make necessary different methods of study. In the chapter of 'Infant Psychology' that M. Perez now brings to notice, these varying conditions are of supreme importance; so much so that it seems impossible in some respects to describe the artistic efforts of children, but only of certain children. Nevertheless the path of progress is in so many respects similar, and the directions of artistic interest so unchanging in spite of national and other influences, that one feels something generic even if vague to be at the basis of it all. Again, that close analogy between the development of the individual and that of the race does not lose its application here. It is true that primitive art is far from all being alike, that the art of civilization of which it was the predecessor is no less variable; but from a psychologic point of view the development is generically alike in all cases. For example, we find that the excessive and gaudy decoration of the body is displayed by savages and young children; we find them preferring the same loud, boisterous airs in music, and equally lacking in a sense of the beauties of nature. We see, too, how the subject of serious use and adornment in one stage of civilization degenerates into a toy for the children of the succeeding stage; witness the drum, and the bow and arrow.

A survey of the many paths along which children find their way to the pleasures of art can be most easily attained by a *résumé* of the chapters of the volume before us. In the first chapter are treated the many forms of personal decoration visible in the toilet. We know how soon a child takes an interest in its costume, how for girls especially the doll is valuable because it is a dressable article; and has not Lotze said that in the exaltation of the ego that is produced by the donning of a new dress is the root of self-consciousness? Taste in this direction is seldom good at first, but it takes its character so entirely from the environment that the psychologist can do little more than record the shifting of interest from one point to another that proceeds as the child matures. In the feeling for the beauties of nature, — the emotions inspired by the graceful, the sublime, the pleasures that flowers and scenery bring, — we have a higher and a later form of artistic interest. M. Perez describes very pleasantly, even if at times prolixly, the growth of these sentiments in different children of his own acquaintance, and records the corresponding descriptions in the autobiographies of eminent men and women. On the artificial side we have the growth of the social instincts, the art of making oneself agreeable, politeness, coquetry, and so on. In France at least this seems to develop precociously early, but the social position of the family must everywhere be the chief factor in its culture or neglect. Passing to the fine arts proper, music is doubtless to be accorded the foremost rank. We know that the most wonderful instances of precocious talent are to be found amongst musicians, and this is in many cases the first artistic pleasure that the child has. The human voice is a source of much pleasure to the child. The distinction between the soothing and the exciting forms of music is soon appreciated. The educational value of rhythm is recognized by all kindergartners. The many decorations of bones, of rocks, of pottery, by primitive peoples are not unlike the first scratches of a child. The things most frequently delineated are quite alike. Given a child, a lead pencil, and some paper, and the result can be predicted, with due allowance to the nationality and other circumstances of the child.

The play instinct is a very potent factor in the growth of artistic taste; performing on a musical instrument as well as acting still go by the name of 'playing.' Foreign personalities are so real to the child, his vivid imagination so easily assimilates them, that 'pretence,' acting, is a common and an early childish trait. The doll is the central figure about which the most thrilling dramas are composed and enacted; to the boy the putting on of a paper helmet and a wooden sword is enough to make him a soldier in thought and deed. Children act to court admiration, and with a normally weak distinction between fact and fiction goes a fondness for acting out what has originated in the realm of the imagination. Literary art is the latest of all acquisitions; but the first letters of a child, though lacking all merit, have a deep interest to the psychologist. To each of these topics M. Perez devotes a full chapter, and succeeds in producing a book which, though not in the strictest sense scientific and certainly not exhaustive or final, is none the less a worthy contribution to an interesting chapter of 'infant psychology.'

NOTES AND NEWS.

JAMES STEVENSON, late executive officer of the United States Geological Survey, died at the Gilsey House, New York, July 25. He was born in 1840, at Maysville, Ky. A more extended notice will appear next week.

— The buildings for the Paris Exhibition have made great progress during the last five or six weeks. According to the Journal of the Society of Arts, the large machinery hall at the south end of the Champs de Mars is now considerably more than half finished, and will probably be completed in another six weeks or two months. Considerable progress has been made with the fine art galleries; but, as they were not commenced until recently, they are not nearly so far advanced as the other parts of the building. The same remark applies to the other parts of the building for the classes included under the term 'liberal arts,' on the other side of the grounds. In this last-named building it is proposed to place a retrospective collection illustrating the progress of the arts and industries from the very earliest period. On the Esplanade des Invalides, the construction of the various small buildings with which it is to be filled has been commenced. This work has been deferred as late as possible, in order not to deprive the regiments quartered in that part of Paris of their remaining drill ground for