churches, theaters, parlors, and other public and private buildings, which is so constructed and arranged as to light the ceiling and walls as well as the floor and body of the room. It softens the light, destroying its glare, and diffuses it agreeably through the room, and at the same time is highly ornamental.

An improved bag holder has been patented by Mr. Thomas J. Bogue, of Riverton, Miss. This is a rectangular frame supported upon uprights and having its sides, which are loosely secured in the end pieces, provided with pegs or nails for holding the bag, and spring actuated levers for operating them.

THE HERCULES BEETLE.

The Hercules beetle (*Scarabeus hercules*) is one of the largest and best known of the beetle family. It is found in Guadeloupe, Colombia, Martinique, and occasionally in the neighborhood of Rio Janeiro, and varies slightly in size and color in these different places. In Guadeloupe are the largest specimens, possibly the best developed horns, and its curious habits have long attracted the attention of naturalists and travelers.

The male beetle is of a shiny black color, with long claw-like horns, covered on the under side with reddish-gray hairs arranged like a brush. The wing-cases are greenish-yellow, spotted with black, in the living insect; but occasionally, in preparing them for collections, the wings absorb a black substance from the abdomen and turn gray. This may be remedied by washing in benzine, which will restore the yellow color.

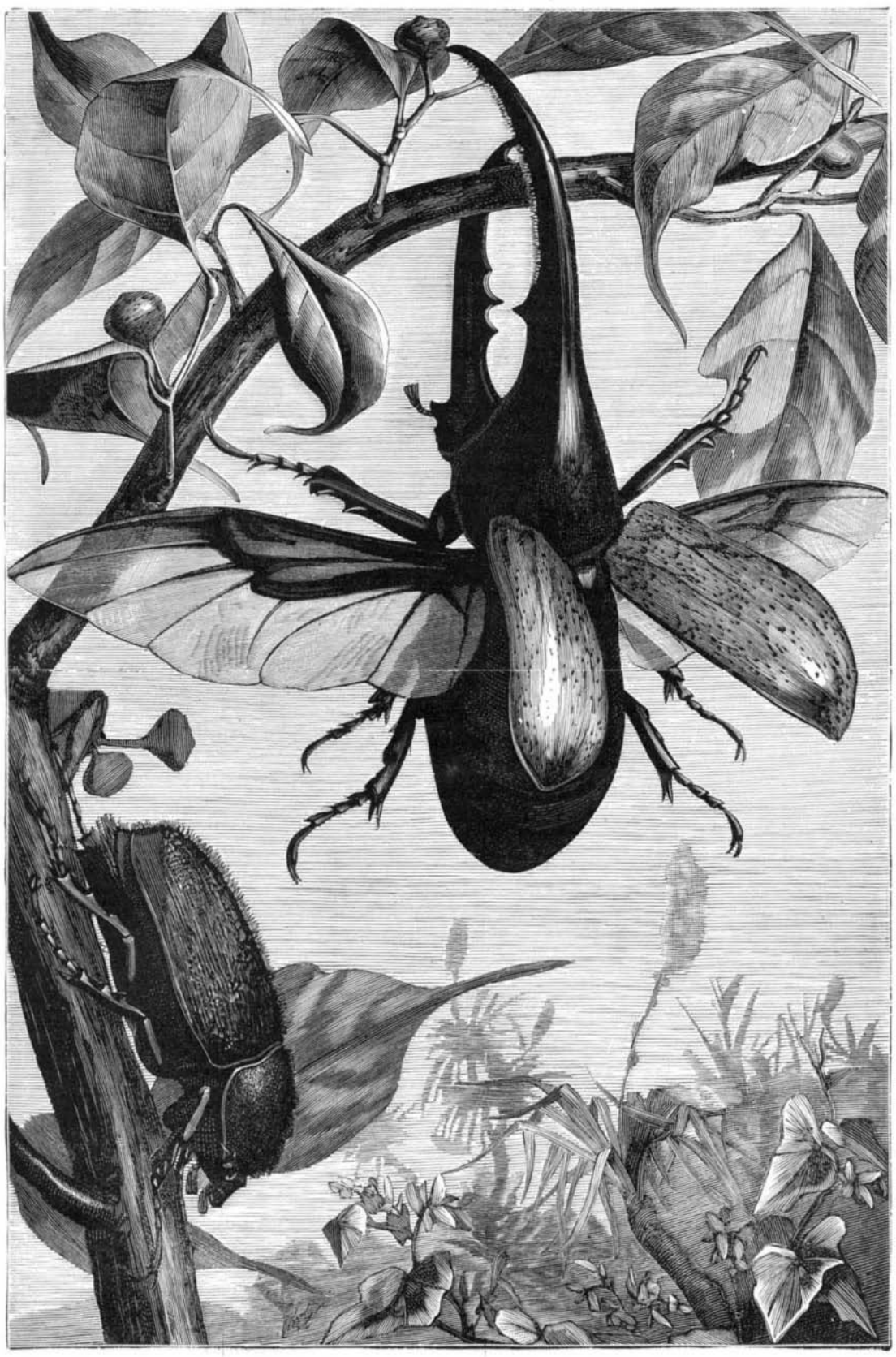
The male is over three inches long, including the horn, which, with the corselet, of which it is the elongation, measures nearly one-third of the whole length.

This insect may often be seen to seize the young shoots or branches of a tree between his strong horns (see illustration), and then turning rapidly around and around, by the aid of his wings, he cuts off the branch.

This revolution is so rapid that when the branch breaks off the beetle is often thrown to the ground with great force.

It has been supposed that he does this to obtain the sap of the tree, though his mouth would seem more suitable for devouring the green leaves.

The female has no horns, so it must be discovered by observation in what way she is able to obtain her food. She differs in other ways so much from the male that she might at first sight be supposed to belong to a different species. She is much smaller and has brown hairy wing cases, very rough and knobby on the shoulders. She deposits her larvæ in the trunks of decayed trees, where she forms a shell of woody *débris*, glued together for their protection.—*La Nature.*



THE HERCULES BEETLE—MALE AND FEMALE.

Ironwood Tree.

One of the hardest woods in existence is that of the desert ironwood tree, which grows in the dry wastes along the line of the Southern Pacific Railroad. Its specific gravity is nearly the same as that of lignum-vitæ, and it has a black heart so hard, when well seasoned, that it will turn the edge of an ax and can scarcely be cut by a well-tempered saw. In burning it gives out an intense heat.

Sound-Producing Ants.

D. M. Lewis, writing to *Nature*, says: "With reference to the question whether ants produce sounds which are of such a pitch as to be inaudible to the human ear, I should like to make a suggestion which occurs to me, but which I have no means of carrying out practically. It is a well-known acoustical fact that two notes of high pitch sounding together produce a third whose vibrational number is the difference of the vibrational numbers of the two primary notes. If now we suppose a vibration at the rate of, say, 60,000 per second, another at the rate of 38,000 per second would give a difference note of 22,000 per second, which would be well within the range of audibility. If then we send up a note beyond the extreme limit of audibility, we shall be able to detect the presence of vibrations which exceed that of the note sent up by the highest number of vibrations of audible sound. It would be interesting to know if this has been attempted, and if the microphone can be applied to assist in the investigations."

Water Carrying Tortoises.

At a recent meeting of the San Francisco Academy of Sciences a fine specimen of the desert land tortoise, captured at Cajon Pass, San Bernardino County, was shown, and Professor E. T. Coxrelated some curious circumstances in connection with it. This tortoise, which is as large as a good sized bucket, is a native of the arid regions of California and Arizona. On one being dissected it was found that it carried on each side a membrane, attached to the inner portion of the shell, in which was about a pint of clear water, the whole amount being about a quart. Professor Cox was of opinion that the water was derived from the secretions of the giant barrel cactus, on which the tortoise feeds. This cactus contains a great deal of water. The tortoise is found in sections of the country where there is no water, and where there is no vegetation but the cactus. A traveler suffering from thirst could, in an emergency, supply himself with water by killing a tortoise. They are highly prized by Mexicans, who make from them a delicate soup.

They are oftentimes attacked by foes, both for their water and also for their flesh. They are overcome by the foxes and killed by being dragged for miles over the country at a pretty rapid pace. Mr. Redding afterwards stated that he was on the Galapagos Islands in 1849, where he assisted in capturing 92 land tortoises, varying in weight from 450 lb. to 600 lb. each. These they brought to San Francisco, where they sold them for more money than the whole of the ship's cargo of lumber made. They were two months on board, yet they neither ate nor drank anything, though food and water were offered them. When killed, however, considerable quantities of water were found in each of them. They lived on the high lava rocks of the islands, where there are no springs or streams, and the only dependence of animal life for water is necessarily upon the irregular and uncertain rain showers. These were of a different species from the one shown. It was generally admitted that it would be useful if the habits and peculiarities of these animals could be noted and some trustworthy information as to how they collect and secrete their water obtained.

Hydrophobia—Its Successful Treatment.

Mr. Ruxton, a surgeon in the East Indies, reports a very remarkable case, which seems worthy of being classed with the small number of cures that are now on record.

A boy, between five and six years of age, was bitten in 1874, by a bull-bitch that was subsequently killed. The bites were deep and severe, but were freely cauterized with fuming nitric acid, causing considerable loss of tissue. Carbolized oil was subsequently employed as a dressing. A month later he became unconscious, refused to drink, and was exceedingly nervous. Mr. R., finding him with saliva issuing from the mouth, suspected the worst, but ordered, as a temporary measure, the tepid sheet, and a diaphoretic mixture. Tranquil sleep and diaphoresis followed, but about one in the morning the patient awoke screaming, had frequent convulsions, refused liquids, and foamed at the mouth. Thinking that as a palliative, cannabis indica might be usefully employed, five minims of the tincture were given, and a short sleep followed. This dose was repeated after an interval marked by screaming fits and saliva-spit from between the teeth. Deep sleep, lasting ten hours, now ensued. On awaking he recognized his mother—the first time for twenty-seven hours. His pupils were now intensely contracted. A third dose of five minims was given on the evening of the second day of medical attendance, and sleep ensued for eighteen hours. Pulse and respiration remained good all the time. From this point the progress toward recovery was steady and continuous.

Dr. Ewart, formerly deputy surgeon-general in the Bengal army, in the same number of the *British Medical Journal* (November 19, 1881), states that little confidence can be placed in drugs after the symptoms have developed. He advocates cauterization as a prophylactic and as practiced successfully by Youatt in four hundred cases; and he quotes Sir William Guil, who states: "If I had to choose for myself, I would inhale ether and have the whole track of the wound destroyed by strong nitric acid or nitrate of silver." But Ewart places himself on the side of Sir Joseph Fahrer, who says: "If I were bitten by a dog or other animal, *even suspected* of rabies, I would suck the wound, put in a ligature, inhale ether . . . . and have the bitten part thoroughly cut out, and then cauterized with nitric acid or nitrate of silver, so as completely to disorganize any virus there might remain. Excision, he remarks, may be practiced successfully after the wounds are thoroughly cicatrized."

Utilization of Underground Waters.

Chief Engineer Robert Van Buren, of the Brooklyn Department of City Works recommends for the increase of the water supply the construction of another well similar to those built at the new stations on the water shed between Jamaica and East New York. From this well he proposes to run galleries east and west for a half mile or more, such galleries to take the place of an open canal. If the supply is found to warrant the extension of these galleries, he would urge their extension so as to intercept all of the water running from this watershed to the ocean. The work could be completed, he says, in a year, at a cost of about $200,000, and the increased supply would be from 3,000,000 to 5,000,000 gallons daily.

Process of Obtaining Printing Surfaces.

The following is a process by Mr. W. B. Woodbury, of London:

When it is desired to prepare a cast of ordinary type or engraved blocks a mould is taken in any of the usual materials—plaster of Paris or paper. Into this mould is pressed a thin sheet of tin foil, lead, or other sufficiently ductile metal, the back of which—that is, the depressed surface—is filled up with a solution of gelatinous material which will set sufficiently hard. The compound sheet of tin foil and gelatine thus formed is then removed from the mould, and its metallic face may be used as a surface to be printed from in the usual way, being either laid flat upon the bed of an ordinary printing press, or being bent or curved round the surface of the cylinder of a suitable printing machine. The method above described may be used to reproduce printing surfaces from blocks or plates of wood, metal, or other material having engraved or other designs upon them, as well as from ordinary type; and sometimes, where the subject of the design to be reproduced is of suitable character, and moisture is not present in the printing ink or during the operation of printing, gelatine or gelatinous material may be poured directly into the cast or mould, without the intervention of tin or other metal foil, and the gelatine surface so obtained may itself be used when dry as a printing surface without the intervention of the metallic face. The gelatine or gelatinous material may be hardened and rendered more impervious to water by the addition of a small quantity of chrome or other alum, or other substance capable of hardening gelatine and rendering it insoluble.

The surface of the tin foil which forms the printing surface, or of the gelatine, is preferably electroplated with a deposit of nickel, steel, or other hard metal for the purpose of rendering it more durable, and such deposit may be effected upon the surface of the sheet either before it is applied to and pressed into the cast or mould, as described, or after the compound printing surface has been completed. In cases where it is desired that the printing surface to be produced shall be more or less soft or flexible, so that it may be used as a hand or other printing stamp, gelatine or gelatinous material, to which has been added a sufficient quantity of glycerine or other substance, such as sugar, capable of rendering the mixture sufficiently soft, flexible, and elastic when dry, is used as a back to the tin foil.

The process may be applied to the reproduction of designs or pictures obtained by means of photography in the following manner: Upon a plate of glass a gelatinous printing surface of any desired design or picture is prepared by means of light in the ordinary well known way. Upon the printing surface so prepared a sheet of tinfoil, preferably electroplated with a harder metal, is placed, and being covered with a number of thicknesses of blotting paper, is passed through an ordinary rolling press, until the metal foil is pressed into intimate contact with every part of the gelatine printing surface, every detail of the design upon which is thus reproduced upon the back of the metal. The surface so prepared and covered with the tin or other metal foil may be used for printing from in an ordinary printing press; or where the subject requires it, as, for instance, where halftones are to be produced, pictures or impressions may be obtained by means of gelatinous ink, more or less transparent, applied to the printing surface, and thence transferred to paper placed upon it, either by means of a flat plate of glass or other material pressed down by any suitable press or by weights. When it is necessary that the design of the pictures produced should not be reversed Mr. Woodbury uses a white pigment, which he transfers to black or colored paper, or a positive instead of a negative photographic picture in order to obtain the gelatine printing surface. In the methods above described, in order to make the tin foil adhere to the gelatine when it is pressed against and into the design, the surface of the gelatine is covered with a thin solution of India-rubber in benzole. The tin or other foil pressed upon it adheres perfectly when dry.

A Chemical Anomaly.

M. Schützenberger has recently made a communication to the Chemical Society of Paris, which, if confirmed, will have an important bearing upon the fundamental principles of chemical science. While pursuing his researches on the petroleums of the Caucasus, the author has not been satisfied with the results of his analyses, which, though made with the greatest care, frequently showed more than 100 per cent of matter. It is known that the ultimate analysis of such bodies is effected by burning a weight, P, of the substance in pure dry oxygen, and by weighing the quantities of water and carbonic acid which alone are formed in the combustion. The weights p of hydrogen and p' of carbon are deduced from the quantities of water and carbonic acid found, and we ought to have $p+p'=P$.

For this calculation to be correct it is not necessary that the composition of water and of carbonic acid must be absolutely exact and constant; H_2O must contain precisely 16 parts of oxygen to 2 of hydrogen, and CO_2 must consist of 32 parts of oxygen to 12 of carbon. The best analysts of all countries have demonstrated that such is the fact. In the case of M. Schützenberger's analysis the weights p and p' of hydrogen and carbon, calculated for the formulæ H_2O and CO_2, are greater than P; and he finds $p+p'=P+m$, without being able to find any change in the nature and purity of the products weighed.

As the Caucasian petroleums have been but recently studied, M. Schützenberger considered it necessary to verify the facts with other products. Pure aniline and benzol showed the same anomalies, yet there can be no doubt as to the composition of bodies which have been for years so completely studied; 100 parts of benzol, C_6H_6, have given quantities of water and carbonic acid such that the sum of the weights of carbon and hydrogen present is = 101 to 101·5. All causes of error inherent in such analyses have been examined and discussed, and more than 150 experiments made.

The author has sought to prepare pure substances which should give 100 per cent, and others giving 101 per cent. In so doing he has made the curious observation that if Caucasian petroleum, aniline, and benzol are heated with sodium or copper, and distilled, they acquire the property of giving more than 100 per cent on analysis, and retain it for a long time if kept in the dark. An exposure of two hours to the light was sufficient to cause a sample which had previously given 100 to 101·5, in a series of determinations, to show no more than 100 per cent. Thus sodium and copper would have the curious property of modifying certain substances without changing their apparent properties. The fact of the possibility of causing compounds to yield more than 100 per cent by the action of sodium, and restoring them to the normal state by the action of light, eliminates all errors due to weighings and manipulations; such errors would appear promiscuously in bodies whether modified by sodium or not. M. Schützenberger, without proposing any formal theory, suggests that the composition of water and of carbonic acid is not always what is supposed. It may also be that the weight of atoms varies within certain narrow limits.

If what we call an atom is merely the result of a vibratory movement of matter according to a certain law, this vibratory movement of the hydrocarbons may possibly be modified by that of sodium or by the luminous vibration.—*Revue Scientifiques and Les Mondes.*

The Mean Velocity of Streams.

At a recent meeting of the American Society of Civil Engineers, a paper by Mr. R. E. McMath, of St. Louis, on the above subject, was read, and with it was presented a set of diagrams of curves, deduced from the experiments of J B. Francis, at Lowell, from the observations of Gen. Theo. G. Ellis, upon the flow of the Connecticut River, from the records of the flow of the Mississippi, made by Generals Humphreys and Abbot, and also from various other observations of the flow of the Mississippi, at Columbus, Ky., at Vicksburg, Miss., at Carrollton, La., and at the passes at the mouth of the Mississippi.

The author of the paper presents for consideration and discussion the suggestion that, to determine a reliable rule for the flow of streams in natural channels, the considerations affecting an artificial channel should be kept entirely distinct; that the definite law of discharge over a river is usefully applicable at any transverse section above and within the influence of a river, dam, or shoal; that the relation between mean and maximum velocity cannot be used in streams of irregular section; that head is pressure, but not in all cases full of surface; that in natural streams the bars or shoals are substituted for the weir or dam; that the level of no discharge is determined by the horizontal plane through the crest of a weir, dam, or natural bar; that two new hydraulic terms may be used, namely: permanent area, or that part of transverse section below the plane of no discharge; and ruling depth, or the depth of the plane below the surface. Formulæ are then suggested in application of these considerations.

Velocity of Propagation of Explosive Phenomena.

The question as to how quickly explosive phenomena in gases travel has now been fully studied by MM. Berthelot and Vieille, and the results are of a somewhat unexpected nature. The authors operated chiefly with an explosive mixture of hydrogen and oxygen at atmospheric pressure. A straight horizontal lead tube, about 133 feet long and one-fifth inch interior diameter, was filled with the mixture, and the explosion started by means of an electric spark at one end. The flame, as it went along, ruptured two electric circuits, by acting each time on a grain of fulminate of mercury applied to a thin strip of tin. Thus a delicate chronograph was affected (the Le Boulenge, having a precision equal to one twenty-thousandth of a second). When the tube, instead of being placed straight, was arranged in several parallel pieces with bent joints, the velocity seemed to be the same. The general average for both cases was 2,841 meters, or about 9,470 feet, per second. A doubt, on getting this high figure, whether it was really the rate of propagation of the detonation that was being measured, or whether a vibratory motion of the metal might not have been the cause of rupture of the circuits (though this seemed unlikely), was set at rest when the similar strong caoutchouc tube was found to give like figures. With a capillary glass tube the velocity was somewhat less, viz , 2,341 meters. Next, it was found that the velocity was much the same, whether one or other of the ends was open alone, or both were open, or neither. The velocity appeared to be uniform throughout the tube, and with pressure varied between one and three, the velocity seemed independent of pressure. Once more the velocity is different in different gases; thus, in a mixture of carbonic oxide and oxygen, it was found to be 1,089 meters, and dilution of the other explosive mixture, of hydrogen and oxygen, with air, reduced the velocity. For instance, in a mixture containing 45 per cent of the explosive gas the velocity was 1,439 meters.

AGRICULTURAL INVENTIONS.

Mr. Asa Chandler Hinson, of Pidcock Ranch, Texas, has patented an improved stock and suitable devices for connecting a plow to any pair of wheels and axle forming a part of a wagon. By these simple additional connections a farmer may construct a sulky plow in a cheaper and simpler manner.

Mr. Jacob S. Baker, of New Freedom, Pa., has patented an improvement in fertilizer attachments for grain drills, which consists in certain means for operating the valve that controls the discharge from the hopper.

An improved coupling for sulky plows has been patented by Mr. Michael Kite, of Prairie Township, Jackson County, Mo. The object of this invention is to allow a sulky plow to be turned at the corner of a "land" without raising the plow from the ground, and also to prevent side draught upon the sulky tongue. The invention consists in a double hinge coupling for sulky plows, constructed with a U-shaped bar and a bolt for clamping the plow beam, and the three bent bars hinged to the clamp bolt and to the draw bail of the sulky, whereby the plow beam will have a free lateral and vertical play.

Mechanical Excitation of the Optic Nerve.

It is commonly believed that, like most other nerves, the optic is sensitive to mechanical stimulation, that thus sensations of light may be excited, just as they are by a similar stimulation of the retinal elements. The question has been recently re-examined by Schmidt-Rimpler, who comes to the conclusion that the current opinion is true, although the grounds on which it is based are not altogether correct. It is usually asserted that division of the nerve in enucleation of the eyeball causes a sensation of light. The fact is, however, doubtful. Rothmund, of Munich, has several times extirpated an eyeball without anæsthetics, and has never known the division of the nerve to cause a sensation of light. It is probable, however, that in many such cases the fibers of the nerve are totally degenerated. A more conclusive instance has been met with by Schmidt-Rimpler. A large part of the contents of one orbit had to be removed on account of epithelioma. The eyeball was healthy, and vision with it considerable, but it could not be saved. The patient was perfectly conscious when the nerve was divided, and was asked if he experienced any sensation of light, but replied in the negative. It is suggested that the supposed stimulation of the nerve on division was really a stimulation of the retina in consequence of the tension of the globe by its necessary fixation at the moment of division of the nerve. Another fact which has been advanced as proof that the optic nerve is sensitive to mechanical stimulation, is the sensation of light which may be produced by extreme lateral movements of the eyeball. It has been referred to the stretching of some of the fibers of the optic nerve. But Schmidt-Rimpler points out that the sensation thus produced is that of a circle of light with a dark center, and that its apparent position corresponds nearly to the point of entrance of the optic nerve. It is difficult to conceive that the fibers which end near the disk have a course so separate from others that they are only stimulated when the nerve is stretched. It is more probable that the phenomenon is due to extension of the sheath of the optic nerve, which pulls upon the sclerotic around the entrance of the optic nerve, and so stimulates the retinal elements. The absence of reaction on division of the nerve does not, however, exclude altogether its mechanical sensibility, since other nerves, motor and sensory, which certainly possess this sensibility, may not react if quickly divided. That sensations of light may be produced by mechanical irritation of the nerve is shown by some observations made by Schmidt-Rimpler on persons from whom an eye had been removed not long before. A blunt instrument was pressed against that part of the orbit in which the stump of the nerve was situated. The observations were made in a room almost completely dark. Of six persons, in two pressure on this spot always caused a flash of light on the side of the enucleated eye. One of them averred that the sensation exactly resembled that which he had before experienced when the eyeball was galvanized. The same patients experienced a similar sensation when the stump of the nerve was galvanized. The negative result in other cases may be explained by more complete atrophy of the nerve, or greater retraction of the stump. These positive observations seem to establish conclusively the mechanical excitability of the optic nerve. —*Lancet.*

Prizes for Farmers' Boys.

The prizes won by Vermont boys last year in competition for the awards offered by the University of Vermont and State Agricultural College, through the generosity of ex-Gov. Smith, have been declared. The conditions of the trial were the same as those of the former trial in 1880, and show a substantial advance, the first prize winners obtaining 5 bushels more of corn and 60 bushels more of potatoes to the acre than the best of the former year's figures. Twenty-five young farmers obtained yields of over 80 bushels of corn and over 250 bushels of potatoes to the acre, and the yields range from these figures up to the really remarkable ones of 127 bushels of corn and 552 bushels of potatoes to the acre! The latter result, at the prices obtained for potatoes last fall, would represent a return of over $300 per acre. The first prize on corn was won by Thomas B. Purdy, of Manchester; the first on potatoes, by Frank C. Ayer, of Goshen.