lar work. Its growth, however, has been very satisfactory, and Professor Dolbear asserts that there is every reason for thinking that in a short time the car will be capable of running away from the swiftest express train.—*Electrical World.*

PHOTOGRAPHIC NOTES.

How to Utilize Light-struck Plates.—It often happens that through carelessness or accident sensitive dry plates become light-struck. Instead of being thrown away as useless, the plates may be doctored so that they can be used in the camera, though their rapidity may be somewhat decreased.

The *Br. Jour. of Photo.* advises that the damaged plates be immersed for five minutes in the following solution :

Bichromate of potash	1 ounce.
Hydrobromic acid (sp. gr. 1,400)	2 fluid drachms.
Water	10 ounces.

If hydrobromic acid is not obtainable, hydrochloric acid or a soluble bromide may be used, to which a few drops of sulphuric acid should be added. After immersion the plates should be carefully washed and reared up to dry. Their sensitiveness will be increased by immersing in a plain alkaline solution for two or three minutes.

Subterranean Photography.—A Mr. Langlois has constructed an apparatus for photographing underground where the only means of access to the locality is a narrow shaft. The camera is very small, holds a 2 inch square sensitive plate, and has a lens of very short focus.

The whole is placed in metal case or tube, open on one side, and can be lowered by means of a cord or small chain attached to the tube. The camera is pivoted within the tube, at its upper end, so that it can be kept at an angle by means of another cord or small chain fastened to its lower end. Above and below the camera are arranged rows of small incandescent electric lamps.

When the apparatus is lowered, and the camera made to incline outward from the case, the current is turned on and the plate exposed. The photographs thus obtained are said to be excellent.—*Mechanical World and Photo. News.*

Method of Holding Separate Celluloid Films in the Dark Slide.—Says Ethel C. May on this subject, in a communication to the *Br. Jour. of Photo.* : "We are generally instructed to lay the films in the holder like a glass plate, and to back them with a piece of cardboard. But the film and backing often slip back and get out of register.

"The plan I have adopted is to take some dark chocolate-colored mounts, and with heavy scissors trim them down 1-64 of an inch smaller than the rabbet of the dark slide. Take some strips of gummed paper, the same as that on the margin of postage stamp sheets, and fasten one over each corner of the card, gluing it firmly to the back by the glue which the strip possesses, taking care not to moisten the corner itself. When dry, slip the celluloid films under these corners, and they will be found to lie beautifully flat, and can be laid in the slide just like a plate. Over them I lay a piece of pretty stout mill board or Eastman's film carrier board, and close the slide, being careful that the pressure of the spring of the partition is only just sufficient to keep the films up to the rabbet. Instead of the spring board a tuft of cotton can be used, large enough to act as a spring in keeping the films pressed outward."

The extreme thinness of the paper at the corners prevents any possibility of the film being out of register, a point which is likely to occur if metal corners are used. The foregoing description applies to the book slide, which opens like a book. For plates which slide in the holder it may answer equally as well.

Process of Toning Dry Plate Lantern Slides.—Mr. W. P. Christian, of the Liverpool Amateur Photographic Association, as reported in the *Br. Jour. of Photo.*, suggests the following modification of Mr. G. F. Blackmore's formula :

After the slide has been developed, wash under the tap, and before fixing bleach it in a bichloride mercury bath—

Bichloride mercury	1 ounce.
Water	20 ounces.

Then wash well and immerse in the following bath :

No. 1.

Water	14 ounces.
Hyposulphite of soda bath (1 ounce to 6 ounces of water)	3 minims.
Sulphocyanide of ammonia	40 grains.

No. 2.

Chloride of gold	5 grains.
Water	2½ ounces.

The bath is made by adding half an ounce of No. 2 to two ounces of No. 1, and should be kept mixed a few days, as it works better. The tones produced vary from yellowish brown to golden brown and deeper brown, passing afterward to purple and steady blue black.

The time of toning may be accelerated by adding more of the gold solution. More hypo gave a yellowish brown tint or more sulphocyanide a blackish brown. He preferred a bath rich in gold, which gives a peculiarly warm, luminous character to the slide. Other range of tones could be effected by dipping the plate in the gold solution (one grain to one ounce) alone just after bleaching, before putting it into the toning solution. If chloride plates are used, the bleaching is not necessary. Any yellowish stain in the slide after toning is removed by immersing in a weak bath of hydrochloric acid and water.

The principle of this toning process is to first convert the reduced bromide image into a chloride, by means of bichloride of mercury, then to tone and fix it at one operation in the sulphocyanide and hypo gold bath. Care should be taken not to develop the slide too far, otherwise it may be too dense.

An Eikonogen Developer, said to be very simple, and to work good for lantern slide plates, is advised by T. A. Sinclair, of the same association :

No. 1.

Eikonogen	½ ounce.
Sulphite soda	2 ounces.
Water	20 ounces.

No. 2.

Washing soda	2 ounces.
Carbonate of potash	2 ounces.
Water	20 ounces.

Take one ounce of No. 1, half an ounce of No. 2, and add half an ounce of water. This will develop eight or ten plates in succession.

New Use of Eikonogen in Reversing the Photographic Image.—That eikonogen is adapted to produce a positive image as well as a negative, on plates exposed directly in the camera, is one of the latest discoveries of its probable many uses. It was discovered accidentally.

We refer to the recent published reports of the experiments of Colonel Waterhouse, of Calcutta, India, who, in trying to find some good preservative for the eikonogen solution, accidentally noticed that a certain chemical added to the solution developed a plate into a positive instead of a negative. The chemical is called thio-sinamine, or allyl-thio-carbamide, the formula of which is—

$$C.S:\begin{matrix}NHC_3H_5\\NH_2\end{matrix}$$

He says of it : It is prepared by treating allyl-thio-carbamide, or the essential oil of black mustard, with ammonia ; is more soluble in cold water than the phenyl-thio-carbamide, and is also soluble in alcohol. A nearly saturated solution can be made by adding four parts of the strongest liquor ammonia to one part of the ordinary essential oil of mustard obtained from the druggist. As soon as the ammonia has taken up as much of the oil as it will, the solution may be decanted off and the ammonia allowed to evaporate.

Of the solution thus prepared, about one part in 100 of the mixed eikonogen developer, as above, is sufficient to produce reversal on development. A little bromide may be added, and a slight trace of ammonia seems beneficial. It is advisable to evaporate the solution as prepared above, and obtain the thio-sinamine in a crystalline and odorless form, in which it may be purchased in Europe. Of the saturated solution of the crystals, from one-half to one part in 100 parts of the developer is enough.

Col. Waterhouse trys to explain the theory on which the reversal is based, and thinks the sulphur in the compound is the active agent. Over-exposure of the plate prevents reversal. He continues : "The results obtained seem to warrant the hope that it may be possible to perfect the process for practical use, but a great deal of work has yet to be done before the conditions of successful working can be fully ascertained. As in all these processes of reversal, the balance between reversal and non-reversal is a very delicate one. In any case an entirely new method of producing reversed negatives, with so many novel features, must be of interest, and, it is to be hoped, may throw some light upon the still unsolved problems connected with the formation and reversal of the developed photographic image.

"For copying line subjects, it is an improvement to use the eikonogen and phenyl-thio-carbamide developer, and before developing to give the plates a preliminary bath of dilute nitric acid at five per cent, or of bichromate of potash solution at about three or four per cent, the solutions being flowed over the plate in a tray, and washed off quickly. By this means greater density is obtained in the lines, together with clearer whites. The reversal takes place slowly, but is more complete, and the change is quite visible, the lines turning black on a light ground. Greater clearness of the ground may also be obtained by treating the plate before fixing with a solution of bromide of copper at two or three per cent. But care must be taken not to weaken the lines too much.

"In working with thio-sinamine, good reversals have been obtained of half-tone subjects by adding about ten drops of a ten per cent bichromate of potash solution to the ounce of eikonogen developer.

"For copying work the process seems quite practical, as proved by heliogravure plates produced directly from the reversed negatives taken in the camera, by which one operation (either the taking of a negative or of an intermediate positive) is saved." We extract the foregoing from the *Br. Jour. of Photo.*

We have been unable to find the thio-sinamine in stock at some of the largest dealers in rare chemicals in this country, but were informed that it could be obtained from Germany at a cost of one dollar per half-ounce. We have not yet tried it, but believe Col. Waterhouse's deductions to be reliable.

When the process is fully worked out, it may be possible to make successive exposures of one landscape on a roll of bromide paper which may be developed out as positives, and thus avoid the interposed negative. It seems remarkable that such an important discovery should be made within a year of the introduction of the eikonogen developer.

Alternating versus Continuous Currents in Relation to the Human Body.

BY H. NEWMAN LAWRENCE, M.I.E.E., AND ARTHUR HARRIES, M.D.

This was a paper lately read before the British Association. The authors say their experiments were made :

1. By using currents directly from lighting circuits, both alternating and continuous.

2. By using currents directly from a dynamo whose rate of alternation could be accurately ascertained.

3. By using currents of high E. M. F.

4. By using an instrument for the measurement of alternating currents whose accuracy has been tested and proved to give correct readings by an eminent practical electrician.

Another practical point to which special attention has been given in this paper is that the experiments have been made chiefly with the skin in a state of nature, so that the conditions of experiment as nearly as possible resemble those which might be expected to exist under accidental circumstances—that is to say, under circumstances when contact with conductors was unexpected, and, therefore, unprovided for.

We omit the details of the various experiments. At the end of the paper the authors say :

We will now briefly summarize our conclusions, and in doing so desire to draw attention to the fact that they are based upon certain conditions, and while we believe them to be sufficiently accurate and reliable under these conditions, we in no sense claim them as true under all conditions.

Conclusions.

A. When the human body, with its skin in its normal unmoistened condition, comes into contact for an appreciable time with bare metal conductors of a dynamo-generated continuous current passing at about 100 volts, in such a way that the current passes from hand to hand, and the total contact area is about 90 square centimeters :

(1) A current of about 0·016 ampere will pass through it.

(2) This current can be borne without discomfort for 15 to 30 seconds.

(3) After about 30 seconds unpleasant burning sensations become marked and quickly increase.

(4) The subject is perfectly able to release himself at will during any portion of the time of contact.

B. When the human body comes into contact with dynamo-generated alternating currents, alternating at about 60 to 70 per second, under the same conditions as above :

(1) A current of about 0·025 ampere will pass through it.

(2) The current is six times greater than that which produces discomfort.

(3) Instantly the subject is fixed by violent muscular contraction and suffers great pain.

(4) The subject is utterly unable to release himself, but remains exposed to the full rigor of all the current that may be passing.

C. When circuit from electric light or power conductors is accidentally completed through the human body, the danger of serious consequences is many times greater when alternating than when continuous currents are passing at equal voltage, and this is still to a large extent true if the voltage of the continuous current be double that of the alternating.

D. (1) With both forms of current a reduction of contact area materially reduces the amount of current strength that passes.

(2) With the alternating current, if the rate of alternation be reduced below 50 per cent, the sensations of pain accompanying muscular fixation will be increased, while if the rate of alternation be increased, the pain will be diminished.

Finally, we would remind those gentlemen who so commonly speak as if voltage were the chief or only factor in the danger of accidental contact, that *current strength is the important item*, and that according to Ohm's law current strength is dependent not only upon E.M.F., but upon the total resistance in circuit at the time of accidental contact. To make statements based upon voltage only, such as newspaper reports of a recent execution have contained, is not only distinctly misleading, but calculated to induce the uninitiated to form erroneous conclusions.

Sugar and the Sugar Cane in Cuba.

M. Truy, French consul at Santiago de Cuba, says, according to the *Journal of the Society of Arts*, London, that the cultivation of the sugar cane in the eastern portion of the island of Cuba is almost entirely confined to the districts of Santiago, Guantanamo, and Manzanillo. This cultivation, although it has experienced some extension of late years, is not in the flourishing condition it was twenty years ago. This falling off is due to the civil war, which ruined many planters and discouraged others. The profits, however, realized for some time past by those planters who had sufficient credit, or confidence in the future, to continue to engage in this industry, have given a stimulus to the cultivation of the cane.

Sugar factories have been established in many parts, particularly in the district of Guantanamo and Manzanillo, old sugar factories have been supplied with fresh plant, and planters, encouraged by high prices recently realized, have hastened to get their ground ready for cultivation. Part of the products of the province of Santiago is shipped to Spain, and some small quantity is consigned each year to Canada, but the United States absorbs almost the whole of the yield of the island. The Cuba market was some years ago controlled by French merchants, who owned the greater part of the sugar factories of the province, but since the civil war many planters sold their estates, and retired to France.

A few estates, however, are still owned by Frenchmen, at Guantanamo especially. Those known as Sainte Marie, Sainte Cecile, and San Antonio are directed or owned by Frenchmen. All the land in the island is, in general, fit for the cultivation of the cane, an even surface being generally chosen, with a view to facilitate the working and the harvesting. The ground should also be as near the sea as possible, so as to avoid the cost of carriage and transport, which is particularly high in that part of the island, where it may be said there is an absence of railroads, and the carriage roads are in a deplorable condition. If the ground chosen is one that has hitherto been uncultivated, the planter, first of all, clears it in cutting down the branches of the trees and small shrubs with the machete, and burning the larger trees. The expenses of these preliminary operations may be estimated at from four hundred to five hundred dollars per plantation of thirteen hectares (the hectare is equivalent to 2·47 acres).

Holes are then dug at intervals of from three to four feet, and in them are placed horizontally pieces of cane of a length from two to three joints. If the ground has previously been under cultivation, the methods differ. The ground must first of all be plowed, and furrows are then made in which entire canes are stretched *a chorros*, that is to say, end to end horizontally. The plants are then covered with earth. The sugar cane is frequently planted in the spring, but many planters are of opinion that plantations in Cuba sown in winter give a much better yield. The young plants are allowed to shoot for ten or eleven months if they have been planted in the spring, for fourteen or sixteen months if planted in the winter, and the harvest then takes place. There are in the island several varieties of sugar cane—the white or Otaheite cane, the twisted white cane, the twisted violet cane, and the so-called black cane.

The first two varieties are the only ones cultivated at Cuba. The white cane is prepared for planting in virgin soil, and gives a good yield. The crystalline is reserved for old plantations, it is better adapted to resist the long drought than the white variety. The cultivation of the last three species of sugar canes has been abandoned on account of their insufficient yield. Before the abolition of slavery, the planters themselves culvated their fields. Since that period, however, they have experienced the greatest difficulty in obtaining a sufficient number of hands to harvest their canes. Many planters, in consequence, deemed it advisable to divide their labor between a certain number of colonists, who are bound to cultivate each his plot of ground, to plant the canes, to cut them at harvest time, and to carry them to the factory, where they receive, after the sugar is turned out, a certain proportion of the quantity of the sugar extracted from the canes harvested on their allotments. Cuban sugar is generally prepared for export. The special quality intended for home consumption is clearer and finer than that shipped abroad.

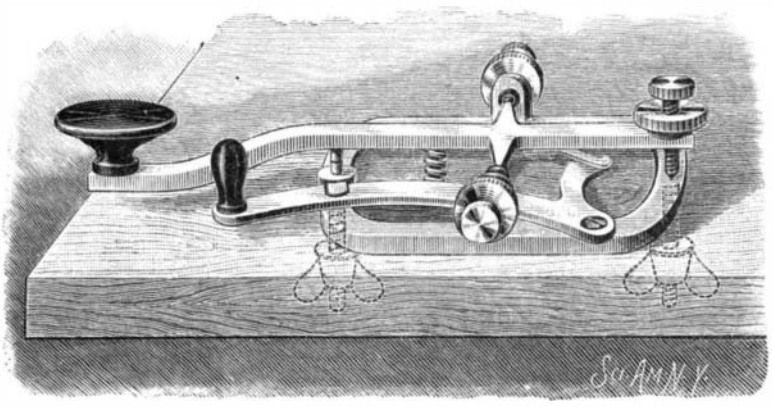
An Artificial Retina.

An artificial retina sensitive to light in the same way as the average human eye is certainly a great desideratum in photometry; and, according to M. Lion, this may be obtained by the use of a moist film of iodide of nitrogen. A new photometer is based on the employment of this substance. Since the longer the film is subjected to the action of the light rays the greater is the quantity of nitrogen disengaged, the sensibility of the instrument must continually increase with the time of exposure. This characteristic forms a decided advantage which the instrument possesses over others; but its significance is much diminished by the fact that it appears to take a considerable time before sufficient nitrogen is disengaged to take a reliable reading. In spite of the fact that the chemical action of light is caused chiefly by the non-luminous or ultra-violet rays, it appears that with this substance the luminous rays are most effective, and that, just as with the human eye, the yellow-green rays have the greatest influence. Considering the well-known fact that human eyes differ considerably among themselves, and that partly in consequence of this photometric measurements are subject to many errors, it would appear that the film of iodide of nitrogen can be regarded as an artificial retina, measuring illumination equally well, whatever its color. If a substance of this nature can be found which may be left to itself without danger, and from whose indications reliable readings may be obtained without the need of waiting some minutes, its applications to photometry would be numerous and important; and with this view it seems desirable that the action of light on complicated chemical compounds should be studied further than has hitherto been the case.—*The Electrician.*

IMPROVED TELEGRAPH KEY.

We give an engraving of an improved telegraph key recently patented by Mr. Wm. A. J. Kohrn, of 33 Franklin Street, San Francisco.

This improvement accomplishes two important results. First, the perfect closing of the circuit when the switch is turned; and second, the protection of the platinum points from the accumulation of dust and dirt. The improvement consists mainly in a spring attached to the under side of the rear end of the key, and a beveled arm projecting from the switch inwardly toward the center of the key frame in position to engage the spring as the switch is closed, thus forcing upward the rear end of the key, and causing the contact point carried by the key lever to touch the anvil contact, and to hold the parts in this position until the switch is again opened, when the usual retractile spring attached to the key opens the circuit. Besides closing the circuit through the contact points, it also closes the circuit by the contact of the switch with the anvil tongue.



KOHRN'S TELEGRAPH KEY.

It will thus be seen that there are two chances of securing a good closure of the circuit, one through the usual switch contact, the other through the points of the key. It will also be seen that as the platinum points of the key are held in contact so long as the key is closed, no dust can enter, and the surfaces will remain clean.

On the Fighting Instinct.

The student of nature is generally, if not universally, supposed to be the very incarnation of peace, and a well-developed organ of combativeness is considered decidedly out of place in happy Arcadie.

Nevertheless, the earth is one vast battle ground where all things living struggle for "the survival of the fittest"—that great and inexorable law, from the influence of which even the proud race of man is not exempt. Among the beasts of the field the law of force prevails. The finest specimens of each class survive, and the weaker go to the wall, or, perchance, the stomachs of their stronger brethren.

I think the Rev. J. G. Wood was the first to draw attention to the extraordinary fighting capabilities of moles. These clumsy, and apparently almost blind, masses of fur and sinew can occasionally become fiends incarnate, veritable subterranean tigers; and with such energy do they attack each other that, utterly ignoring the presence of man, they will rough-and-tumble at his very feet, their enormously muscular little limbs working convulsively, and bones audibly cracking beneath the pressure of their jaws. No one who has not witnessed a tourney of this nature would credit the extraordinary activity and fury which are here displayed, for, unless they are forcibly parted, the battle seldom leaves both combatants in the land of the living.

Hedgehogs are occasionally cannibalistic, the larger ones, when hard up for a dinner, chasing the smaller at a wonderful rate, and devouring them, without sauce or mercy, when caught and conquered. Curiously enough, the vanquished animal seldom employs against its own species its strongest means of defense—rolling itself up into the well known ball form.

A fight between two hares is a droll sight, appearing much like a jumping match, the skipping exercise being kept up with tremendous energy and spirit: but a blow from the leg of a hare is no laughing matter for the recipient, who occasionally finds himself knocked out of the world altogether.

The representatives of the order *Mustellidæ* are hard fighters, for a friend of mine once witnessed a duel between an old gray rat and a weasel, which lasted nearly an hour, and resulted in the annihilation of the former. The rat fought with great pluck and determination, but his antagonist was too much for him, and drew blood at every bite; while the rat, which displayed the utmost activity, rushing on again and again, failed to make much impression on the tough hide of the weasel. The latter fought in a very undemonstrative manner, appearing to act mostly upon the defensive; but his sharp teeth played havoc with the firm body of the rat, which finally retreated into a bundle of fagots, followed by the weasel. A great deal of scuffling and squeaking ensued, after which the rat was driven out into the open and there killed.

Among the *Gallinaceæ*, the pheasant may be considered "cock of the roost," for he will boldly enter the farm yard and settle the military-looking barn-door fowl in a trice.

Perhaps none, among smaller birds, wage war more desperately than the domesticated robin. It is said that he is guilty of parricide, the young ones chasing and slaying the parent before twelve months have passed over their youthful heads. Their first plumage is brown, but afterward red—perhaps a Cain mark, to distinguish them for their evil deeds. They follow up their battles with great pertinacity, and so frantic and lost to all sense of outer danger do they become, that, on two occasions, I have picked them up and held them in my hand, where they lay panting, but still holding on to each other with bills and talons. Once, two of these tiny gladiators fell from a tree under which I was discussing the good fare of a picnic, and, utterly ignoring the situation, finished the argument in my lap.

An invalid friend of mine, who is a close observer of nature, has a recollection of two cats, which advanced daily from opposite ends of a long and lofty wall, and, meeting in the middle, fought with great fury, until one or both were precipitated to the ground below, upon which the fight ceased immediately, the combatants remounting the wall, and basking peacefully side by side in the sunshine.

On one occasion, lately, a particularly fine Newfoundland dog was sitting on a wooden bridge discussing a bone, when a predatory mastiff came along, and, being unable or unwilling to distinguish between *meum* and *tuum*, a smart altercation arose. So violent became the debate, that both suddenly overbalanced and fell into the stream beneath. The nearest landing place was a hundred yards down, and to it the Newfoundland betook himself without much difficulty, and, after a good shake, was preparing to depart, when he suddenly became aware that the other dog, who was more of a soldier than a sailor, was wildly beating the water and drowning as fast as he could drown. One look was enough. In went he of the shaggy coat, and, seizing the other dog by the collar, brought his late enemy safely to land. The two dogs then eyed each other with a perfectly indescribable expression for some seconds, then silently and solemnly wagged their caudal appendages, and with dignity departed.

Some will, no doubt, say this was but instinct, and they may be right; but I prefer to give my four-footed friend the benefit of the doubt.—*J. A. Bartlett, in Longman's Magazine, London, September.*

Read before Signing.

Among the pithy sayings of a well-known German philosopher and reader occurs the following: "Sign no paper without reading it." In these days of education, enlightenment, and progress, such a caution would hardly seem necessary to any person in the full possession of his faculties; yet it is astonishing how many people there are, including good business men, who attach their signatures to papers or documents whose contents may have a serious bearing upon themselves or their affairs, with scarcely a glance at their contents. Carelessness in failing to acquaint themselves with the contents of a paper before signing it has worked incalculable harm to thousands of well intentioned people. It is a good thing, therefore, to bear in mind continuously the above quotation, particularly with respect to such papers as express or imply anything in the nature of a contract or a legal obligation.—*Trader Review.*