and off the stud, and by pressing this key for short or long intervals, short or long flashes are produced. This is the whole story of the heliograph; and now, says our contemporary, that our readers may have learned its *modus operandi*, we hope some of them will set to work and apply a camera to it in such a way that the flashes may be recorded and true light impressions produced by its means.

AGRICULTURAL INVENTIONS.

Mr. Joseph W. Hobson, of New York City, has patented an improved horse hay rake, in which, by the adjustment of the rake teeth points forward and backward, together with the integral vertical adjustment, a great number of positions for the rake can be obtained to suit the requirements of the land or crop, or the views of the operator.

Messrs. Samuel Scott and Winfield Scott, of Floyd Court House, Va., have patented an improvement in the class of devices attached to trunks of trees for the purpose of protecting them from injury by worms, borers, and other insects or animals. The device is made of sheet metal in conical form, and is adapted for adjustment in diameter or size.

Messrs. Mortimer B. Mills and Christopher E. Dinehart, of Chicago, Ill., have patented an improved apparatus for generating steam for cooking food for cattle. It has a large area of heating surface within a small cubical space, and is adapted to economize heat to a high degree.

Mr. John W. Blackhart, of Wells' Tannery, Pa., has patented a fork for hay and like material, furnished with a weighing apparatus, by means of which each fork load can be weighed as it is handled.

Mr. John T. Greenfield, of Uniontown, Ky., has invented a plow, the cutting parts and gauge wheel of which can be conveniently lowered or raised, as may be necessary, on account of hardness or unevenness of the ground, by a person seated on the plow, and also to provide a plow, the cutting parts of which can be easily sharpened.

An improvement in plows has been patented by Mr. John M. Martin, Jr., of Ocala, Fla. The invention consists in the arrangement of a plowshare provided with a detachable mould board or wing, for the purpose of throwing more ground over the grass in the middle of the rows.

Photography in Natural Colors.—Printing Photo-Collographs.

After referring to the fallacy of producing natural colors by the camera, as put forth by Rev. L. L. Hill, of this State, whose alleged discoveries were published in this paper as long ago as 1850, a writer in *Chambers' Journal* says:

"It would be a triumph of optics and chemistry if photographs could be made to represent the natural colors of objects. Attempts toward this result have hitherto ended for the most part in disappointment. But Captain Abney, in a short paper 'On the Production of Colored Spectra by Light,' read before the Royal Society, makes known that he has succeeded in producing, approximately in the natural colors, pictures of the solar spectrum on silver plates, and also, but less brilliant, on compounds of silver held in place by collodion. 'I reserve for the present,' the Captain writes, 'the exact details of the production of these pictures, but may say that they are produced by oxidation of silver compounds when placed in the spectrum, an exposure of two minutes being amply sufficient with a wide slit to impress the colors The coloring matter seems to be due to a mixture of two different sizes of molecules of the same chemical composition, one of which absorbs at the blue end, and the other at the red end of the spectrum, and the sizes of these molecules are unalterable while exposed to the same wave lengths as those by which they were produced.' And he is of opinion that 'the colors may be preserved unchanged when exposed to ordinary daylight.' From this it will be understood that Captain Abney has made a step in advance of high importance."

To this the London *Photographic News* adds:

We should be very sorry indeed to appear to underrate the work of Captain Abney in this direction; but, unless our memory misleads us, M. Becquerel obtained an image of the solar spectrum in natural colors early in 1849. Niepce Victor and others have since secured still greater results. On a film of sub-chloride we ourselves have obtained very approximate natural colors. But in all these cases the colors were evanescent. Captain Abney is of opinion that his colors will remain unchanged when exposed to ordinary daylight. This is a decided step in advance. Our own results were gradually destroyed by daylight. We shall look for further details of our friend Captain Abney's operations with interest.

The writer in *Chambers'* proceeds to refer to the interesting experiments of Herr Albert in printing colored photo-collographs, which have, however, no connection with photography in natural colors. He says:

"In connection with this we mention improvements in color printing by which Herr Albert, court photographer at Munich, produces chromo-photographs of surprising excellence. The process commences by the taking of three photographs, each being exposed to the action of different and definite portions of the spectrum. This is effected by causing the light, before it reaches the sensitized plate, to pass through colored glasses, or suitable colored liquids, and, moreover, by employing in each case special solutions for the development of each negative. A positive printing plate (a glass plate gelatinized) is then produced for each negative; and, if the absorbing media and the developing preparations have been correctly chosen, it is only necessary to color one of these plates with red, another with yellow, and the third with blue, in order, by successive printings, to obtain a picture which exhibits more or less resemblance to the original. Success appears to depend on the skill and nicety with which the absorbing materials are employed, for mixtures of colors and of coloring materials are quite different things; and, to quote the technical description, 'for the negative belonging to the blue plate we must employ such absorbing media and preparations as will prevent green from producing any influence on it, and at the same time will render blue and violet quite inactive, inasmuch as these tints must appear only on the positive plate.'

"Specimens of landscapes and of decorative panels printed by Herr Albert's process were exhibited at scientific receptions in Londou during the past session, and were deservedly admired. The details were shown: a plain yellow picture; then on the yellow a blue, and on the blue a red; and with these three the effect of a well-finished water color drawing was produced."

Launch of the Agamemnon.

The Agamemnon, four, double screw iron armor-plated turret ship, 8,492 tons, 6,000 horse power, was launched at Chatham on September 17. She has a length of 280 feet, compared with 325 feet for the Inflexible, and a breadth of 66 feet compared with 75 feet, while the displacement in tons of the Inflexible is 3,500 greater than that of the Agamemnon. Her two revolving turrets, which will be plated with iron 1½ inch thick, will be placed *en échelon*, and will contain each two 38-ton guns, all four being revolving. Her power of attack, however, is not confined to ordnance, for she will be armed with Whitehead torpedoes, means of ejection being provided from the armored sides of her citadel. Her water-tight compartments are to be filled with cork, the object being to prevent her from sinking if struck below the water line. She is an ironclad of the center citadel type, which means that she is built with an invulnerable citadel, or central compartment, which is kept afloat by two unprotected ends of the vessel. Within the walls of this citadel are inclosed the magazine, engines, boilers, and ordnance, with its hydraulic loading gear. The armor protecting this citadel is 18 inches thick, and that on the turrets 16 inches; on the citadel is two thicknesses. The outer or face armor will probably be of steel, strengthened by vertical angle iron girders 11 inches wide and 3 feet apart, the space being filled with teak. Behind this backing and these girders will be riveted the rest of the armor, which will, in its turn, be backed by horizontal girders and another thickness of teak. In addition to the ordinary decks there is a superstructure, running lengthways with the keel and erected above the upper deck, for working the vessel. In the "unprotected" portion of the vessel horizontal armor is largely used. This is no less than 3 inches thick on the upper deck, and on the lower deck, both before and in the rear of the citadel, 6 feet under water, the same thickness of plating is used. The Agamemnon is calculated to realize a speed of 13 knots an hour.

How they Attract Custom to the American Produce Stores in England.

Within the last few months, consequent on the large importations of American produce into Bristol by the Great Western line of steamers, a great many stores for the sale of American provisions have been started in different parts of the city, especially at Laurence Hill and Russell Town, in the eastern portion, and in Bedminster, the district of Bristol in Somersetshire. The go-ahead character of these stores is manifested in many ways, and one store at East street, Bedminster, has lately been rendered notorious by a large flag suspended from a pole above the shop. Other grocers and provision merchants in the neighborhood made a display of bunting likewise; and the police, not partial to this flourish of finery, brought the matter before the magistrates, who on Tuesday were called to adjudicate in a summons taken out against Mr. Frederick Wm. Leach, proprietor of the American Stores. He was charged under the 18th Section of the Bristol Street Encroachment Act with projecting from one of the windows of his premises a pole and flag to the inconvenience and danger of the public. Mr. Clifton, who appeared for the defendant, admitted that the defendant had exhibited a flag from his premises, and contested the right of the police to interfere. Police Sergeant Smith said that, in consequence of instructions received from his superintendent, he called on the defendant on the 30th ult. in reference to the flag, and defendant asserted that he had a perfect right to exhibit it, and declined to take it in. The chief constable (Mr. E. Coathupe) said that, on August 13, he was driving through Bedminster, and his horse caught sight of a string of flags suspended across the carriage-way, and started off, and it was with the utmost difficulty he could control the animal. Witness, understanding that several of the flags were only exhibited as trade advertisements, communicated with the town clerk, and, being advised that the practice was illegal—in fact, an encroachment on the public rights—communicated with the divisional superintendent. Mr. Clifton, interposing, said he understood on that day there was a parochial garden party at Bedminster, and that the string of flags did not belong to his client at all, but were thrown across the road in honor of the event. Superintendent Harris deposed that in the second week in August the flag shown from the defendant's premises was lower than it was now. The defendant kept an American store, and one or two provision dealers also hung out flags in opposition, until one hoisted a string of eleven. He called on them, and, having complained, all of them discontinued exhibiting their flags with the exception of the defendant, who said he should contest the question whether or not he had a perfect right to do what he was doing. Mr. Herbert Thomas, magistrate, said the Bench were of opinion that no obstruction or nuisance had been proved, and they therefore dismissed the summons. A summons against another tradesman was, after this decision, withdrawn by the police. As several shopkeepers in Bristol, desirous of hanging their banners on the outer walls of their premises, have been awaiting the issue of this test case at Bedminster, the streets of Bristol will no doubt ere long assume a gala appearance, and the flags about shops will rival in number the "flags" of the pavements.—*London Grocer.*

Division of Electric Light.

Referring to the division of the electric light, the *Mining and Scientific Press* says:

"We give the result of experiments, of which we were an eye-witness, at the *atelier* of Messrs. Molera & Cebrian, in this city. The light used by them was a 4,000-candle electric light, inclosed in a chamber, on one side of which was a 24-inch Fresnel lens, from which the light is projected in parallel lines. The whole or any number of these lines or rays of light may be collected on a mirror or reflecting surface of any kind, and distributed in any greater or less intensity through secondary lenses without additional loss. In the experiment hardly one-half of the main light was collected, but it was divided into 16 separate lights, equal to 80 candles each. The secondary lenses were of small size, and situated in the ceiling, the light being thrown down. The quality of the light was equal to pure diffused daylight—in fact, several hundred shades of silk, arranged upon cards and placed side by side, could be distinguished as readily as by sunlight. Had it not been for the loss of light, occasioned by the size of the reflecting mirrors, we believe the light could have been subdivided to its fullest extent and into at least 50 separate lights. The whole light from the main lamp can be divided and subdivided, and distributed down to a single ray even, at pleasure. The dispersing lenses and reflectors are arranged inside the building so as to illuminate every part without any obscure corners. In the open air the rays of light thrown upon objects over a mile away in the darkness of night brought them into view with startling distinctness."

This system of electric lighting was recently illustrated and fully described in the columns of the SCIENTIFIC AMERICAN.

St. Paul (Minn.) as a Milling Center.

The *Pioneer Press*, of St. Paul, Minn., states that there are now building at the Falls of St. Anthony, five large flouring mills, of which one will probably make from 2,500 to 3,000 barrels a day, another 2,000, another 1,000 to 1,200, and the others from 500 to 800. In addition to this, Gov. Washburn is tearing out the inside of his old "B" mill in order to put in improved machinery, so that when completed it will have a capacity of from 1,500 to 2,000 barrels. It is worthy of note, in this connection, that it is but a little while since a 300 barrel mill was considered a large one, and 500 barrel mills were rare.

The *Press* estimates that when all the new mills are finished and running on full time, the daily production of flour in St. Paul will be over 12,000 barrels, which, with the mill-stuff made, will load seven trains of twenty-one cars each. At this rate the yearly production will be over 3,000,000 barrels, requiring 15,000,000 bushels of grain.

Nitrate of Silver Stains on Clothing.

To the Editor of the Scientific American:

In your issue of October 11 is a paper on the removal of silver stains from clothing. The salt recommended to be used is stated as bichromate of mercury. This is an error; it should be *bichloride* of mercury, known commonly by the name of corrosive sublimate.

Its solubility is greatly increased by first dissolving a little chloride of ammonium in the water.

GEORGE WILSON.

New Haven, Conn.

Pine Cones for Fire Kindling.

Almost the universal article used on the Continent for kindling fires are dry pine cones. A couple of these is usually enough to start a fire of dry wood, and several of them contain enough resinous material to start a coal fire without other kindling. They are readily ignited with a match, and are free from dust and insects. In Paris, and other large cities on the Continent, scarcely any other than pine cones are used for kindling purposes in the hotels, and it is a wonder to us that they have not been introduced for the same purpose here. We believe a large and profitable business might be made from gathering the cones in pine growing regions and selling them in our cities.

The Purification of Memphis.

A very earnest effort has been made by the National Board of Health to thoroughly disinfect Memphis. In this important work there had been used, by the end of September, upward of 170,000 pounds of copperas, 9,000 barrels of lime, 40 barrels of sulphur, 15 barrels of carbolic acid, 1,215 pounds of sulphate of zinc, and 1,200 gallons of zinc iron.

Powder-Post Producing Insects.

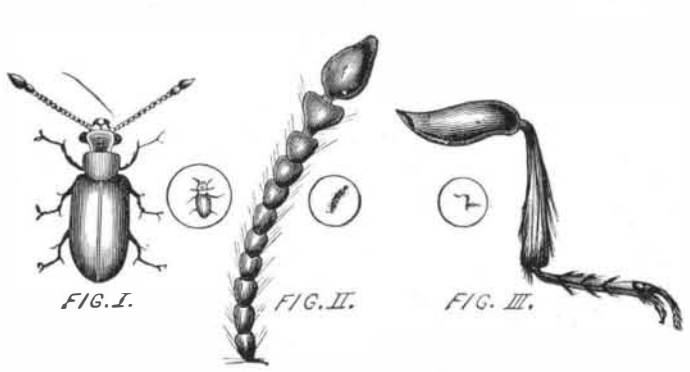
Our excellent contemporary, *The Hub*, publishes the following account of the wood destroying beetle *Lyctus*, which Charles Evans, of Cleveland, Ohio, communicates to that paper:

Of the multitude of insects which devour plants and trees, some attack only the leaves, others the trunk, and others the roots or various other parts. The nettle is infested by no less than forty species of insects, which are born, live, and die on its stems. The oak alone has one hundred and eighty-four species, and the hickory is the exclusive home of numerous tribes of insects. One particular species which infests the hickory is the *Lyctus*.

Fig. 1, accompanying, shows a magnified illustration of the beetle of the genus *Lyctus*, which is called the *Lyctus opaculus* (Packard). It is allied to the death-watch beetle of England, which is assigned to the genus *Petmus* (Hogg).

This is the chief pest of the carriage wood shop, and causes more trouble than any other insect in shops where second growth hickory is used. This beetle is of a dark chestnut-brown color, and has eleven jointed antennæ, club-shaped at the outer end, as shown in drawing, Fig. 2. These antennæ are distinct from each other at the base, and are inserted immediately in front of the eyes.

Fig. 3 shows a magnified sketch of the foot and leg of this beetle. The small circle denotes the natural size, the beetle being about three-sixteenths of an inch long. It matures as soon as the warm weather of spring or early summer sets in. I have found them in the shop, says Mr. Evans, as early as the 1st of March, and as late as the 15th of July. In the lumber shed they are most numerous from about the 15th of May to the 15th of June, during which time they mate, and the female deposits her eggs in cracks and pores of the wood. They select freshly sawed second-growth hickory, or that which has the most sap, on which the female deposits her eggs, such timber apparently being the best adapted for the nurture and growth of the larva or worm when hatched, which takes place in about fourteen days; and then they begin to eat their way into any piece of wood on which they have been deposited, confining themselves to the most sappy portions. When hatched they are very minute, but increase in size as they continue to work their way into the wood; and they attain their full growth about the last of December, when they are about three-sixteenths of an inch long, as before stated. At the latter time they



work close to the outside of the piece, leaving only a thin shell on the outside as a protection. They then undergo transformation, and eat through the shell, and return to the outside as perfect beetles, in the spring or early summer, to reproduce and carry on their work of destruction, leaving small pin holes in the wood as evidence of their exit. Some call this trouble the "powder post," and others simply speak of the timber as "worm eaten." Some think that the worms breed in the wood, but this is an error, as investigation clearly proves.

The club shaped eleven-jointed antenna, shown in Fig. 2, is a mark of their identity, as it is a peculiar characteristic of the species, and can be defined with a small magnifying glass or any microscope.

The best method of destroying these pests is to destroy every piece of worm-eaten timber before the month of March. If any man in the shop finds the wood he is working is infected, instead of putting it in a corner and saving it, let him immediately use it for firewood, or otherwise destroy it; for if it be left in the shop it will surely help to continue the pests another year.

Timber cut in the month of August is less liable to be attacked by them, as it then has less sap than when cut in the spring or fall. With a little care in selecting timber, buying only that cut in August, and using caution and foresight in the shop and lumber shed, they may be almost if not quite got rid of; but if left to themselves, they will very soon spoil every piece of second-growth hickory about the establishment.

A New Fluorescent Body.

According to the *Journal of the Chemical Society*, C. O. Harz has discovered a new fluorescent body in *spergulin*. This product occurs in the seed coverings of the caryophyllaceous plants, *Spergula vulgaris* and *S. maxima* (Anglice "Spurrey"). It is produced at the time when the seeds blacken and are nearly ripe. Spergulin is very soluble in absolute and aqueous alcohol. Viewed by transmitted light the solution appears nearly colorless, with a shade of olive-green; by reflected light it exhibits a dark blue fluorescence. It has not yet been obtained in the form of crystals. It is very soluble in methylic alcohol, less so in amylic alcohol, and scarcely soluble in ether or petroleum. Concentrated sulphuric acid dissolves it, forming a dark blue liquid. The fluorescence of an alcoholic solution of spergulin is maintained for more than a year if the liquid be kept in darkness, but is rapidly destroyed by the action of direct sunlight, and more slowly by that of diffused light. Small quantities of caustic alkalies, or alkaline carbonates, added to an alcoholic solution of spergulin, transform it into an emerald green fluorescent body; and basic lead acetate produces a precipitate. The new compound contains 61·85 per cent of carbon, 7·05 of hydrogen, and 31·8 of oxygen. It appears to be related to chlorophyl, and is probably closely allied to phyllocyanin. An alcoholic solution of the product showed strong absorption, almost entirely in the violet; and in this respect differs considerably from chlorophyl, phyllocyanin, and phylloxanthin. Mr. Harz is disposed to regard spergulin as a feeble acid, the acid salts of which, as well as the acid itself, exhibit blue fluorescence, the neutral salts exhibit green fluorescence, and the basic salts are destitute of fluorescent properties.

Visit to a Pin Factory.

A correspondent of the *Evening Post* thus describes the mysteries of pin making:

"The pin machine is one of the closest approaches that mechanics have made to the dexterity of the human hand. A small machine, about the height and size of a lady's sewing machine, only stronger, stands before you. On the back side a light belt descends from the long shaft at the ceiling, that drives all the machines, ranged in rows on the floor. On the left side of our machine hangs on a peg a small reel of wire, that has been straightened by running through a compound system of small rollers.

"This wire descends, and the end of it enters the machine It pulls it in and bites it off by inches, incessantly, one hundred and forty bites to a minute. Just as it seizes each bite, a little hammer, with a concave face, hits the end of the wire three taps, and 'upsets' it to a head, while it grips it in a countersunk hole between its teeth. With an outward thrust of its tongue, it then lays the pin sideways in a little groove across the rim of a small wheel that slowly revolves just under its nose. By the external pressure of a stationary hoop, these pins roll in their places, as they are carried under two series of small files, three in each. These files grow finer toward the end of the series. They lie at a slight inclination on the points of the pins, and by a series of cams, levers, and springs, are made to play 'like lightning.' Thus the pins are pointed and dropped in a little shower into a box.

"Twenty-eight pounds of pins is a day's work for one of these jerking little automatons. Forty machines on this floor make five hundred and sixty pounds of pins daily. These are then polished. Two very intelligent machines reject every crooked pin even the slightest irregularity of form being detected.

"Another automaton assorts half a dozen lengths in as many different boxes, all at once and unerringly, when a careless operator has mixed the contents of boxes from various machines. Lastly, a perfect genius of a machine hangs the pin by the head, in an inclined platform, through as many 'slots' as there are pins in a row on the papers. These slots converge into the exact space, spanning the length of a row. Under them runs the strip of pin paper. A hand-like part of the machine catches one pin from each of the slots as it falls, and by one movement sticks them all through two corrugated ridges in the paper, from which they are to be picked by taper fingers in boudoirs, and all sorts of human fingers in all sorts of human circumstances. Thus you have its genesis:

"'Tall and slender, straight and thin,
Pretty, little, useful pin.'"

Preparation of Albumenized Paper.

Leicester, England, supplies very large quantities, and many of the largest firms in the kingdom are supplied by Messrs. Meadows & Son. No less than 5,000 eggs passed through the hands of those engaged, the whites only being utilized; and the enormous number of yolks are more than sufficient to supply Messrs. Dent's manufactory at Worcester, the yolks being in great demand for glove purposes. There is a demand for the yolks in Leicester for confectionery purposes; but the supply is more than being consumed, many being thrown away daily. Every sheet has to be bathed singly, and each pressed before the ream is allowed to pass out of the hands of the manufacturers. There are all kinds of tints; and the senior member of the firm being a practical chemist, and one of the best known among the members of the Pharmaceutical Society, brings his scientific knowledge to bear. It may not be uninteresting to know that a first-class hand—females only being employed, owing to their tender manipulation—can earn as much as 36s. a week; many can earn 20s., and even half timers can receive weekly as much as 8s., and this without having the disadvantage of being in badly-ventilated premises.

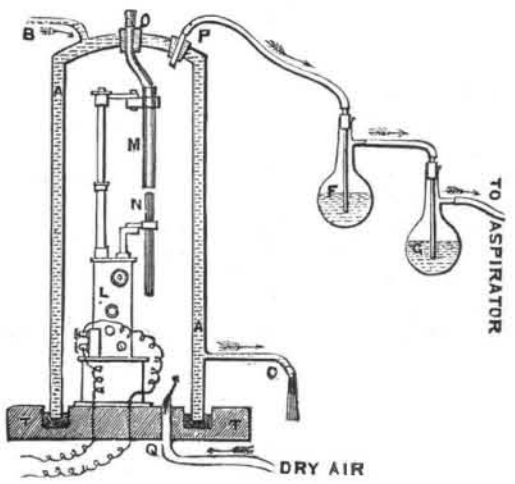
New Photo Printing Process.

A new method by Herr Schahl is to coat a thin zinc plate with chromated gelatine, which he then exposes under a negative. The film is then rolled up with some reducing substance, which adheres only to the parts affected by the light. Tracing paper impregnated with iron is then pressed against the plate, and the iron being reduced at those places, an image is obtained, which is said to be much more delicate than one produced by ordinary photo-lithography.

Acids from Electric Lights.

At the recent meeting of the British Association, Professor Dewar, F.R.S., read two very interesting papers, the one "On the Synthesis of Hydrocyanic Acid," and the other "On the Amount of Nitrous Acid Produced in Electric Illumination." In these communications, the subjects of which are closely connected together, Professor Dewar said that when carbon poles are used for the purposes of electric illumination in an atmosphere of hydrogen, acetyline is formed in a gaseous state, which readily condenses and combines with a large number of other compounds; but it does not combine with nitrogen, except at high temperatures. By passing powerful electric sparks through the mixture, combination with nitrogen takes place, and hydrocyanic acid is formed. [C_2H_2 (acetyline) + N (nitrogen) = 2HCN (hydrocyanic acid).] Professor Dewar expressed the opinion that what is generally called the carbon spectrum is in reality the spectrum of a hydrocarbon intimately related to acetyline and its compounds. When the electric light is produced between carbon poles in atmospheric air a mixture of acetyline and hydrocyanic acid is produced at the positive pole, which fact is of great interest, because if hydrocyanic acid and acetyline can be produced, almost all organic bodies can be produced artificially.

In the experiments which were made at the Royal Institution, Professor Dewar used a medium sized Siemens machine, absorbing about six horse power, and this was placed in circuit with a small sized Siemens lamp, by which the electric arc was produced in the interior of an air-tight chamber, fitted with arrangements for collecting and analyzing the air in which the arc was burning, and of measuring the heat produced by it. Professor Dewar thought that as the electric light is attracting great attention at the present time, it would be of interest, and perhaps attended with useful results, to make an examination of the impurities thrown into the air during the production of the electric arc; he therefore designed and had constructed the apparatus shown in the diagram, in which A A is a water jacketed bell cover, the mouth of which rests in an annular mercury



trough cut in the circular wooden base, T T. Within this jacket a stream of water can be made to circulate by entering by the tube, B, and flowing away at the exit pipe, C. Within the chamber forming the interior of this bell receiver is placed the electric lamp or regulator, L, on which M and N are the upper and lower carbons respectively. The former of these, M, is a hollow tube of carbon, the latter being a solid pencil of the ordinary form. To the top of the upper hollow carbon pole is attached a short length of flexible tubing communicating with the outside of the chamber through a perforated cork at O, and, by connecting this with an aspirator, gaseous products may be drawn away from the center of the electric arc and subjected to analysis.

For examining the air surrounding the electric arc a stream of dry air is allowed to enter the receiver at Q, and by an aspirator is drawn away at P, and may be passed through any number of wash bottles, such as are shown at F and G, by which the air within the chamber, after having been subjected to the influence of the electric arc, may be analyzed. Professor Dewar, with this apparatus, found that with a Siemens lamp, adjusted to give a long arc, there was an average development of nitrous acid equal to half a gramme per hour, that is, between seven and eight grains; but with a short arc the amount of nitrous acid thrown into the air is very much less, not exceeding 0·08 of a gramme per hour. A similar series of experiments revealed the fact that the Jablochkoff candle discharges into the air a much greater quantity of nitrous acid than does the arc produced in the ordinary way; this amount is nearly double that produced by the Siemens lamp, being as much as one gramme per hour, that is, from twelve to fifteen grains, and this amount is still further increased if the insulating material (which consists of zinc with kaolin or plaster of Paris) be removed; the reason of this is that the lime absorbs some of the nitrous acid, nitrite of lime being produced.

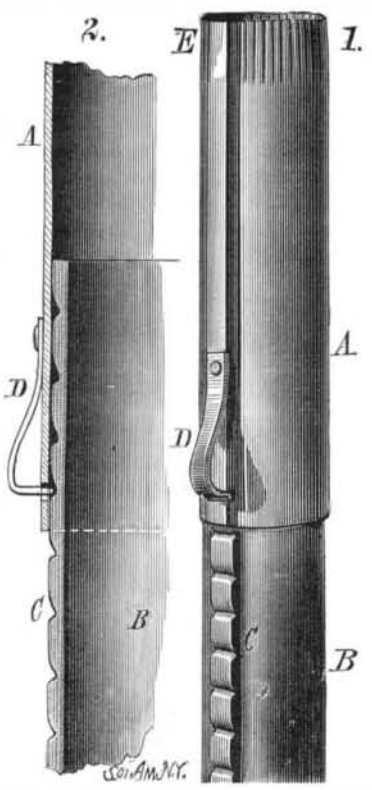
Professor Dewar's experiments show, says *Engineering*, that in places where the electric light is used, it should be placed under a ventilator, by which these deleterious compounds may be carried away, or it would have injurious effects on health as well as the binding of books. The substance produced Professor Dewar found to be nearly pure nitrous acid.

A New Therapeutic Agent.

A new method of treating cancerous growths, tumors, etc., consists in subjecting the parts to a stream of hot, dry air. This is proposed and has been successfully applied by Dr. G. A. Keyworth, of England. By means of a foot bellows he caused air to pass through a glass vessel containing calcic chloride, then through a heated iron tube, and thence directed the hot, dry air against the surface of a cancerous sore. The treatment was continued for an hour, the effect being to relieve the pain and cause the parts heated to shrink and dry up very considerably. It is believed that this new method will prove valuable when proper appliances are employed to maintain and direct the supply of the air.

AN IMPROVEMENT IN STOVEPIPES.

The inventor of the adjustable stovepipe shown in the accompanying engraving has endeavored to relieve those who are unfortunate enough to have to use stovepipe, from the trials and vexations incident to taking down and setting up stoves, by providing a single length of stovepipe which may be extended or contracted like a telescope, and which is formed at the ends so as to fit pipes whose sizes vary within reasonable limits.



PATTISON'S EXTENSION STOVEPIPE.

The section, A, is of sufficient size to permit the section, B, to slide freely in it, and it is provided with a spring pawl, D, that fits into notches formed in the seam, C, of the section, B. By means of this arrangement the two lengths may be held in any position relative to each other, and the compound length may be easily fitted into a space in a stovepipe of nominally the same size.

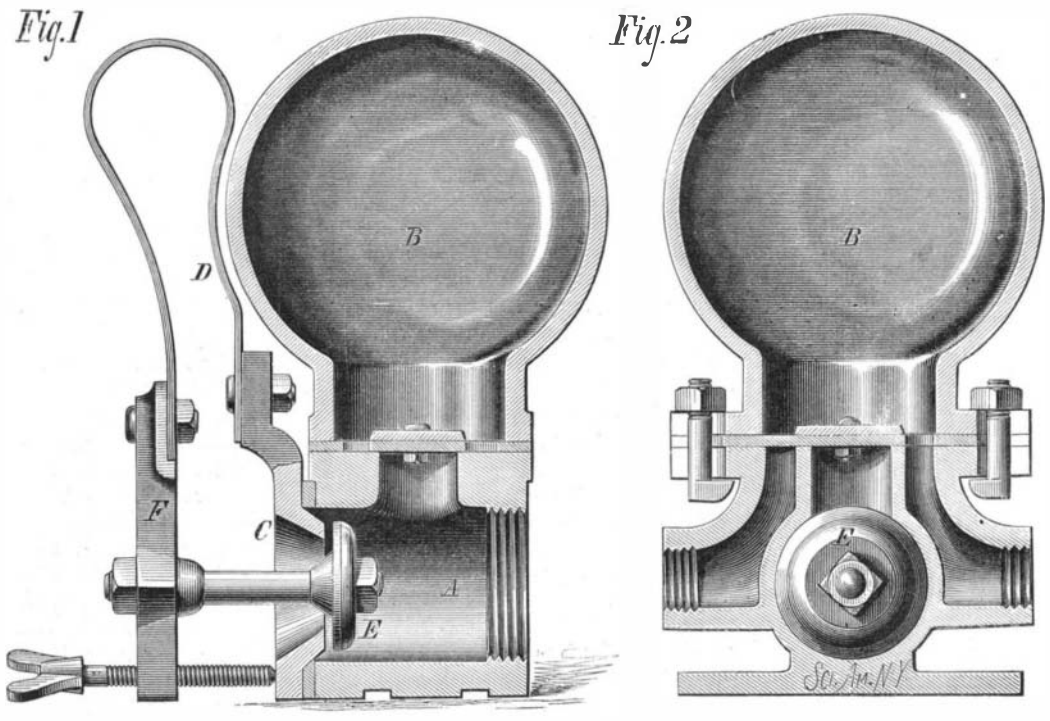
The exterior appearance of the pipe is clearly shown in Fig. 1, and the arrangement of the different parts will be seen in Fig. 2. The end of the outer section is corrugated to admit of easily contracting or expanding it to adapt it to various sizes of pipe.

For further particulars address the patentee, Mr. R. R. Pattison, 300 N. Fourth street, Terre Haute, Ind.

NEW HYDRAULIC RAM.

The accompanying engraving represents an improvement in hydraulic rams recently patented by Mr. Harry H. Heise, of Columbia, Pa. It is very compact and simple and seems well calculated for practical use.

The cylinder, A, is cast in one piece with the base that supports it, and is provided with three passages—a central one which discharges into the air chamber, B, and is covered with a check valve, and two lateral passages leading from the lower portion of the air chamber; only one of these is necessary, however, the two being formed merely for convenience in attaching the discharge pipes. The cylinder head, C, is apertured and provided with a valve seat fitted to the waste valve, E. This valve is supported by the spring, D, carrying at its lower extremity the bar, F. An adjusting screw passes through the bar, F, and bears against the cylinder head. The valve, E, is held open by the spring, D, until the water in the supply pipe attains sufficient momentum to close it, then the water escapes into the air chamber, where it is retained by the check valve, and is forced out through the discharge pipe by the air cushion. When the momentum has thus been partially checked, the spring opens the waste valve, E, and the operation is repeated.

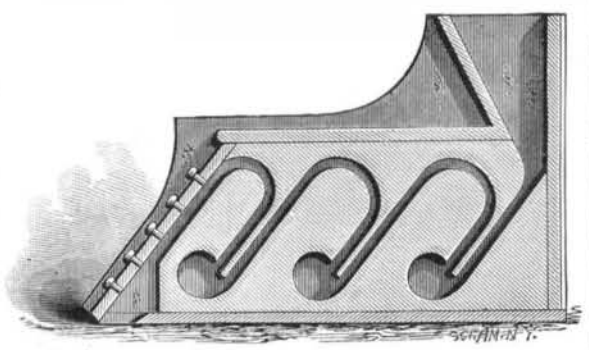


HEISE'S IMPROVED HYDRAULIC RAM.

ANALYSIS OF A PIECE OF MODERN ENGLISH CALICO.—Cotton, 53; china clay, 26; starch, 12; fatty matter, 2·5; chloride of magnesium, 2; chloride of zinc, 1·5; chloride of calcium, 0·5; moisture, 2·5: 100·0.

NEW AMALGAMATOR.

The novel and simple amalgamator shown in the engraving is the invention of Mr. Perry Dickson, of Spearfish City, Dakota Ter. The apparatus has a supply hopper, and



DICKSON'S AMALGAMATOR.

a series of downward and upward passages connecting with scroll-shaped chambers, arranged so that the pulp from the stamp mill is spread out in thin sheets, and the current is made to revolve with great velocity so as to bring the gold and quicksilver in the chambers into intimate contact. The amalgam remains in the chambers, but the lighter particles escape from one chamber to another, and are finally allowed to pass away through the discharge sluice.

The velocity of the water is regulated more or less by removing or inserting plugs in the side of the discharge sluice.

Photo Decoration of Metals.

Herr Falk's photographic method consists in coating the metallic surface with a photographic film, which is then exposed under a transparent positive; by this arrangement the parts lying beneath the dark places of the positive are not affected by the light, and are consequently capable of being etched. With curved surfaces a print taken in fatty ink on paper by a photographic method is transferred to the metal, and all the parts covered with the ink are by this means protected from the etching. It is a peculiarity of this process that the etching fluid colors all the etched places black, and this adds considerably to the effect of the whole.

Heat of the Electric Light.

The temperature of the polar extremities of carbons giving the electric light has been recently investigated by M. Rossetti (*Jour. de Phys.*), using the same method and instruments as he used in measuring the temperature of the sun. (The face of a thermo-electric pile is placed at suitable distance to receive rays from a radiating surface of determinate size, and the thermal effect is measured by a very sensitive Wiedemann reflecting galvanometer; the temperature is deduced by means of a formula previously established.) We give, briefly, the author's conclusions: (1) The positive carbon pole, at the moment of production of the light, has always a higher temperature than the negative. (2) These temperatures vary according to variation of the current's intensity. (3) They are higher the smaller the radiating surface, provided, of course, it comprises the extremity of the point. (4) For the negative pole the minimum temperature was 1,910° C., the radiating surface being large, and, in part, of small brilliancy; the maximum 2,532° C., the radiating surface being half the preceding. (5) For the positive pole, the minimum temperature was 2,312°, the carbon being very large and the radiating surface very extensive; the maximum 3,200° when the carbon was thin, and the radiating surface nearly a quarter of that corresponding to the minimum temperature. (6) We may consider, says *Nature*, the temperature of the extreme negative polar point as equal to 2,500° at least; that of the positive polar extremity is not less than 3,200°.

Discovery of a Remarkable Cave.

The *Courrier de Tlemcen* (near Algiers) states that some miners occupied in blasting rocks in the vicinity of the picturesque cascades, discovered the entrance to a cave, the floor of which was covered with water. They ventured upon the subterranean river on a raft, and followed it for some 60 meters' distance, when it disappeared in a vast lake. Here the vault of the cave was very high and covered with stalactites. In many parts the miners had to steer their raft between colossal stalactites which reached down to the surface of the water; eventually they reached the end of the lake, where they noticed a canal extending toward the south, and into which the waters of the lake flowed. The workmen estimate the length of the lake to be 2 miles, and the breadth about 1⅛ miles. They brought out a quantity of fish, which, they say, surrounded the raft, and which were found to be blind.

A NOVEL CANDLE.

In the service of some churches there are occasions when candles are employed; generally these candles are large, sometimes being thirty-four inches long and two inches in diameter; they are consequently quite expensive, and are never burned continuously for a sufficient length of time to exhaust them, but are lighted at different times, becoming shorter and shorter. It is desirable to have the candles of full length each time they are lighted. Mr. Francis Maguire, of Cambridge, Mass., has patented a novel device for renewing the tips, so that the candles will be full length whenever they are lighted.

The invention consists in securing in the upper end of the main body of the candle a tapering pin of sufficient length to steady and support the tip, the latter being cast with a conical socket for receiving the pin. The wick of the tip does not extend entirely through it, but is secured at its lower end to a small metallic anchor which holds the wick in the process of making the candle. The object of this device is to prevent the candle tip from being burned entirely to the socket.

What to Teach.

Rev. Charles Brooks, father of the State normal schools in America, was asked by a teacher this question: "What shall I teach my pupils?" He answered, "Teach them thoroughly these five things: 1. To live religiously. 2. To think comprehensively. 3. To reckon mathematically. 4. To converse fluently; and, 5. To write grammatically. If you successfully teach them these five things, you will nobly have done your duty to your pupils, to their parents, to your country, and to yourself."

ENGINEERING INVENTIONS.

An improvement in valves for steam engines has been patented by Mr. Albert F. Kirsten, of Orange, N. J. The object of this invention is to dispense with steam and valve chests in connection with the cylinders of steam engines, and operate the valves by direct action of the piston without levers or other intervening mechanism. For this purpose the inventor places the valves in slide ways within the cylinder, and moves them by contact of the piston head with lugs projecting from the valves.

Mr. Christopher Castle, of Cleveland, Ohio, has patented improvements in apparatus for cleaning boiler flues by directing a jet of steam through them. The object of the improvement is to prevent the wasting of steam and the blowing of the soot from the flues out into the boiler room. It consists in providing the nozzle of the apparatus with a conoidal head, provided with a sleeve fitting over the nozzle and bearing against a spiral spring, and a finger that operates the stem of the valve that shuts off the passage of steam through the apparatus.

Mr. Michael Condon, of Newark, N. J., has invented improvements in frogs and guard rails for railroads, designed to secure greater strength, cheapness, and increased facilities for repairing. The invention cannot be described without diagrams.

Mr. Henry Spindler, of East Saginaw, Mich., has invented a simple and effective clamp to be used in tubing or withdrawing tubes from salt, oil, or Artesian wells. It consists of a metallic frame in which is rigidly secured one jaw of a clamp, while the other jaw is secured to a nut that slides in the frame, and is worked by screw or lever.