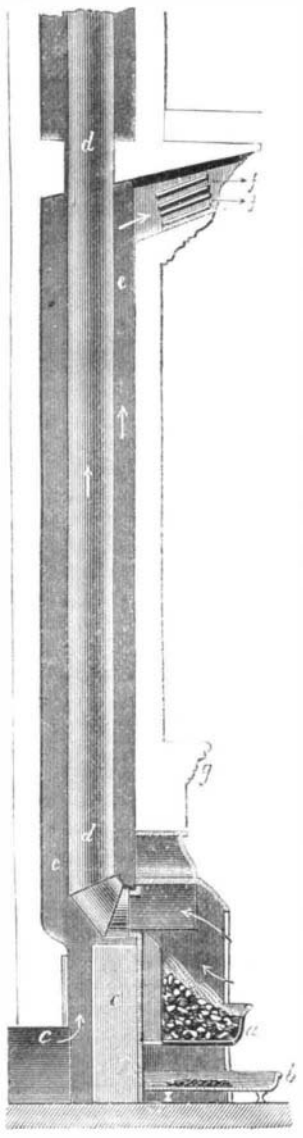
CAPTAIN GALTON'S VENTILATING FIREPLACE.

Mr. C. William Siemens, F.R.S., recently delivered a lecture before the operative classes at Bradford, England, on the important subject of fuel. The portion of the discourse under the subheading of domestic consumption was mainly devoted to advocating the use of Captain Galton's ventilating fireplace, a sectional engraving of which we herewith present. Referring to the invention, Mr. Siemens termed it "the one grate that combines an increased amount of comfort with reasonable economy, and which, although accessible to all, is as yet very little used." It is not patented.



The device differs little in external appearance from an ordinary grate except that it has a high brick back which forms the exterior boundary of a chamber, *c*, into which air passes directly from without, becomes moderately heated (to 84° Fah.), and using, in a separate flue, *e*, is injected into the room at *f*, under the ceiling. A plenum of pressure is thus established within the room, whereby indrafts through doors and windows are avoided, and the air is continually renewed by passing away through the fireplace chimney as usual. The latter, *d*, it will be noticed, is encircled by the air flues, so that the heat of the ascending products of combustion is utilized throughout its whole length. *a* and *b* are respectively the grate and ash pit, which are curved outwards slightly in advance of the mantel.

Mr. Siemens remarks that the cheerfulness of an open fire, the comfort of a room filled with fresh but moderately warmed air, and great economy of fuel, are here happily combined with unquestionable efficiency and simplicity. Such high commendation emanating from so distinguished an authority will, we think, bespeak for the apparatus more than an ordinary share of attention. It seems to us that the principle underlying its construction may lead to some better arrangement of heating and ventilating devices in our public halls and school rooms, and thus prevent many of the difficulties pointed out in our recent editorial on this important subject.

HOW GREENBACKS ARE CANCELLED.

The money received by mail comes in all sorts of damaged conditions, and has all imaginable kinds of horrible or ludicrous histories. Sometimes it has been swallowed by a calf or a goat, which, finding a pocketbook carelessly left within its reach, proceeded to regale itself with the salt which the leather had absorbed from the perspiration, until the book was forced open and the contents exposed. The green notes had an inviting and familiar appearance, and the confiding animal eagerly swallowed them, and so sealed his own death warrant; for the owner, returning and seeing the wreck of the pocketbook, rightly conjectured where his money had disappeared, put the unwilling thief to death and recovered the half digested notes. Others have been found on the bodies of drowned or murdered men, weeks perchance after their death. Frequently they have been so burned that nothing remains but the charred resemblance of notes, so frail and brittle that a slight touch will change them to cinders.

The identification and restoration of notes which have been burnt is a difficult and interesting operation. Every one has observed that a printed paper, after having been burnt, if not subjected to a strong draft or roughly handled, retains its original form, and that the printing is distinct and legible, and appears as if it had been raised or embossed on the paper, but that if it is touched never so gently it crumbles into dust. Notes in this condition are frequently received at the Department for redemption. The counter subjects each note and fragment of a note to a careful inspection in a strong light, under a powerful glass, until she determines the denomination and issue, and then pastes it upon a piece of thin, tough paper, in order that it may be safely handled. But this pasting, by destroying the raised or embossed appearance, at once and for ever precludes all chance of again identifying the kind or denomination of the note. Henceforth it is but a plain, black piece of paper, giving no indication that it ever represented money. It is therefore very necessary that the counter should be quite sure that her judgment is correct before the note is pasted upon the paper. She must also—a most difficult task—determine whether the note is genuine or counterfeit. And yet counterfeits are discovered by these experts among the charred remains of notes with almost as much certainty as among perfect notes.

The whole basement floor of the north wing of the Treasury building, at Washington, including the large room under the cash room, is occupied by these busy counters. One hundred and eighty women are engaged in counting redeemed money in this division. The work is far from pleasant, for the money is often deplorably dirty and emits the most nauseating smells.

Such labor cannot fail to be detrimental to health, especially as want of space has necessitated the crowding of the counters almost as closely as they can sit. Hence we are not surprised to see that many of the women are pale and thin, and apparently weary and careworn.

Entering the last room to which our inspection will lead us, a busy scene is presented. Messengers, each accompanied by a counter, are hastening to and fro with boxes containing bundles of money carefully strapped and labeled, while a bevy of women surround a large table which they almost screen from our gaze, but which the continual "thud!" "thud!" that salutes our ears proclaims to be the site of the cancelling machine. Approaching, we find that

FIG. 1.—CANCELLING REDEEMED GREENBACKS.

the apparatus consists of two heavy horizontal steel bars, about five feet in length, working on pivots about a foot from the ends nearest to us. To the shorter end of each is attached a punch, while the other is connected by a lever with a crank in the sub-basement beneath, which is propelled by a turbine water wheel, furnished with Potomac water from one of the pipes which supply the building. The bundles of notes, each containing one hundred pieces, are passed rapidly and dexterously under the punch by a man whose fingers seem ever just on the verge of complete destruction, but which always escape in some marvelous manner unhurt and whole. The punch savagely and easily cuts a hole in each end of each bundle. This is done for the purpose of effectual cancellation. The bundles, when all have been punched, are returned to the box, the messenger picks it up, and the counter and he hasten away to turn over the money to the clerk who is to make up the cash account of the division and ascertain whether all the money received and delivered to the counters has been returned and accounted for. From the time when the money is received by her, until it is thus delivered, the counter is responsible for it, and is required to keep it constantly within sight, except when it is locked away for the night. For this reason she accompanies the messenger who carries her box to the cancelling room, superintends the punching, and returns with the money to the clerk, to whom it is delivered, when her responsibility ends.

Just beyond the punches, a knife of formidable aspect and

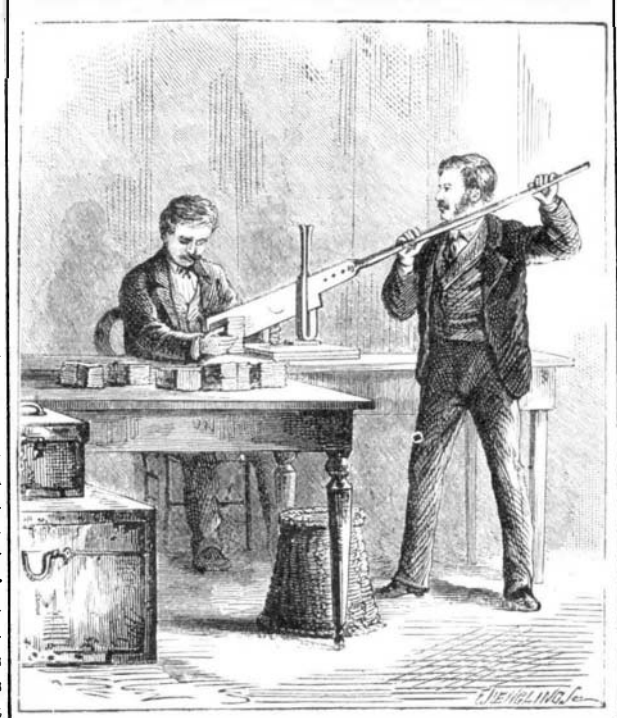
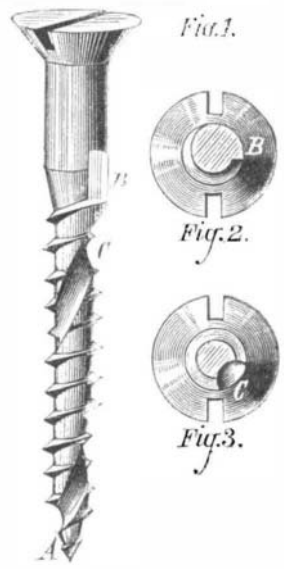


Fig. 2.—CUTTING CANCELLED GREENBACKS.

proportions is engaged in cutting the cancelled bundles in two in the middle of each note. After a sufficient quantity of money has been counted, it is made up into lots of about one hundred thousand dollars of fractional currency and proportionately larger amounts of legal tender notes, and sent in to be cut in two by this knife. The straps with which the bundles of notes are surrounded are so printed as to be also cut in two, and to show upon each half the denomination of the notes, the issue, and the number inclosed. The counter's initials and the date of counting are also written upon each end, as well as a number or letter to identify the bundle, so that if, upon recounting the money, errors are discovered, they can be traced in a moment to the proper counter, date, and bundle. One set of half notes is delivered to counters in the Secretary's office, the other to counters in the Register's office, in each of which the money is recounted. This is done as a check upon the Treasurer's counters, and for the purpose of securing as complete accuracy as possible.

IMPROVED WOOD SCREW.

Messrs. A. N. Ladd and C. N. Corning, of Concord, N. H., are the patentees of a novel and apparently useful form of wood screw herewith illustrated. The improvement consists in combining the German twist bit with the screw, in such a manner that the latter will cut its own way or hole in the wood, so as to enter the same easily and avoid splitting or other difficulty. The device may be used with the common straight bit, if desired, but the German twist bit, as shown at A, Fig. 1, is believed to be the best combination. A section of the screw is represented at Fig. 2, and Fig. 3 is a similar view of a cutter (B, Fig. 1) in the shaft of the screw, by which a hole is cut for the shaft of a larger size than is made by the bit portion of the screw. The channel or groove, C, is cut, no through the threads alone, but into the body of the screw and retains the wood cut away by the bit.



DRAWING AND SKETCHING---PRACTICAL HINTS AND RECIPES.

We give below a number of useful suggestions and recipes relating to drawing, compiled from a variety of sources and comprising, so far as possible, the most recent improvements, as well as the plainest directions attainable, which seem to us likely to be of service to the student of the art.

In selecting a drawing board, choose wood of close grain, well seasoned, free from knots, and of even surface. Notice that the edges are perfectly straight and at right angles. A slight roundness may be given to the face with advantage in order that the drawing paper when stretched may rest tightly and flatly upon it. An apparently excellent form of board, lately introduced in the market, consists of strips of pine wood glued up to the required width with the heart side of each piece of wood to the surface. A pair of hard wood ledges are screwed to the back, the screws passing through the ledges in oblong slots bushed with brass, which fit closely under the heads and yet allow the screws to move freely when drawn by the contraction of the board. To give the ledges power to resist the tendency of the surface to warp, a series of grooves are sunk in, half the thickness of the board over the entire back. These grooves take the transverse strength out of the wood to allow it to be controlled by the ledges, leaving at the same time the longitudinal strength of the wood nearly unimpaired. A slip of hardwood is let into the edge of the board and sawn apart at about every inch to admit contraction. Its object is to make the two working edges perfectly smooth, thus allowing of an easy movement with the square.

Whatman's (English) drawing paper is generally preferred It is known by the following names, according to dimensions of sheet: Demy 15 × 20 inches, medium 17 × 22, royal 19 × 24 super royal 19×27, elephant 23×28, imperial 22 × 30, colombier 23 × 34, atlas 26 × 34, double elephant 27 × 40, antiquarian 31 × 53. Its cost for "selected best" varies from $1.00 to $30.00 per quire. Paper can usually be bought ready mounted on muslin, but the process can be easily accomplished by first tacking the cloth tightly to a frame and covering it with a coat of strong size, leaving the same until nearly dry. The sheet is then well laid with paste, in two coats, the second being applied some ten minutes after the first. The paper must lastly be placed carefully upon the muslin, patted down all over with a clean cloth, and left to become thoroughly dry before removing from the board.

In fastening paper to the drawing board, there is no necessity of soaking the sheet, as is recommended in many handbooks on drawing. Lay the paper, back up, and go over it with a large flat camel's hair brush well filled with clean water. Wet the sheet to a distance of about an inch and a half from the edges. Two applications of water are sufficient, the second being applied when the wet gloss of the first disappears. Then turn the sheet over, wet side against the board, and bend up the edges, tightly all round, against a flat ruler, afterward passing the paste brush between the turned up edge and board. The ruler is afterward drawn

over the glued edge and pressed along. The next adjoining edge must be treated in the same manner and so on until all sides are secured. Wetting paper on the right side with a sponge or cloth is a bad habit and tends to destroy the fine surface, rendering it unsuitable to receive clean washes of ink or color. The right side of Whatman's paper can be told by holding the sheet up to the window, and noticing that the water mark reads from left to right; the reverse side should not be used except for rough sketching, as it generally has knots and other imperfections, which exhibit themselves when washed over.

As regards pencils, the market offers quite a number of excellent varieties from which a selection can be made. Faber's are standard articles, though a cheaper but equally good pencil is made by the Dixon Crucible Company. The latter is used by the artists of the SCIENTIFIC AMERICAN in drawing upon wood, no light test for the qualities of a pencil, by the way, and has proved of excellent quality. In sharpening a pencil, it should be remembered that, for sketching, a fine conical point is required, but for fine drawing it is much better to have the end thin and flat. To produce this, the wood is cut away from two sides only, so as to make a chisel-shaped extremity, and afterwards removed from the other sides only sufficient to slightly round the edge. This kind of a point can easily be kept sharp by rubbing the lead occasionally upon a bit of fine sand paper.

The best eraser is known as bottle rubber, which is quite soft. It has the merit of not fretting the surface of the paper. A good way of hiding small mistakes in ink lines, in places where scraping with a knife cannot be well accomplished, is to touch the spots over with flake white, mixed rather dry, with a fine sable brush.

A good black and indelible drawing ink, it is stated, may be made by dissolving shellac in a hot water solution of borax and rubbing up in this a fine quality of Indian ink. After using, the drawing pen should be dipped in alcohol and wiped dry. Good Indian ink will show, when the stick is broken, a very bright and almost prismatic colored fracture; if employed singly and without admixture, it should be used at the first rubbing. Redissolving renders its washes cloudy and irregular in tone.

To fix pencil drawings, various plans are in use. The simplest way is to cover the paper with new milk and dry carefully. Water starch, cold isinglass water, size or rice water, may also be applied with a camel's hair brush. Collodion mixed with paraffin, stearin, or castor oil, has been suggested for the same purpose, and is said to render the sketches much clearer and more easily copied.

Drawings may be copied in facsimile by the aid of various mechanical contrivances, or transferred by the use of transfer paper. The latter is made by rubbing white paper with a composition consisting of 2 ounces of tallow, ½ ounce powdered black lead, ¼ pint linseed oil, and sufficient lamp black to make it of the consistency of cream. These should be melted together, and rubbed on the paper while hot. The prepared sheet is placed between the original and the blank paper, blackened side against the latter. The lines of the original are then gone over with a steel point (a darning needle with the point ground off will answer) and are thus caused to appear on the paper below. Copies may be multiplied by perforating the picture, or a copy of it if it be desirable not to destroy the original, with a number of fine needle holes along the outlines, and then laying upon the paper. A piece of cotton wool dipped in finely powdered blacklead, (or chalk, which is better), is then gently patted over the surface, so that the powder passes through the holes and appears on the sheet below. The outline is then filled out with pencil.

Rénault's reproducing process consists in first making the drawing on strong glazed paper with glutinous ink and afterwards covering the lines with bronze powder. If the drawing thus prepared be pressed upon a sheet of sensitized paper, the lines of the original drawings are reproduced in black by the chemical action of the pulverized metal upon the sensitized paper. By softening the ink with the vapor of alcohol, and renewing the bronze when it is exhausted, many impressions may be produced.

Tracing paper can almost always be readily procured at a small expense. It is not difficult to make by washing thin paper with a mixture of spirits of turpentine 6, resin 1, and boiled nut oil 1, parts by weight, applied with a soft sponge; or a simpler way is to brush over thin unsized paper with a varnish of equal parts of Canada balsam and turpentine. Vegetable parchment, sometimes used for drawing purposes, is made by dipping ordinary paper for a few seconds in a solution containing one part water to six sulphuric acid. Careful washing at once is necessary to remove every trace of the acid.

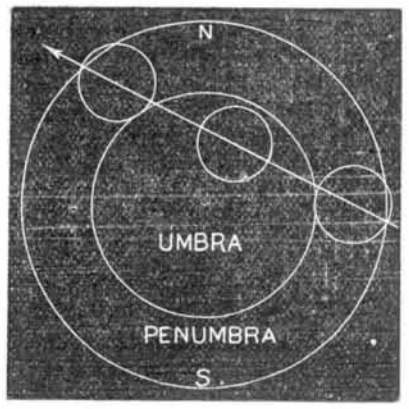
In using colors, at the outset purchase none but the very best, as with no other can purity of tone in washes be gained. The following table, showing the general indication of tints used in mechanical drawing, will perhaps prove useful: Carmine or crimson lake for brickwork in plan or section to be executed; Prussian blue, flint work, lead, or parts of brickwork to be removed by alteration; Venetian red, brick work in elevation; violet carmine, granite; raw sienna, timber not oak; burnt sienna, oak or teak; Indian yellow, fir; Indian red, mahogany; sepia, concrete or stone; burnt umber, clay earth; neutral tint or Payne's gray, cast iron, rough wrought iron; dark cadmium, gun metal; gamboge, brass; indigo, bright wrought iron; indigo with a little lake, bright steel; Hooker's green, meadow land; cobalt blue, sky. If washes do not flow well, owing to greasiness of the paper, a few drops of prepared ox gall in the water with which they are mixed will generally remedy the trouble. In coloring tracings on thin paper, work on the back and mix the colors quite dark.

Correspondence.

Total Eclipse of the Moon, October 24, 1874.

To the Editor of the Scientific American:

On October 24, 1874, a total eclipse of the moon will occur, which will be visible throughout the United States and Canada.



The accompanying diagram represents the path of the moon through the earth's shadow during the eclipse and the moon's position at the time of the middle of the eclipse. The first and last contact with the umbra, or shadow, are also shown. The Washington mean times of the different phases, as given in the *American Nautical Almanac* for 1874, are as follows:

First contact with penumbra	11h.	35·8m.
First contact with shadow	12h.	33·7m.
Total phase begins	13h.	51·7m.
Middle of eclipse	14h.	8·6m.
Total phase ends	14h.	25·4m.
Last contact with shadow	15h.	43·5m.
Last contact with penumbra	16h.	41·3m.
Magnitude of eclipse (moon's diameter = 1)		1·053
Duration of total phase		33·7m.
Entire duration of eclipse	5h.	5 5m.

The mean time at which the phases occur at any other place may be easily found by simply adding or subtracting the longitude of the place from Washington, to or from the times above given, the correction being added when the longitude is east, or subtracted when it is west.

The times of the occurrence of this eclipse, as given above, are astronomical, being reckoned from 0h. at noon of October 24 upwards, so that the greater portion of the eclipse occurs on the morning of October 25, civil time.

St. Catharine's, Ontario, Canada. J. M. BARR.

The Devil Fish of Newfoundland.

To the Editor of the Scientific American:

In your article on the devil fish. in No. 9, volume XXIX., you speak of "historians, otherwise credible, reporting the capture of some which measured 40 feet." As a proof of their veracity, I inclose you a photograph of an arm or sucker which measures 17 feet in length. It was coiled for the purpose of bringing the whole within the field of the camera, the diameter being 2 feet 6 inches as it lay on the table of the artist. It is of a nearly uniform circumference of 3½ inches for 14 feet 6 inches of its length, and 6 inches at the thickest portion of the remainder containing the suckers.

While off the eastern end of Belleisle, in Conception Bay, the crew of a fishing boat noticed what they supposed to be an old sail upon the water, and proceeded to make prize by striking it with a boat hook, when, to their astonishment, the limb now photographed was thrown across the boat from gunwale to gunwale; it was broken from the creature some feet (not less than two) from the body, and subsequently pieces were cut off by the boys of the settlement to which the men belonged, before an attempt was made to preserve the specimen. How much was lost in this way cannot be told. When fresh, the length was taken by a reliable person as 19 feet, but with the same tape line, some time afterwards, I found it reduced to 17, probably by the strong pickle used for its preservation.

Another sucker, described as being as thick as a man's thigh, was also thrown into the boat, of which a length of five feet was chopped off but, unfortunately, lost. The men used their oars as levers over the gunwale to pry the boat from the creature, which shortly rushed off at great speed, then, stopping, went into a flurry, throwing the peculiar inky fluid of the squid with great violence over a space of two hundred yards, and in such quantities as would have swamped the boat had the discharge taken place close to it.

The hurried and alarmed observations of the crew are, of course, worth but little as to actual size, but the men think the total length could not have been less than 60 feet.

About three weeks previously a creature, described as of great length (probably 60 feet), was seen from the shore while swimming in the bay, within a few miles of the same place.

The specimen is now in spirits in the museum being formed by Alexander Murray, Esq., F.G.S., our geological surveyor.

Since writing the foregoing, an entire devil fish was captured by getting foul of some nets at Torbay, about nine miles from here. The body is about 6 feet 6 inches long, and the eight main tentacles about the same length, with two others of 22 feet each, measured from the head to the extreme point. To bring the entire length into view these were hung over a rail. The body and eight tentacles around the head are about of equal length, and this seems to be the usual proportion of the structure of these creatures, with two other slenderer arms three and a half to four times longer.

The notice of this specimen has brought out many anecdotes of large squids having been stranded on our shores, in all cases reliable as to great size, and more or less so as to actual dimensions, which range (for the bodies) to eighty and even ninety feet. Without accepting them as authentic, the fact seems established that a considerable number of these creatures, of large size, exist in the Newfoundland and Labrador waters.

J. T. NEVILLE,
Inspector of Lighthouses.

St. John's, Newfoundland.

[Our thanks are due to our correspondent for the photographs mentioned in his letter, and which have safely reached us. They exhibit a hideous and formidable monster, and represent with great clearness, on the long tentacles, the suckers by which the animal attaches itself to whatever may come within its grasp. It is to this species that Victor Hugo alludes in his novel, "The Toilers of the Sea," in which one of the personages is clutched by a devil fish, and slowly drawn to a horrible death.—ED.]

Poisonous Aniline Dyes.

To the Editor of the Scientific American:

I fully agree with you that aniline dyes should not be used in candies. I recently ate about three inches of stick candy, of a red color, and was taken sick with a burning pain in the stomach and upper intestines. I grew worse; in three days I was not able to walk without being faint and giddy, and had much pain all the time. A doctor prescribed for a case of aniline poisoning, and three doses of medicine put me out of danger. I am now about well again.

WILLIAM WARD.

Cleveland, Ohio.

Microscopical Exhibition.

The Odontographic Society lately gave a microscopical exhibition in the rooms the of Philadelphia Dental College, before an audience of about five hundred ladies and gentlemen, who manifested the most marked interest in the display of instruments and objects.

The microscopes, forty in number, were placed upon the operating tables, extending one hundred feet. The instruments were arranged so as to be a distance apart sufficient to afford a fair view of the objects without inconvenience to the visitors. In addition to the microscopes belonging to the members of the society, a number of valuable instruments were kindly loaned for the occasion by the Biological and Microscopical Section of the Academy of Natural Sciences, and by several eminent microscopists. The microscopes included every variety of form, from the one thousand dollar grand microscope of Ross and the binocular of Beck, to the inexpensive student's microscope.

The objects exhibited were mainly confined to the teeth of man and animals. The sections of the teeth of man, the cat, horse, cow, sheep, elephant, hog, etc., afforded an excellent opportunity of observing and contrasting the difference in the arrangement of the enamel, dentine and cementum in those animals, while the gizzards of the cricket and the cockroach showed the provision made by Nature for the comminution of their food. Among the more notable specimens shown, in addition to those already named, may be mentioned: 1st, a longitudinal section of a dilacerated incisor, and section of a human incisor with the cementum covering a portion of the enamel; longitudinal section of a human molar with vascular canals in the dentine, and a human embryo of twenty-nine days; section of an adult human incisor and the lower jaw (tooth *in situ*) with the vessels of the dental pulp and Haversian canals injected with carmine; hypertrophied root of human molar; enamel columns of human tooth; transverse section of buck's horn and other sections of teeth; section of molar tooth and jaw of a cat, with vessels of dental pulp; periosteum and Haversian canals injected with carmine.

Dr. Joseph G. Richardson gave a very satisfactory demonstration of the circulation of the blood in the capillaries of the web of the frog's foot, in the museum of the college.

Professor S. B. Howell, aided by Professor Hunt, exhibited a number of interesting objects by means of the gas microscope, and demonstrated the importance of this instrument as a valuable and indispensable aid to the teacher of histology and physiology.

The success attending this effort on the part of the society has decided the members to give another microscopical exhibition at no distant day.—*Dental Cosmos.*

Physiology of the Siamese Twins.

Dr. Hollingsworth, of North Carolina, who examined the bodies of the Siamese twins at the time of their decease, found the band which connected them to be an extension of the sternum, for about four inches in length and two in breadth. The band was convex above and in front, and concave underneath. The two bodies had but one navel, which was in the center of the band, and it is supposed that there were two umbilical cords branching from this, one extending into each body. The connecting link was found to be the ensiform cartilage, and was as hard as bone, and did not yield in the least. [It may be here mentioned that, for some time previous to their death, no motions were observable in the band.] The doctor said that he did not think they would have survived a separation, not from the fact of being afraid of separating the arteries, but from fear of producing peritonitis. No hæmorrhage would have been produced, so far as could be seen, as there were no arterial connections of any account.