

outline to be followed, and its motion is communicated to the series of rulers which, by a kind of parallel movement, actuate the pencil to describe precisely the same line, equal in dimension to that of the copy, or enlarged or reduced. Space forbids our entering into the mathematical demonstration of how this instrument reduces or enlarges, but generally it may be stated that the scales of the two drawings are to each other as the distances of the pencil and of the tracing-point from the fulcrum or pivot of the pantagraph, and these distances are adjusted by altering the position of the joints in the holes above noted. Any good mechanic can make the instrument for himself from hard wood, though metal is better. Care must be taken in constructing the joints, as looseness or bad fitting in such places greatly impairs the accuracy of the copy. In fact, any of the devices we have described require but little skill, though perhaps some time and patience in their manufacture. But if properly finished in a workmanlike manner, none will fail to be handy and useful additions to any apprentice's collection of drawing-tools.

AN IMPROVED CAMERA LUCIDA.

The accompanying figure represents an improved form of the camera lucida for the use of artists and draughtsmen. The different kinds of camera now in use, although they have all undergone various modifications, have nevertheless remained very inconvenient for those who have occasion to employ them, none of them allowing the image of the object and the point of the lead pencil to be seen at the same time with sufficient distinctness.

Desiring to remedy these defects, Dr. J. G. Hoffman, of Paris, has devised the present form of the apparatus.

Fig. 14 represents it, half size. The small outline is a transverse section of the optical portion, composed, at A, of a metallized mirror, or other highly polished and absolutely plane metallic surface; at B, of a small plane glass, forming, with the metallized mirror, a fixed angle. The object of the latter is to allow a portion of the luminous rays, coming

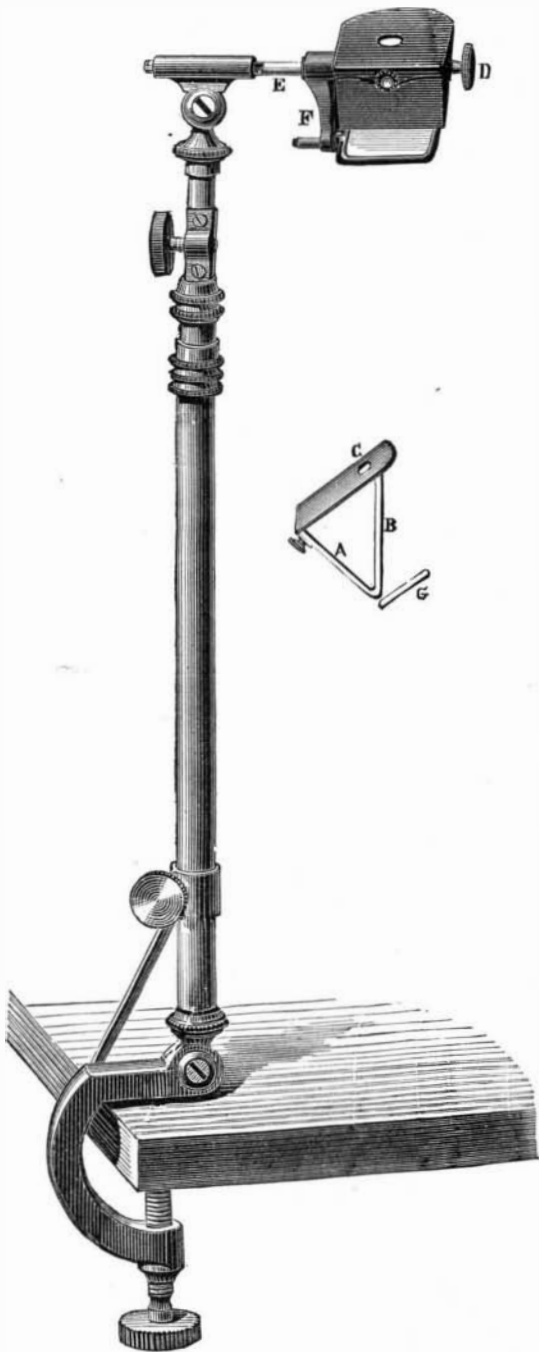


FIG. 14.—A NEW CAMERA LUCIDA.

from the object to be drawn, to pass, and at the same time to cause the point of the pencil to be seen alongside of the images projected on the paper. At G may be placed, at option, in a movable frame, either a plate with parallel faces or lenses of neutral glass of various foci. The object of the plane glass is to tone down the brightness of the sunlight when white paper is used. At C is the opening or eyehole to which the eye is applied. The button, D, serves to adjust the camera in a suitable position, a matter, however, which depends on the location of the artist with respect to the object; but generally the glass, B, is placed vertically. The same pieces of the optical portion of the apparatus have been made use of by the inventor in the construction of a modification to be applied to the microscope, for which, as well as for the telescope, all systems hitherto in use have given very indifferent results.

HOW TO MAKE A CAMERA LUCIDA IN TEN MINUTES.

I first procured a pill box lid which just fitted on to the eyepiece of my microscope, and in the center of it made a

circular aperture about the size of the top lens of the eyepiece. I then cut a piece of card to the shape of No. 2, Fig. 15, in which the angles, A E B and C F D, are both 45°, just nicked with a penknife along the lines, A E, B E, C F, and D F, and with a little gum affixed to the lid, as in No. 1. A

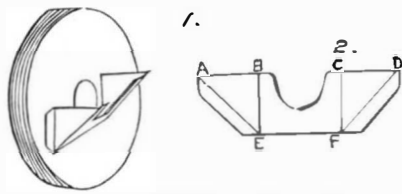


FIG. 15.—A SIMPLE CAMERA.

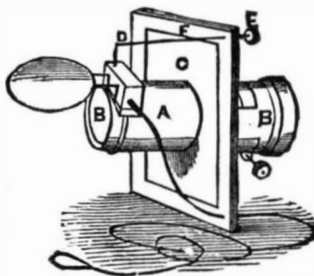
piece of thin covering glass attached to B E C F, and therefore inclined at an angle of 45°, completed the apparatus, which answered remarkably well.

PNEUMATIC PHOTOGRAPHIC SHUTTER.

By W. BARRY.

I PRESUME that most of the photographic profession are using the above shutter to their cameras, and have little doubt but that they have found out ere this its weak point, viz., its being visible to the sitter, and thus causing them, when it is unexpectedly raised by an unseen power, and being a novelty also to them, to cast their eyes round to it, and especially children, who generally keep their eyes on it, expecting it to move again; and as we do not always want them looking straight to the front, we have devised the following scheme, so as to fix the shutter inside the camera, and so out of sight; thus the exposure can be made quite unobserved by the sitter. I can recommend it to all who have room inside their cameras to admit the shutter. In most double or C.D.V. or cabinet cameras there is just room—ours being of this description. Below is a sketch of the inside of the camera front, with the shutter attached as we use it.

A is a tin tube blacked, whose diameter is a quarter of an inch larger than the outside of the back tube of the lens, BB, to be used so that the lens will move freely in it, when moved by the action of the focusing screw. Length equivalent to the amount of lens tube inside the camera, when the lens is screwed or focused right in. C is a tin plate on which the tube is soldered, which is screwed to the inside of the camera front, leaving the sliding front free. On this tin tube the pneumatic shutter is fastened by the supplied means of the elastic band. It need not be fair on the top (as it always appears in the wood cuts), but to one side, if needed, as ours is, or even at the bottom; in fact, anywhere where there is most room for it; also so as to bring



the catch lever to fix the shutter up in a line with the most convenient place for the hole for the wire and button hereafter mentioned. The elastic tube to the air ball passes through a tight fitting hole (to prevent ingress of light) in front of the camera, and close to the bottom, so as to keep clear of the sliding front. The catch lever, to keep the shutter up when focusing, is fitted with a brass wire, D, terminating in a button, E, outside the front of the camera, through tight fitting hole, care also being taken to keep it clear off the sliding front. In the sketch it is shown as in our camera, viz., in the top right hand corner, also the hole for tube in the bottom right hand corner. There is a shoulder or rim, F, on the wire inside the camera, the distance between the shoulder and the button just leaving sufficient movement backward and forward for the release and catch of the shutter, about half an inch. It is obvious that the entire arrangement leaves the lens, BB, free to be moved (or focused) backward and forward to each extreme inside the tin tube, without carrying the shutter with it, or in any way interfering with it. The lens can even be screwed out of the flange, the sliding front removed and replaced by another front and lens, without disturbing the shutter at all; also, it in no way interferes with the shortening or lengthening of the camera.

We have found the plan to answer well, particularly with children or animals (the latter are sure to turn their heads to look at the shutter when it moves, if it is fixed outside); and if any of my photographic brethren feel disposed to give it a trial, I have no doubt they will be equally pleased with it.

I may add that we had to take the bellows arrangement out of its case, but it is easily done, and in no way detrimental to it; it is also protected from injury by its being inside the camera.—*Photographic News*.

PHOTOGRAPHIC ENGRAVING.

By CAPT. J. WATERHOUSE, B.S.C.

OWING to the imperfection of photographic appliances in those early days of the art, the results obtained by Niepce could not have been very satisfactory, but with better appliances the same process has yielded in the hands of Niepce de St. Victor, the nephew of the inventor, Amand Durand, and others, results which prove its practicability, and its capabilities for reproducing images direct from nature, or for copying fine line engravings and similar subjects, for which latter it is much better adapted.

A process on this principle has been very successfully used at the Imperial State Printing Office, Berlin, for the engraving of plates for bank notes and other purposes, and I have also tried it myself with fair success.

The following outline will give an idea of the operations: A perfectly smooth copper plate, having been thoroughly cleaned and polished, is coated with a solution of asphaltum in turpentine, to which a little oil of lemon is added. It is then carefully dried in the dark, so as to preserve an even coating, free from dust.

The image may be impressed upon the sensitive surface by sun-printing through an ordinary negative on glass, but

as there is by this plan great risk of losing perfect sharpness by want of close contact between the glass and the copper plate, it is better to remove the collodion film from the negative, and transfer it on to the surface of the asphaltum, so that it may be in absolute contact with it all over, and thus secure the utmost possible sharpness of the image. The collodion film is loosened from the glass in an acid bath, containing one part each of sulphuric and acetic acids in 320 parts of water, and the transfer is then effected in a bath of one part glycerine and four parts of water. The transfer film being dry, the plate is ready to be exposed to light, and, as the asphaltum is not very sensitive, the exposure is somewhat long—extending from six to thirty-six hours; but it is better to over-expose and to work in diffused daylight, rather than in the full sunshine.

When the plate is judged to have been sufficiently exposed, the collodion film is removed, and the asphaltum surface is rubbed lightly with a tuft of cotton dipped in olive oil, to which, after a short time, a little turpentine is added. The image gradually begins to appear and by degrees the unaltered asphaltum is all removed, so that the design appears in clear brown upon the polished copper. The plate is then washed with soap and water, and allowed to dry.

The next operation is the etching or biting in of the image. The back of the plate having been well coated with a thick varnish of asphaltum, to protect it from the action of the acid, the plate is plunged into a trough containing a mixture of—

Chlorate of potash.....	1 part.
Muriatic acid	10 parts.
Water	48 "

and allowed to remain till the weakest lines of the drawing begin to appear. It is then well washed, and the asphaltum covering the lines is removed with benzole. The design will now be seen standing in a slight relief, and an electrotype must be made in order to obtain a printing-plate, from which impressions may be taken in the ordinary way. The sharpness of the lines is better preserved by making a relief and electrotyping, than it would be by biting in.

The best results by this process are obtained from subjects in line, and even with these the operation of "biting in" demands a little manipulative skill. Good results have, however, been obtained in reproducing half-tone subjects, but they require the greatest skill on the part of the operator, and generally much retouching by a practised engraver.

A modification of Niepce's process, by which good results have been obtained, has been introduced by M. Nègre. It is briefly as follows:

A plate of steel is covered with a coating of bitumen or bichromated gelatine, and exposed to light under a negative. After development by a suitable solvent, which removes the parts not acted on by light, the plate is placed in a solution of gold, and, by means of a galvanic battery, a thin regular coating of gold is deposited on those parts which present a clean metallic surface; the remainder of the sensitive coating is then removed, and a beautiful damascened design in gold is obtained. The gold adheres well to the metal surface, and, as it is not attacked by the etching liquid, the design may be etched without injuring the ground of the plate.

This process also appears only suitable for line work, though it is said that satisfactory results in half-tone have been obtained with it.

M. Baldus, of Paris, is said to have used a similar process, but to have etched his plates in a solution of sulphate of copper by attaching them to the positive pole of a galvanic battery.

The processes dependent on the use of asphaltum are all more or less slow and uncertain in practice, and if not already quite abandoned in favor of the quicker and more certain processes dependent on the use of gelatine and bichromate of potash, are rapidly becoming so, especially as their usefulness is almost entirely confined to reproducing subjects in line. Exceedingly fine results can, however, be produced in this manner, and it is particularly valuable in cases where an "etching" or "biting in" process is required, because the bitumen forms a much better "resist" for the acid or etching liquid than does gelatine.

MILLERS AND THEIR MEN.

[From Punch].

(A civil-service examination in connection with the Board of Trade.)

EXAMINER—Now, sir, what is calico?

Candidate—Sir, there is theoretical calico and practical calico. Theoretical calico is a textile fabric manufactured from cotton—the laniferous envelope of the seeds of *Gossypium herbaceum*. That is rare. Practical calico is the more common thing.

Examiner—Indeed, sir! And how do you describe that?

Candidate—Practical calico, sir, the calico of commerce, and especially the calico designed for exportation, is formed in part only of cotton. It consists, besides, of size—a mixture composed of flour, China clay, Epsom salts, chlorate of zinc, chlorate of magnesia, and glue, in the proportion of from 70 or 80 to 130, and even 200 per cent.

Examiner—This information is new to us, sir. Will you oblige me with the origin?

Candidate—Certainly, sir. You will find the facts and figures I have had the honor to state in a recent issue of the *Liverpool Mercury*, quoted by the *Pall Mall Gazette*. They occur in the report of a law case—a suit between a cotton manufacturer and a firm of cotton warp-sizers, respecting a disputed charge for cotton warp-sizing. It is a distinct business—I had almost said branch of industry. The details I have given you were furnished by one of the plaintiffs, who coolly avowed his acts. In conclusion, he said he had been "in the trade twenty years, and in commencing only put 5 per cent. into the warps, and the size then consisted solely of flour, but now they had to add chemicals to get the weight up, as manufacturers asked them for more weight."

Examiner—Does any adage in an elementary educational work occur to you as applicable to that gentleman's career?

Candidate—*Nemo repente fuit turpissimus*.

Examiner—Very well, sir. In respect to composition, can you point to any analogy between cotton and silk?

Candidate—Silk proper, sir, is simply woven from the chrysalis-cocoon of the *Bombyx mori*. The silk you purchase is, much if not most of it, "loaded," as it is called, with logwood and gum. The web is sent to the dyer weighing, say, sixteen ounces. It is returned to the silk miller with its weight increased by from twenty-four up to forty ounces—the result of loading with matter in the wrong place.

Examiner—Can you name any other description of busi-