ZING ETCHING IN RELIEF.

The object of this process is the production of a metallic cliché, which may be used with type in the letterpress printing press; that is, may replace the as yet generally-used woodcut. The drawing may be produced on the asphalte with chromated gelatine directly either by hand or by photography, or by transferring a fatty picture which serves to resist the etching.

In all these various ways the drawing must be strengthened, either by a special covering or in some other way before etching. The work is then almost limited to repeated rolling with ordinary lithographic rollers, and should be preceded by washing away the small, over those parts of the metal sufficiently bitten in by the acid, in order to protect them from its further action. The further the etching proceeds the more difficult does this becoming, because the ink must be forced as far as necessary into the hollows.

For this purpose an oven, having a cast-iron plate, is used as a table; this plate is now ready to be mounted upon wood, and printed in the letterpress printing press, where thousands of proofs may be pulled from it.

In the following paragraphs a few words will be said of Gillot's high relief etching process, which is now used in many establishments.

TYPOGRAPHIC HELIOGRAPHY.

For this process a zinc plate furnished with a coating sensitive to light is exposed under a negative. It is the quickest and cheapest process.

It is very important that good metal should be chosen; and the plates must be made very level, so as to lie close to the negative and to be equally rolled. The zinc must be homogenous in the test so that the plate may act equally upon it. It must be very compact and have no rents, and it is well to bear it before using it, as that lessens the porosity of the metal and makes it stronger.

It is easily known whether the plate is flat enough if one look at the image of the picture as reflected in its upper surface and bounded by certain lines. The thickness of the plate may be varied from one to three millimetres; the larger the picture and the greater the distance between the lines the thicker the plate should be. Too thin plates are often difficult to fasten down to the wood.

(To be concluded in our next.)

COMPOSITE PORTRAITS.

MADE BY COMBINING THOSE OF MANY DIFFERENT PERSONS INTO A SINGLE RESULTANT FIGURE.

The best instrument I have as yet contrived and used for optical superimposition is a "double-image prism" of Iceland spar. The latest that I have had were procured for me by Mr. Tisley, optician, 172, Brompton-road. They have a clear aperture of a square half an inch in the side, and when held at right angles to the line of sight will separate the ordinary and extraordinary images to the amount of two inches, when the object viewed is held at seventeen inches from the eye. This is very useful for working with porte-dé-rente portraits. One image is quite achromatic, the other shows a little colour. The divergence may be varied and adjusted by inclining the prism to the line of sight. By means of the ordinary image of one component is thrown upon the ordinary image of the other, and the composite may be viewed with the naked eye or through a lens of long focus or through an opera-glass (a telescope is not so good) fitted with a sufficiently long draw-tube to see an object at that short distance with distinctness. Portraits of men may be mixed so that different parts may be combined by placing the larger one further from the eye, and a long face may be fitted to a short one by inclining and foreshortening the former. The slight fault of focus thereby occasioned produces little or no sensible ill-effect on the appearance of the composite.

The front and profile faces of two living persons sitting side by side or one behind the other can be easily superimposed by a double-image prism. Two such prisms set one behind the other can be made to give four images of equal brightness, occupying the four corners of a rhombus, whose acute angles are 45°. Three prisms will give eight images, but this is practically not a good combination. The images fall in distinctness, and are too near together for use. Again: each lens of a stereoscope of long focus can have one or a pair of these prisms attached to it, and four or eight images may thus be combined.

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SINGLE RESULTANT FIGURE. 

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Fig. 1 shows the simple apparatus which carries the prism and on which the photograph is mounted. The former is set in a round box which can be rotated in the ring at the end of the arm and can be clamped when adjusted. The arm can be rotated, and can also be pulled out or in if desired, and clamped. The floor of the instrument is overlaid with cork covered with black cloth, on which the components can easily be fixed by drawing pins. When using a second portrait is pinned down and the other is moved near to it, overlapping the margin if necessary, until the eye looking through the prism sees the required combination; then the second portrait is pinned down also. It may now receive its register marks from needles fixed in a hinged arm, and this is a more generally applicable method than the plan with cross threads, already described, as any desired feature—nose, the ear, or the hand—may thus be selected for composite purposes. Let A, B, C, . . . Y, Z, be the components. A is pinned down, and B, C, . . . Y, Z, are successively combined with A, and registered. Then before removing Z take away A, and substitute any other of the already registered portraits, say B, by combining it with Z; lastly, remove Z and substitute A by combining it with B, and register it. Fig. 2 shows one of three similarly-jointed arms, which clamps on to the vertical rod. Two of these carry a light frame covered with cork and cloth, and the other carries fig. 3, which is a frame having lenses of different powers set into it, and on which, or on the third frame, a small mirror inclined at 45° may be laid. When a portrait requires foreshortening it can be pinned on one of these frames and be inclined to the line of sight. When it is smaller than its fellow it can be brought nearer to the eye and an appropriate lens interposed. When a right-handed profile has to be combined with a left-handed one it must be pinned on one of the frames; and viewed by reflection from the mirror in the other. The apparatus I have drawn is roughly made, and being chiefly of wood is rather clumsy, but it acts well.

Another instrument I have made consists of a piece of glass inclined at a very acute angle to the line of sight, and of a mirror beyond it, also inclined, but in the opposite direction to the line of sight. Two rays of light will therefore reach the eye from each point of the glass; the one has been reflected from its surface, and the other has been first reflected from the mirror and then transmitted through the glass. The glass used should be extremely thin, to avoid the blur due to double reflections; it may be a selected piece from those made to cover microscopic specimens. The principle of the instrument may be yet further developed by interposing additional pieces of glass successively less inclined to the line of sight, and each reflecting a different portrait.

I have tried many other plans; indeed, the possible methods of optical superimposing two or more images are very numerous. Thus I have used a sextant (with its telescope attached); also strips of mirrors placed at different angles and their several reflections simultaneously viewed through a telescope. I have also used a divided lens, like two stereoscopic lenses brought close together, in front of the object-glass of a telescope.
I have not yet had an opportunity of superimposing images by placing glass negatives side by side, or for that matter, for engraving on the same screen; but this or even a simple dioramic apparatus would be very suitable for exhibiting composite effects to an audience, and if the electric light were used for illumination the effect on the screen would be photographed as soon. It would also be possible to construct a camera with a view camera, and the disappointed observer could throw an image of a separate glass negative upon the same sensitized plate.

The uses of composite portraits are many. They give an interesting and anything but a single expression. If many photographs of a person were taken at different times, perhaps even years apart, their composite would possess that in which the single entity of his personal identity can already be recognized. The analytical tendency of the mind is so strong that out of any tangle of superimposed outlines it is possible to distinguish one of them. It is not easy, however; for in the non-compositional occasion it will select one outline, on another a different one. When looking at the patterns of the papered walls of our room we see, whenever our fancy is active, all kinds of forms and features; often catch some strange outline, and take it as the subject of a momentary occasion, while later it may suddenly flash full upon us. A composite portrait would have much of this varied suggestiveness.

A further use of the process would be to produce from many independent pictorial deductions of the same subject, a composite made from them. It will be found in mind that it is perfectly easy to apportion different “weights” to the different components. Thus, if one statue be judged to be so much more worthy of reliance than another that it ought to receive double consideration in the composite, all that is necessary is to double either the time of its exposure or its illumination.

The last use of the process that I shall mention is of great interest as regards inquiries into the hereditary transmission of features, as it enables us to compare the average features of the produce with those of the parent. Compositions of all the brothers and sisters in a large family would be an approximation to the likeness that the genealogists produce, would probably be in the family were indefinitely increased in number, but the approximation would be closer if we also took into consideration those of the cousins who inherited the family likeness. As regards the parent and child, a composite of the two parents; the four grandparents and the uncles and aunts on both sides should be also included. Some statistical inquiries I published on the distribution of ability in families* give provisional data for determining the weight to be assigned to the second degree relatives. The other cousins I should disregard. The weights as previously mentioned would be bestowed by giving proportionate periods of exposure.

* Compositions on this principle would undoubtedly aid the breeders of animals. Lord Rayleigh began his fourth and concluding lecture on Thursday, of the male parent would count equally with the father and brother of the female parent. Secondly, I should “weight” each parent as four, and each grandparent and each uncle and aunt as one. Again, I should weight each brother and sister as four, and each of those cousins as one who inherited one part of the likeness of the family in question. The other cousins I should disregard.

The weights as previously mentioned would be bestowed by giving proportionate periods of exposure.

The effects of various methods of combing colours were also exhibited. Thus, with polarized light, greenish-yellow and reddish-yellow gave white. With Professor Clerk Maxwell’s apparatus two or three slits would be placed side by side overlapping definite portions of the spectrum may be mixed. The colours thus formed, or the white light thus produced, may be resolved by the prism into the component parts, and do not give a continuous spectrum. Lord Rayleigh said that red and yellow might be supposed to produce orange, the colour of the spectrum between them, and his lordship’s expedition supports this idea; but going upwards from the red, the intermediate colours are not always produced by mixture. Thus, purple—a mixture of red and blue—is not represented in the spectrum at all. The yellow of the spectrum is produced by the mixture of red and green, and with due proportions of those colours all the shades of yellow and orange; hence it is concluded that green and not yellow is a primary colour. By rotating discs with sectors of red and green a match was produced of yellow, white, and black; and his lordship obtained a yellow liquid by the mixture of chemical solutions, biro-mate of potash (red), and litmus (blue). This colour, when passed through a prism, gave red and green, without yellow, on the screen.

A TRIO OF SUGGESTIONS.

Outside of the absolutely necessary paraphernalia of a photogallery, I would suggest as one of the most useful a good, reliable amateur printing press, with from six to a dozen, or even more, small foot presses. Barrows, &c., for the early trials. Such press pieces are now made very cheaply from any design furnished. Photographers can have special designs of their own always ready for printing the ends of their stereo. views, backs of cards, &c., &c., in just as neat a manner as the above. Then I would suggest for the earlier trials first to give equal “weights” to the male and female sides; thusthe father and brother of the case into which they are slipped, and not in the photographs themselves.

ROYAL INSTITUTION LECTURES.

COMPOUND COLOURS.—COLOUR BLINDNESS.

Lord Rayleigh began his fourth and concluding lecture on Thursday, the 23rd ult., by showing that a combination of yellow and blue liquids produced green, and then explained that the result was due to the impossibility of combining red, yellow, and blue. The substances had been absolutely pure, and the mixture would have been colourless. Various methods of combining colours were also exhibited. Thus, with polarized light, greenish-yellow and reddish-yellow gave white. With Professor Clerk Maxwell’s apparatus two or three slits would be placed side by side, overlapping definite portions of the spectra may be mixed. The colours thus formed, or the white light thus produced, may be resolved by the prism into the component parts, and do not give a continuous spectrum. Lord Rayleigh said that red and yellow might be supposed to produce orange, the colour of the spectrum between them, and his lordship’s expedition supports this idea; but going upwards from the red, the intermediate colours are not always produced by mixture. Thus, purple—a mixture of red and blue—is not represented in the spectrum at all. The yellow of the spectrum is produced by the mixture of red and green, and with due proportions of those colours all the shades of yellow and orange; hence it is concluded that green and not yellow is a primary colour. By rotating discs with sectors of red and green a match was produced of yellow, white, and black; and his lordship obtained a yellow liquid by the mixture of chemical solutions, bio-

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