

consequently, cost much less than equal accommodation in stone or brick, yet the average rent is fifteen dollars per month, or nearly forty pounds per annum.

Such are Waverley, Owega, Binghamton, Athens, Ulster, &c., &c., beautiful as Paradise, and inhabited by a people keen in the pursuit of business during business hours. Sober, so far as an outsider can see, as if distillation had not been discovered; and, consequently, as far removed from poverty as the Seven Dials from St. James's.

But, of course, this is not photography, and I suppose that is what my readers wish especially to hear about; and, therefore, for their sakes, I am sorry that there is little to be said regarding it. Photographers are there in plenty, and in most cases a tolerably good trade is being carried on. I write "trade" advisedly, as, with very few exceptions, the work done is destitute of every vestige of art—inferior, indeed, to most of that to be found in the out-of-the-way villages of the old country.

An American photographer rarely speaks of his "studio" or "glass house," but almost always of his "skylight;" and in most cases the name is well applied, as the light is in nearly every case a top light only, with a very steep pitch, a large expanse of glass, frequently covered with tissue paper, rarely curtained, and when so only with thin white cotton—shadows being got, when got at all, by the use of hood, or rather stand, screens. In a word, the great mass of pictures made in such towns as I have named are simply patches of white and black, without any pretension to the delicate gradation or variety of middle tint absolutely essential to a good photograph.

This was at once admitted by nearly all that I called upon, but excused on the ground of insufficient payment. Something like the following was almost invariably said:—"What can you expect for \$2.50 for cards and \$5 for cabinets (10s. 3d. and 20s. 6d.), and we can't get more? Besides, it's only the commoner people we get, who don't know a good picture from a bad one, and would rather have the white faces than not, especially the coloured ones. Bless you! they would'n't have a bit of shadow in their face, not for any money. The rich folks all go to New York, Philadelphia, or Boston, where they willingly pay twice my prices; and, of course, get better 'fixed'"—this "fixed" being a verb of universal application for anything that has been done, from the cleaning of one's boots to the erection of a palace. By-the-by, speaking of cleaning boots, I would seriously advise all who may purpose visiting this country to take a few lessons in that useful accomplishment. For some reason that I have altogether failed to discover it would seem to be considered a kind of degradation for any one to clean the boots of another person. A servant girl who will do almost anything else would rather throw up her situation than touch a blacking brush, and the wife of even a labouring man would sit quietly by and see her husband doing it himself, or let him go with boots as brown as the road on which he has to walk. So much is this the case that I have within a few days actually seen two gentlemen—one a landed proprietor owning almost as much as the eye could see of one of the most highly-cultivated and beautiful vallies in the United States; the other the president of one of the most flourishing banks, and both keeping numerous male and female domestics—actually brushing their own boots! Even hotel servants are not exempt from this curious prejudice, and, as a rule, there is nothing gained by leaving one's boots outside the bedroom doors. Of course there are "boot blacks" in the larger cities; but even they would seem to look on the occupation as one for which some compensating advantage was necessary, and, consequently, require a fee of fifteen cents for the performance of the operation. Surely sevenpence halfpenny is a *little* too much for a touch of Day and Martin!

But the notions of independence of some of the American women are sometimes even more troublesome than in the matter of boot-cleaning, and extend frequently to a determination to sit only as they please when being photographed. Nor are they exempt from the privileges not infrequently claimed by their sisters on the other side, i.e., of changing their minds as often as, and whenever, they please. An amusing instance of this I saw while in a studio in one of the villages already named. The lady was tolerably pliable while being posed, only stipulating that she should "not be took like them foolish people as had'n't more'n half a face, or had bin a fitin and ahamed to let the other eye be seen;" but just as the usual word of caution had been given, and the cap removed, she suddenly exclaimed—"Stop, Mr. Photographer! I ain't used to bin fixed this way! I guess I can fix myself better," and, crossing one leg over the other, and folding her arms, continued:—"Now get along, and don't you stop a bit too soon, as I shan't have it a bit less than the biggest of them in that glass box!" Of course a second plate was prepared, and then the exposure was made. Before payment was made there was a little difficulty, as she wanted to see "how it was;" but on being assured that "the machine" had gone long enough to make a picture sufficiently large to fill the card she seemed perfectly satisfied.

A visit to the United States would not be complete unless it included Niagara, and so in my next I shall have something to say of the peculiar class of photography practised there and of the men who practise it.

JOHN NICOL, Ph.D.

COMPOSITE PORTRAITS,

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

[A communication to the Anthropological Institute.]

I SUBMIT to the Anthropological Institute my first results in carrying out a process that I suggested last August in my Presidential Address to the Anthropological sub-section of the British Association at Plymouth, in the following words:—

"Having obtained drawings or photographs of several persons alike in most respects, but differing in minor details, what sure method is there of extracting the typical characteristics from them? I may mention a plan which had occurred both to Mr. Herbert Spencer and myself, the principle of which is to superimpose optically the various drawings and to accept the aggregate result. Mr. Spencer suggested to me in conversation that the drawings reduced to the same scale might be traced on separate pieces of transparent paper and secured one upon another, and then held between the eye and the light. I have attempted this with some success. My own idea was to throw faint images of the several portraits, in succession, upon the same sensitised photographic plate. I may add that it is perfectly easy to superimpose optically two portraits by means of a stereoscope, and that a person who is used to handle instruments will find a common double eyeglass fitted with stereoscopic lenses to be almost as effectual and far handier than the boxes sold in shops."

Mr. Spencer, as he informed me, had actually devised an instrument, many years ago, for tracing, mechanically, longitudinal, transverse, and horizontal sections of heads on transparent paper, intending to superimpose them, and to obtain an average result by transmitted light.

Since my address was published I have caused trials to be made, and have found as a matter of fact that the photographic process of which I there spoke enables us to obtain with mechanical precision a generalised picture—one that represents no man in particular, but portrays an imaginary figure, possessing the average features of any given group of men. These ideal faces have a surprising air of reality. Nobody who glanced at one of them for the first time would doubt its being the likeness of a living person. Yet, as I have said, it is no such thing; it is the portrait of a type, and not of an individual.

I begin by collecting photographs of the persons with whom I propose to deal. They must be similar in attitude and size, but no exactness is necessary in either of these respects. Then, by a simple contrivance, I make two pinholes in each of them, to enable me to hang them up one in front of the other, like a pack of cards, upon the same pair of pins, in such a way that the eyes of all the portraits shall be as nearly as possible superimposed, in which case the remainder of the features will also be superimposed nearly enough. These pinholes correspond to what are technically known to printers as "register marks." They are easily made; a slip of brass or card has an aperture cut out of its middle, and threads are stretched from opposite sides, making a cross. Two small holes are drilled in the plate, one on either side of the aperture. The slip of brass is laid on the portrait with the aperture over its face. It is turned about until one of the cross threads cuts the pupils of both the eyes, and it is further adjusted until the other thread divides the interval between the pupils in two equal parts. Then it is held firmly, and a prick is made through each of the holes. The portraits being thus arranged, a photographic camera is directed upon them. Suppose there are eight portraits in the pack, and that under existing circumstances it would require an exposure of eighty seconds to give an exact photographic copy of any one of them. The general principle of proceeding is this, subject in practice to some variation of details, depending on the different brightness of the several portraits:—We throw the image of each of the eight portraits in turn upon the same part of the sensitised plate for ten seconds. Thus, portrait No. 1 is in the front of the pack; we take the cap off the object-glass of the camera for ten seconds, and afterwards replace it. We then remove No. 1 from the pins, and No. 2 appears in the front; we take off the cap a second time for ten seconds, and again replace it. Next we remove No. 2, and No. 3 appears in the front, which we treat as its predecessors, and so we go on to the last of the pack. The sensitised plate will now have had its total exposure of eighty seconds; it is then developed, and the print taken from it is the generalised picture of which I speak. It is a composite of eight component portraits. Those of its outlines are sharpest and darkest that are common to the largest numbers of the components; the purely individual peculiarities leave little or no visible trace. The latter being necessarily disposed equally on both sides of the average, the outline of the composite is the average of all the components. It is a band and not a fine line, because the outlines of the components are seldom exactly superimposed. The band will be darkest in its middle whenever the component portraits have the same general type of features, and its breadth or amount of blur will measure the tendency of the components to deviate from the common type. This is so for the very same reason that the shot-marks on a target are more thickly disposed near the bull's-eye than away from it, and in a greater degree as the marksmen are more skilful. All that has been said of the outlines is equally true as regards the shadows, the result being that the composite represents an averaged figure whose lineaments have been softly drawn. The eyes come out with appropriate distinctness, owing to the mechanical conditions under which the components were hung.

A composite portrait represents the picture that would rise before the mind's eye of a man who had the gift of pictorial imagination in an exalted degree. But the imaginative power, even of the highest artists, is far from precise, and is so apt to be biased by special cases that may have struck their fancies that no two artists agree in any of their typical forms. The merit of the photographic composite is its mechanical precision, being subject to no errors beyond those incidental to all photographic productions.

I submit several composites made for me by Mr. H. Reynolds. The first set of portraits are those of criminals convicted of murder, manslaughter, or robbery accompanied with violence. It will be observed that the features of the composites are much better looking than those of the components. The special villainous irregularities in the latter have disappeared, and the common humanity that underlies them has prevailed. They represent, not the criminal, but the man who is liable to fall into crime. All composites are better looking than their components, because the averaged portrait of many persons is free from the irregularities that variously blemish the looks of each of them. I selected these for my first trials because I happened to possess a large collection of photographs of criminals through the kindness of Sir Edmund Du Cane, the Director-General of Prisons, for the purpose of investigating criminal types. They were peculiarly adapted to my present purpose, being all made of about the same size and taken in much the same attitudes. It was while endeavouring to elicit the principal criminal types by methods of optical superimposition of the portraits, such as I had frequently employed with maps and meteorological traces,* that the idea of composite figures first occurred to me.

The other set of composites are made from pairs of components. They are selected to show the extraordinary facility of combining almost any two faces whose proportions are in any way similar.

It will, I am sure, surprise most persons to see how well defined these composites are. When we deal with faces of the same type, the points of similarity far outnumber those of dissimilarity, and there is a much greater resemblance between faces generally than we who turn our attention to individual differences are apt to appreciate. A traveller on his first arrival among people of a race very different to his own thinks them closely alike, and a Hindu has much difficulty in distinguishing one Englishman from another.

The fairness with which photographic composites represent their components is shown by six of the specimens. I wished to learn whether the order in which the components were photographed made any material difference in the result, so I had three of the portraits arranged successively in each of their six possible combinations. It will be observed that four at least of the six composites are closely alike. I should say that in each of this set the last of the three components was always allowed a longer exposure than the second, and the second than the first, but it is found better to allow an equal time to all of them.

The stereoscope, as I stated last August in my address at Plymouth, affords a very easy method of optically superimposing two portraits, and I have much pleasure in quoting the following letter, pointing out this fact as well as some other conclusions to which I also had arrived. The letter was kindly forwarded to me by Mr. Darwin. It is dated last November, and was written to him by Mr. A. L. Austin, from New Zealand, thus affording another of the many curious instances of two persons being independently engaged in the same novel inquiry at nearly the same time, and coming to similar results:—

"To Charles Darwin, Esq. " *Invercargill, New Zealand, Nov. 6, 1877.*

"SIR,—Although a perfect stranger to you, and living on the reverse side of the globe, I have taken the liberty of writing to you on a small discovery I have made in binocular vision in the stereoscope. I find by taking two ordinary *carte-de-visite* photos. of two different persons' faces, the portraits being about the same sizes and looking about the same direction, and placing them in a stereoscope, the faces blend into one in a most remarkable manner, producing in the case of some ladies' portraits in every instance a *decided improvement* in beauty. The pictures were not taken in a binocular camera, and therefore do not stand out well, but by moving one or both until the eyes coincide in the stereoscope the pictures blend perfectly. If taken in a binocular camera for the purpose, each person being taken on one-half of the negative, I am sure the results would be still more striking. Perhaps something might be made of this in regard to the expression of emotions in man and the lower animals, &c. I have not time or opportunities to make experiments, but it seems to me something might be made of this by photographing the faces of different animals, different races of mankind, &c. I think a stereoscopic view of one of the ape tribe and some low caste human face would make a very curious mixture; also in the matter of crossing of animals and the resulting offspring. It seems to me something also might result in photos. of husband and wife and children, &c. In any case the results are curious if it leads to nothing else. Should this come to anything you will no doubt acknowledge myself as suggesting the experiment and perhaps send me some of the results. If not likely to come to anything a reply would much oblige me.

"Yours very truly, " A. L. AUSTIN, C.E., F.R.A.S."

Dr. Carpenter informs me that the late Mr. Appold, the mechanic, used to combine two portraits of himself under the stereoscope. The one had been taken with an assumed stern expression, the other with a smile; and this combination produced a curious and effective blending of the two.

* *Conference at the Loan Exhibition of Scientific Instruments, 1878.* Chapman and Hall. Physical Geography Section, p. 312. *On Means of Combining Various Data in Maps and Diagrams*, by Francis Galton, F.R.S.

Convenient as the stereoscope is, owing to its accessibility, for determining whether any two portraits are suitable in size and attitude to form a good composite, it is nevertheless a makeshift and imperfect way of attaining the required result. It cannot of itself combine two images; it can only place them so that the office of attempting to combine them may be undertaken by the brain. Now the two separate impressions received by the brain through the stereoscope do not seem to me to be relatively constant in their vividness, but sometimes the image seen by the left eye prevails over that seen by the right, and *vice versa*. All the other instruments I am about to describe accomplish that which the stereoscope fails to do; they create true optical combinations. As regards other points in Mr. Austin's letter I cannot think that the use of a binocular camera for taking the two portraits intended to be combined into one by the stereoscope would be of importance. All that is wanted is that the portraits should be nearly of the same size. In every other respect I cordially agree with Mr. Austin.

FRANCIS GALTON, F.R.S.

(To be concluded in our next.)

A WRINKLE FOR THE PRINTER.

WHEN a great quantity of paper has to be prepared in limited room, and when this has to be done so as to have it ready for use as soon as possible, the ordinary process soon proves itself useless, since almost everywhere, with few exceptions, the room for the preparation of paper is awarded, in a very stepmotherly manner, an area seldom exceeding four square metres in floor measurement. If in such a small laboratory an operator has his large silver bath, or perhaps even two—one for salted and the other for albumenised paper—and then has to hang up six or eight sheets to the lines, there remains but little room for anything else; so when a great quantity has to be prepared the first batches must be completely dried by artificial means.

In this case, as when the paper is left to dry spontaneously, the drying does not proceed equally, but the upper part of the sheet is already dry while the under edge is still wet. This is accompanied by many drawbacks which will at once suggest themselves to the worker. A sheet dried in this way will never have the same tone throughout; one half will be warmer and the other half colder. This peculiarity will be of but little consequence if the sheet be cut up for *cartes* and not used for large pictures. Such sheets are also affected unequally by the fixing bath, those parts which remained longest wet requiring to remain longest in the soda. All these things are, however, but trifles, and were not the principal reasons why I looked out for another mode of preparing the paper. My weightiest reason was the want of room for preparing large quantities of paper and the difficulty of getting it ready for immediate exposure. To attain this twofold end I proceed now in the following way:—

All paper, but especially albumenised paper, is stored in an unheated room, so that it may not become dry and brittle, but always remain soft and supple. In the heat of summer, when it might be too hard and brittle, I take it some hours before silversing it, or the night before, and place it in the damp room so that it may attract a little moisture, as nothing is more perverse than paper that will not lie flat upon the bath but always rolls up, except, perhaps, when air-bubbles make their appearance. This dry paper also does not take on the silver so equally as that which contains a certain quantity of moisture; and, in fact, the whole process goes much more smoothly with the latter sort. I now place my sheet upon the bath and let it float, with a gentle movement, for a minute and a-half or two minutes. In order to produce the same result the time of floating should be the same for all the sheets. At the end of that time I draw each sheet slowly out of the bath and place it, wet side lowermost, upon a sheet of chemically-clean blotting-paper, placing above it a sheet of strong, smooth packing paper, and with the palms of my hands I smooth it out in all directions, giving the pressure, which, having the sheet between my hands and it, it can now bear, so that all the moisture may be sucked up by the sheet of blotting-paper below it. Of course the table upon which the three layers of paper are laid ought to be perfectly flat. The paper may be rubbed until it is almost dry, and then be laid aside at once, but that is not necessary, as without it by the time I come to the fourth sheet the first will be ready for use.

Of troublesome blisters there can be no question with this mode of preparation. Blisters are principally caused by unequal drying; when the wet sheets are hung up to dry the moisture collects in little drops, which evaporate very slowly and separate the albumen from the paper, as is seen afterwards in the toning and fixing baths. If very woolly filter paper has been used for drying it is well to rub down each sheet of albumenised paper with wadding or a fine rag before laying it out for use, in order to remove any small fibres that may have stuck to the somewhat adhesive albumenised surface. The filter paper may be used for a long period, only from time to time it should be laid aside as it becomes at length too wet to fulfil its purpose, and should then be dried at the stove either in the dark or in the evening, as the blotting-paper should not contain any reduced silver. From time to time a fresh sheet of blotting-paper is laid on the table, but the old one is always left under it.