Marion's Practical Guide to Photography

PRACTICAL

GUIDE TO PHOTOGRAPHY

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BY

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CHAPTER I.

HISTORICAL SKETCH.

Boyle—Niepce—Talbot—Daguerre.

So thoroughly has photography, the art of drawing by light, entered into our every-day life that it is difficult for us in the present day to realise how recently it has come to be. So accustomed are we to have scenes and persons represented to us by its means, to become as familiar with the features of our statesmen and famous men and women of all classes as we are with those of our own near relations, and to depend upon the art as a means of truthfully recording almost all of our scientific observations, that it is difficult for us to conceive how our forefathers managed without it. Yet half a century ago the very rich only could possess portraits of their friends or relations, the features of our great men were unknown to the mass of the people, the architectural and other beauties of foreign states and towns were conveyed only by the fallible pencil of the draughtsman, records of scientific observations were for the most part the result of weary watching.

A tale of threescore years ago is told of a certain Frenchman. We do not guarantee its truth, but give it

as showing, better than long description could, the state of knowledge of the time.

The camera obscura was then known. The beautiful image which it would give of surrounding objects, in which colour seemed to be even more vivid than in the objects themselves, had been admired by many, and some had sighed for the discovery of a means of fixing the fleeting image so that it might become a lasting record.

A woman called at the house of one of the greatest French scientists of that time and explained that her husband had, in spite of the discouragement of his friends, got fixed in his mind the idea that the image *could* be made permanent. He was spending all his time in vain experimenting, and she wished to know if such infatuation might be considered as a symptom of lunacy, or if there was really hope in the work he was carrying on.

The scientist replied that, in his opinion, there was no hope; but that the infatuation of the lady's husband could scarcely alone be considered as itself a proof of insanity.

The woman was the wife of Daguerre; the time was fourteen years before the date of the publication of the process known as Daguerreotype.

A brief sketch we must give of the history of photography. It is usual in so doing to attribute the *invention* of the art to some one of the earlier experimenters in it. This we think is a mistake; seldom does it occur that one single man *invents* or discovers entirely by himself a great scientific theory or fact. There is no new thing under the sun. It will generally be found that the so-called

discoverer or inventor but improved on what went before, or put in a practical shape what had been floating in men's minds as hypothetical truth. A step is made which may be greater or smaller. The steam-engine was not invented by Watt, nor the locomotive by Stephenson. These both took the materials which were at hand and improved upon them.

So it is in photography. We look in vain to find who first discovered the fact that certain chemical substances were changed in appearance by light. The credit of the discovery is generally given to Boyle, who lived about two hundred years ago.

From this we may take a great stride, to the time when the first camera picture was produced;—to the time when the much-admired picture of the camera obscura was, in fact, caused to leave behind it some more or less lasting trace of its beauties.

In 1816 Nicéphore Niepce describes most accurately in letters to his brother the taking of camera pictures. These were, however, but imperfect. They were in negative. Every shade of nature was reversed, and, moreover, the pictures, such as they were, very soon faded. Nevertheless, the letters referred to show wonderful penetration, and a knowledge in advance of the time in which the experimenter worked. To those who feel an interest in the matter we recommend a perusal of Mr. H. Baden Pritchard's interesting little book, *About Photography and Photographers.* Although experiments made by Niepce were interesting and instructing, and might, had they been carried farther, have led to great results, we hear nothing further of them than what is contained in the aforementioned

letters, until we hear the name of Niepce coupled with that of Daguerre.

About 1825 Daguerre became acquainted with the fact that Niepce had been working in the same direction, and with apparently far greater success than himself. The two formed a partnership, and working together invented the process known as Daguerreotype. Before its publication Niepce had died, and Daguerre purchased from his son the right to omit any mention of him in connection with the publication of the process which bears to this day the name of Daguerreotype.

The year 1839 was a momentous one in the history of photography. Daguerre in France published his process, which at once gained popularity; and almost simultaneously Fox Talbot in England published his method of photographic drawing on paper, which must be considered as containing the germ of the negative processes of to-day.

And now there occurred what we almost always see when a great discovery is made, what we have so recently seen in connection with electric light, the telephone, microphone, and phonograph. The public, at first indifferent, passed over to the opposite extreme. The most wildly-extravagant expectations of what the new process was to do were entertained. Painters were shortly to be no more required. A small step only in advance seemed necessary to secure the rendering of natural colours. The most impossible things were to be done. From this there was naturally a reaction. The Daguerreotype had so far obtained the larger share of public favour. The appearance of a picture by this process may not be known to all. The medium is a

plate of polished silver, somewhat like a mirror, and on the surface is a picture beautifully delicate, but neither very bold nor distinct, requiring to be looked at from a certain angle. Daguerreotypes are not in all respects pleasing representations at the best, and it will readily be understood that the crudities which occur too often, even in the present day, in photographs, from want of artistic knowledge and taste, were much more conspicuous at a time when few were trained to the process, and when exposures were such as would now be considered extravagantly long.

The Daguerreotype fell into comparative disrepute, and the process of Talbot, which as improved in 1841 by its originator was of far greater general utility than that of Daguerre, advanced in favour but slowly.

It was not till Archer in 1850 invented the process known as "wet-collodion," and which up till within a couple of years ago was the popular process with both amateurs and professionals, that photography began to assume the importance which has been attached to it in late years.

A few words must be said in description of the manipulations used in the processes which we have mentioned.

That of Daguerre is the first which requires description, those before having never passed the experimental stage.

In this a silver surface is required. For economy a copper plate is used, which is thickly plated with silver. The silver surface is polished and most carefully cleaned. Afterwards it is exposed to the fumes of iodine. A thin film of iodide of silver is thus produced, and this is sen-

sitive to light. The sensitiveness is, however, slight as compared with the films which we use in the present day. An exposure of several hours was generally required.

A great improvement was made by employing the vapour of bromine combined with the iodine. The exposure was thereby reduced. The greatest improvement in the process was, however, the discovery of *development.*

Development is a process which requires some explanation, as it is the point on which turns the success of every modern process of photography.

A tale is told of the discovery of development by Daguerre. It is as ill authenticated as the others which are told of him, but may, nevertheless, be recounted, as it will serve better to give an idea of the operation than a long description would.

It is told that Daguerre, during his experiments, had inadvertently given to several plates so short exposures that little or no image was perceptible. These he placed on one side in a cupboard, with the intention of repolishing them at his leisure, and of using them again.

His surprise may be imagined when, on returning after the lapse of some time to his cupboard, he found that each plate had on it a picture apparently perfectly exposed. His first idea was that his cupboard was bewitched, his second that possibly some of the chemicals which were stored beside the plates affected them. He proceeded to place on the shelf where the first plates had been other under-exposed ones, removing after each was placed there one of the chemicals. Still, however,

the apparently magical process went on. At last he bethought him of some mercury which had been spilt on the wood. This was indeed the magic substance. Further investigation showed him that a portion of the iodide of silver film, exposed to light for a period too brief to cause on it a visible change, yet had acquired a selective power and attracted to itself minute globules of this vapour of mercury, thus becoming visible. Afterwards the process of "development," as it was called, was regularly carried out by placing the plates, bearing apparently no image, over a vessel containing mercury, which was heated. This process of development should be well borne in mind. Something of the same kind—that is to say, a strengthening by some means of an image so weak as to be generally at first invisible, till it becomes as strong as we desire—takes place in every photographic process.

The chief difference between the process of Daguerre and Talbot lay in this, that whereas the Daguerreotype is a positive process, the Talbotype is a negative one. The result of exposing a Daguerreotype plate was one finished picture with the lights and shades correct, but, unless a mirror or prism reflector was used, with right and left transposed. If a second copy were required, the whole operation had to be gone through again.

A Talbotype represented the shades of nature reversed. The darker shades are represented as white, the lighter shades as black. From such a negative it was, however, possible to get any desired number of copies with the shades correct, and without transposition of right and left.

Talbot used paper as a support for his sensitive salt,

which, as in Daguerreotype, was iodide of silver. His negatives were developed with a solution of gallic acid, and afterwards the paper was rendered as transparent as possible by the application of white wax so as to facilitate the taking of copies, or "printing," as it is usually termed.

CHAPTER II.

HISTORICAL SKETCH (*Continued*).

The Wet-Collodion Process—The Dry-Gelatine Process.

WE have now brought our historical sketch up to the time of the invention of wet-collodion process, which, as the one that has held the first place for a longer time than any other, and has kept it till within the last few years, deserves a somewhat more detailed account than those which went before it.

As we have said, the collodion process was invented by Mr. Archer. The novelties which this gentleman introduced may be stated as follows: He proposed glass as a support for the photograph instead of silvered copper or paper; he proposed as a vehicle for the sensitive salts collodion, which is a substance obtained by dissolving gun-cotton or pyroxylin in a mixture of alcohol and ether; and he proposed as a developer a solution of pyrogallic acid, or, as it is more properly called, pyrogallol, in water.

The results of the changes were that a very much briefer exposure than had been required before was sufficient, that either a positive or a negative picture could be got as was desired, and that there was more

delicacy in the negative obtained than in that by the paper process, more boldness in a positive than in the Daguerreotype.

As in the last-mentioned process, the sensitive salts were iodide of silver and a small quantity of bromide.

Briefly described, the manipulations employed in the wet process are as follows:—

A glass plate is cleaned with great care. A short time before the exposure has to be made this plate is coated with what is known as iodised collodion,—that is to say, collodion in which is dissolved a certain quantity of soluble iodides and bromides. After the plate is held for a few seconds the collodion "sets" on its surface. Now the coated plate is dipped with great care into a vertical vessel containing a strong solution of silver nitrate, and known as the "bath." What is called "double decomposition" takes place, and iodide and bromide of silver are formed in the film. These are sensitive to light, and when the action has gone on for a few minutes the plate is ready for exposure. It is taken from the bath and placed in the camera whilst still wet in the manner which will be described for dry plates farther on. After exposure, and whilst still wet, it is treated with various different chemical substances, the operations being known as development, intensification, fixing, washing, drying, and varnishing.

Now this process, although a beautiful one and a great advance on any which had gone before, left much to be desired, and this especially for the amateur and for the landscape photographer.

The operations which have been mentioned were very delicate and required no little manipulative skill; the

solutions were expensive and were liable to go out of order; especially the silver bath, the most expensive of all, was liable to the most extraordinary, unexpected, and inexplicable vagaries. Great has been the lamentation of many an amateur on suddenly finding that he could get on his plates no result but what is technically termed "fog," and that he would require to purchase many ounces of silver nitrate to make up a new bath.

Then there was the dirtiness of the process. All must remember well the bedabbled appearance of the person and possessions of the "wet-plate amateur." He was a terror to his friends. His silver solution appeared to produce every result but the right one. Its devastating effects were found in the most unexpected places. Clothes, carpets, and curtains alike suffered, and the stains produced were generally indelible; but all these inconveniences were less than what resulted from the fact that the whole manipulation of the plate had to be performed within the space of an hour or so,—that is to say, before the plate became dry. It was therefore necessary for the photographer, wherever he went, to burden himself with the whole of the apparatus and chemicals required to make and develop his plate; and, as the manipulations could only be carried on in a yellow light, he had to carry with him in addition a tent in which to work. Besides this, the exposure, although shorter than what photographers had been previously used to, was generally inconveniently long. What are known as instantaneous effects could only be produced under the most exceptionally favourable circumstances, whilst the amateur was unable to satisfy his desire to portray the features of his friends unless he had the

means of doing so in the open air. To take a portrait in an ordinary room required so prolonged an exposure that it was out of the question.

The wet-plate photographer sighed for such a process as would give him plates which might be kept for a length of time before exposure, and between exposure and development, so that he would not have to carry with him a chemical laboratory and workshop; and he sighed for a process which would enable him to shorten his exposures.

The first requirement was in a certain degree supplied by "dry-collodion" processes. In these, as indicated by the name, the plates were used *dry*. They could be kept for some time both before and after exposure. They had serious drawbacks, however. The results were generally inferior in quality to those got by the use of wet plates, and the exposure required was longer. Besides this, most of the plates required in their preparation the use of the troublesome collodion and bath.

A few years ago a great change took place. A process was invented which appears to embody everything which the photographer could possibly desire. This is the gelatine dry-plate process. The history of this process we cannot give here, but may say that the names which are most intimately connected with its discovery are those of Dr. R. L. Maddox and Mr. Charles Bennet.

In this process the plates are dry. They may be kept for an indefinite time either before they are exposed or between the time of exposure and development; how long is not known, but certainly the limit of time is to be measured by *years*. The exposure is less than one-tenth of that which was required for wet plates. The

manipulations are so easy that they can be performed by any one almost without practice, and may be so cleanly that the most scrupulous need no longer fear to take up the practice of what used in the wet-plate days to be sarcastically entitled the "black art." If we add to all this that the results are artistically *superior* to those obtained by wet plates, and that, whereas everything which could be done with a wet plate can also be done with a dry, many things which were impossible with a wet plate are no longer so when a gelatine one is used, we will see that the stride made was immense.

What has, however, perhaps done more than anything else to make the benefit of the change fully available to the photographic public is that plates by the new process have become an article of commerce.

It is evident that a wet plate, which has to be made and finished within an hour or two, must be made by the operator himself. The collodion dry plates, it is true, would keep for some time, but the time was comparatively limited and was somewhat uncertain. The consequence was that, although these plates were produced commercially by one or two firms, they were never largely used. Besides this, the price was so high as to prevent the greater number of photographers from adopting them had there been no other objections.

The amateur, as a consequence, if he used dry plates, manufactured them himself at the cost of great labour, considerable expense, and frequently with disappointing results.

It is true that there are even now in the days of gelatine plates a few amateurs who manufacture their own plates, but those are such as have an experimental turn

and take pleasure in the work itself. They will generally be found willing enough to admit that neither economy nor better results arise from their labours.

The Britannia plates have now been before the public for some years and have given uniformly satisfactory results. They appear to possess every good quality which is to be found in a photographic plate. At the present stage, before we have commenced our actual instructions for working plates, we cannot enter into technicalities which would probably not be understood by most of our readers, but may briefly say that the plates are such that negatives of the best quality may be produced by their means with the utmost certainty, the shortest possible exposure, and the minimum of trouble, whilst the price is most moderate.

CHAPTER III.

THE APPLICATIONS OF MODERN PHOTOGRAPHY.

We have brought our readers up to the present time. We have contrasted the wet-plate photographer of former days—who required to have at his elbow, whilst he exposed his plate, a quantity of chemicals and a tent to work in, and who consequently either was tied down to a very small size of plate or had to have in attendance on him several porters, or even a van or cart—with the dry-plate worker of to-day, who steps out on his work with a light leather case containing all that he requires, and who without assistance can walk a long distance carrying with him all the necessities for working even a comparatively large size of plate.

We have seen, on the one hand, the wet-plate photographer, who, having prepared his plate, dreaded lest it should dry in the camera ere the effect, possibly of sea and cloud, which he wished to secure had established itself; on the other, the dry-plate worker, who can sit by his camera for hours if the effects he wishes come not sooner, and may smoke his pipe in peace knowing that his plate will in no way change.

Before entering on the practical working of the plates we may take a brief survey of the various ways in which

photography as practised in the present day may be useful to members of the general public.

As we write rather for the amateur than for the professional photographer, we shall place amusement first, and amongst photographic amusements landscape work first of all.

It would be difficult to think of any more delightful amusement than that afforded by amateur landscape photography. The occupation is a healthy one, and it is one which can readily be combined with any of an almost indefinite number of country occupations. The pedestrian can carry with him the academy camera, which will go into his pocket; the tricyclist may without inconvenience burden himself with a somewhat larger-sized apparatus; whilst the boatsman or yachtsman is hardly limited to size at all. Full scope is given to any artistic feeling which the amateur may have, and many a picture will be taken which in after years may serve to bring back the memory of happy days. The enjoyment, too, of the scenes themselves is greater far when they are looked at with the view of selecting the spots and combinations of form and shade which will make a picture than when gazed on merely with a general idea of admiring what is beautiful in them.

Landscape work is that in which English photographers excel, and it is the branch of photography in which the amateur shows best, as compared with the professional worker.

Nor is there any reason why the fair sex should not in these days practise the art far more extensively than they do. In the days of wet-collodion the difficulties of carrying the necessary bulky apparatus were naturally

more felt by ladies than by men; moreover, the dirtiness of the process was a fatal objection in the eyes of most. Now these objections do not hold, and we should be glad to see members of the fair sex, who surely require rational amusement quite as much as their male friends, taking greater advantage of the opportunities which dry plates offer them. They would appear to be specially suited for the work. They are quite as often possessed of artistic taste as men, and more generally have had at least some slight rudiments of artistic training; they are also neat and quick at manipulation.

If the advantage to the amateur landscape photographer by the introduction of dry plates has been immense, that to the amateur portraitist has been possibly even greater. The shortening of the exposure which dry plates make possible renders it practicable to take portraits in any ordinary room.

Very excellent portraits can be taken out of doors if advantage be taken of surrounding objects to modify the light, but there is a certain roundness of lighting which is scarcely to be got except indoors. This is afforded in perfection in the studio, but very fairly in an ordinary room, especially if it have a large window. Besides the superior lighting obtainable indoors, we have to consider that many have not available space for portraiture out of doors. To those will be specially welcome the facilities for indoor work which dry plates offer. So cleanly are all the operations in connection with exposure that there need be no hesitation, on that score at least, in converting the drawing-room into a temporary studio.

Even in the months of winter portraiture in the house is possible, except perhaps in the very heart of London, where the yellow fogs are prevalent; but there are other means of using the art if the light become too poor for portrait work. Pictures may be copied — paintings either in oil or water-colour, engravings, etchings, and so forth, are all equally well reproduced by the aid of the dry plate.

When flowers are in season, beautiful pictures may be made by those who have skill and taste in arranging them. Special sets of apparatus are now prepared for boys and girls at school.

So far for amusement; but there is no reason why the photographer, although he be an amateur—that is to say, although his profession is something different from the photographic — should make nothing more than a plaything of his hobby. There is scarcely a profession in which photography is not at times useful.

How useful photography may be to the soldier and naval man is proved by the fact that the art is taught in naval and military colleges.

To the artist photography may often be useful, and in fact it is greatly used by many painters, although, we are sorry to say, a few of those who do make use of it are not very willing to let the fact be known. Artists too often look on photography with a mingled feeling of contempt and jealousy.

To the architect the art is possibly more useful than to almost any other professional man. Photographic reproductions of buildings must always be infinitely more faithful and useful for his purpose than the most

elaborate and laboriously prepared sketches or drawings. The same applies of course to the builder.

To the engineer, possibly as much as to the architect, photography is useful, and with him it is indeed continually in force. We know of civil engineers in charge of contracts far from home whose weekly report of progress is accompanied by a photograph, which, we need scarcely say, will tell more than volumes of description would. To the mechanical engineer a special benefit is to be found in the use of photographs when work is being tendered for or offers are being made for erecting machinery. A photograph of a machine will in many cases give a much better idea of the general construction and arrangement of parts than will the most elaborate drawing; whilst, on the other hand, there is less of dimensional design revealed, because on account of perspective, foreshortening, etc., there is difficulty in taking measurements from a photograph, except in certain special cases where it is taken with a view to measurement. The engineer thus gives to his customer a better general idea of his machine by the use of a photograph than by that of a drawing, whilst he is less likely to have his designs stolen.

To the medical profession photography is invaluable. Typical cases of all kinds are recorded, and the progress of disease or cure may be shown. To the Alienist, or as he is generally jocularly called the "mad doctor," does this perhaps apply more than to any other specialist.

In fact there is scarcely a case of any set of professional men to whom photography may not be useful as something more than a mere plaything, and we might multiply cases without end.

In pure science photography is used in every direction. There is scarcely a branch of science in which it is not used, either as a means of keeping records or in some other capacity, whilst for some scientific pursuits a knowledge of it is absolutely necessary.

CHAPTER IV.

THE DARK ROOM.

We now enter upon a practical description of the manipulations which take place in the production of negatives and finished prints, and of the apparatus which is used to assist such manipulations.

Our intention is to go through every manipulation, attempting to make it as clear to the mind of the beginner as possible, describing in brief and general terms as we go on the apparatus used. Afterwards we shall describe more particularly and at some length the various modifications of this apparatus, so that the would-be photographer, having got an idea of what he will have to do to secure photographic pictures, may then judge on what scale he will work and of what nature his camera and suchlike are to be.

We must describe first of all what can scarcely be called a piece of apparatus, but what is nevertheless the first requirement in the manipulation of photographic plates of any kind. This is the *Dark Room*. Without entering into a disquisition on light or on the sensitive photographic film we may say this much. The plates with which the photographer is about to work, and which consist of pieces of glass with a film spread

on them of a white creamy material called gelatine emulsion, are affected by the most inconceivably small amount of light which may reach them. This is true of white light, or of light of any colour except *red*. Red light has little or no effect on photographic films. Taking this into consideration, it will readily be seen that the only means of manipulating the plates without getting them affected—and consequently spoiled—is to work in a room which is illuminated with red light only. To such an apartment has been given the name of the "dark room." It is needless to say that the title is an incorrect one, and that "red room," or something of that kind, would have been better. The expression "dark room" is so well known and universally used by photographers that we retain it throughout this book.

In the old wet-collodion days, or even now, where wet plates are used for enlarging and suchlike purposes, the dark room is of necessity a somewhat elaborately fitted apartment, because there the plates have to be prepared as they are required. Moreover, in the case of wet-plate work, the all-pervading "silver bath" makes it almost impossible to use a common apartment temporarily for the purposes of a dark room. The dark room has to be permanent and established. With dry plates the thing is different. The only necessities are a room which can be darkened, a plain deal table to work upon, and a lamp giving a red light to work by. The writer has often performed all his manipulations in the bedroom of the hotel at which he might be stopping after it was dark in the evening, using the wash-hand stand to work on, and for a lamp

to work by having nothing but a night light covered with a cone of red paper. Such make-shift arrangements are, however, rather for the advanced photographer in an emergency than for the beginner, who may meet with difficulty enough without making them for himself. He should, if possible, have some room, no matter how small, which he can devote to the purpose of dark room solely. If a room with a sink and water laid on can be got he will have as perfect a dark room as could be desired. A deal table is, as we have said, necessary to work upon, and there should be one or two shelves on which to place bottles, etc.

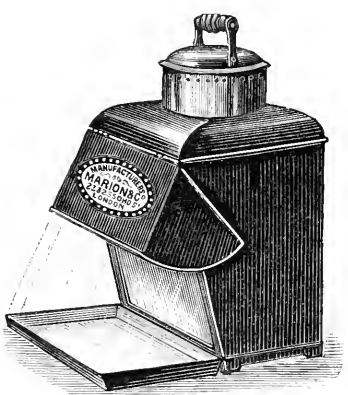
Supposing the beginner have the means of either building or fitting up a room, the following is the way in which it should be done :—

Somewhat to the right of the centre of one of the longer walls and against it there is fitted the sink. This should be of stoneware so that it may readily be cleaned. It may be about three feet long by one foot six inches wide. It should be supplied by a tap about eighteen inches above it, and projecting several inches from the wall.

Immediately to the left of the sink is the operating table. It should be somewhat high. Three feet six inches is not too much. The height prevents the necessity of excessive stooping whilst watching the progress of the various operations. The table may be three feet long or more if there is space to spare, and two feet wide. It is best covered with sheet-lead of the thickness known as 5 lb. It may slope slightly towards the sink, so that any spillings may find their way into this latter, and in this case it should have a narrow

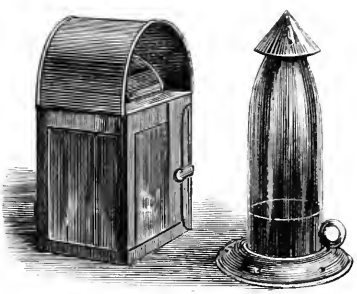
ridge along the front edge, standing, say a quarter of an inch above the level of the rest, so as to direct such spillings. There should be a shelf about a foot below the table on which to lay dishes.

The only further question is, how to supply the necessary red light,—it being, of course, understood that all extraneous white light is entirely shut out. If the side of the room against which the sink is fixed be an outside wall, there may be made in it, at a height of six inches above the operating table, a window, say two feet long and one foot six inches high, glazed with one thickness of ruby and one of orange glass. Whether this be done or not, a "ruby lamp" of some kind will be required for night work. Several varieties of such are here illustrated; but we would specially recommend our Reflector Developing Lamp, which is fitted with a new orange glass, allowing of much more light and yet perfectly safe for even the most sensitive plates. An excellent arrangement when a "borrowed light" can be had is the following: We suppose the wall against which the sink is fixed to be a partition dividing the dark room from another apartment which is well lighted. A window is made as before, but in this case it may be considerably larger, possibly



two and a half feet square, and need be only glazed with one thickness of ruby glass. Opposite this window, several inches from it, and on the light room side there is fixed an ordinary gas-burner. When the daylight wanes this burner is lighted, and affords the necessary illumination.

In any case there should, if possible, be in the dark room at least one ordinary burner, so that there may be a comfortable light if it be desired to do any work which does not involve the exposure of sensitive films,—for example, the washing up of utensils, etc.



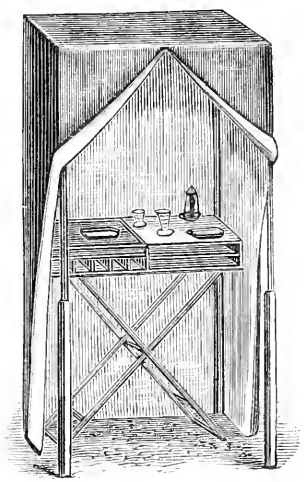
The door of the room should fit light-tight, and there should be an opaque black curtain hung just inside it, so that the photographer may make his entrance and exit without letting in a flood of light.

Any available space on the walls may be occupied by shelves on which to place bottles, etc. Besides this, a useful piece of apparatus is a box which shuts light-tight, in which sensitive plates may be placed if it be wished to turn up the gas.

Such is the form which a permanent dark room usually takes, and if the student be fortunate enough to have the means of fitting up such a room he will find it most convenient; but it is not by any means necessary that he should do so. As we have said already, almost any room or closet may be used for a temporary dark

room, and this not for the production of second-class work, but for the very best. Or our (Marion and Co.'s) new portable tent and table may be used; it answers the purpose admirably, and has the great convenience of permitting its being put up in any room, outhouse, or even in the garden or courtyard. It is easily fixed, and as easily taken to pieces and stowed away.

It will be seen that the room which we have described



very closely resembles an ordinary pantry; and, in fact, if a pantry can either be secured altogether, or if one can be darkened for the time being, when the photographer wishes to operate, there will be completed as good a dark room as can be desired. If a room with a sink cannot be secured, it is sufficient to have an ordinary table, to place under it a large pail or tub to act as a sink, and on it a water-jug to supply the necessary water.

For outdoor work it is not uncommon even in these days to use a tent, and for the amateur this may take the place of the dark room altogether. The tent will be described farther on.

CHAPTER V.

THE EXPOSURE OF PLATES.

We now come to the actual beginning of operations, and have to describe the exposure of a plate.

The apparatus required for this is the following: A camera with a dark slide, a lens, a camera stand, and a focussing cloth.

The photographic camera is simply a portable form of the camera obscura. It is a box, at one end of which is fixed the lens, whilst at the other there is a piece of ground glass on which falls the inverted image which the lens forms of any brightly-lighted object which is opposite to it. The dark slide is a light-tight case to hold one or more, generally two, sensitive plates, and so constructed that when the ground glass is removed from the camera it (the dark slide) may slide into a groove, and so that after this, on drawing out a thin slab of wood, the sensitive plate finds itself in the precise position in which the ground glass before was,—the image formed by the lens now of course falling on it in place of on the ground glass.

The lens will be fully described hereafter in a chapter on photographic optics. It may be called the chief of photographic tools. The first experiments may be made

with any of the several forms of lenses. Every camera is fitted with an adjustment for altering the distance between the lens and the ground glass or sensitive plate so as to perform the operation known as focussing.

The tripod stand is the three-legged support for the camera, which must be familiar in appearance to all. In most modern tripods the legs slide one half into the other, and the whole packs into a very small space.

The focussing cloth is a piece of square opaque cloth to cover the head of the photographer and shut out the glare of light so as to enable him with ease to examine the image on the ground glass of his camera. The size may be from one yard to a yard and a half square according to the size of the camera. The best material is velvet. Black waterproof cloth is also good, but any cloth which is opaque and black will do very well.

We now commence our first experiment. The smallest size of plates which are sold should be used, as the first results may not be of great use, and the smaller the plates wasted the better. The smallest size of plate commonly used is five inches by four inches. If the dark slide be constructed for larger plates it may be fitted with a carrier for the size mentioned. Dark slides for dry plates are now always made to hold two plates each, and are called "double dark slides."

The dark slide is taken into the dark room, and is placed open on the table opposite the red light. All other light that may be in the room is now extinguished.

The box in which the dry plates are purchased is opened. A plate is taken out. On careful examination it will be seen that this plate is different on the two

sides. One side shows the ordinary surface of a sheet of glass, the other is covered with emulsion, and looks something like a ground-glass surface. Care must be taken not to touch with the fingers this last-mentioned side. The plates should be handled by the edges. It is placed in the dark slide with the film side downwards, so that when the shutter of the slide is withdrawn this side will be exposed. The other plate is placed similarly, and the piece of blackened tin which is used with every dark slide goes between the two plates.

It must be explained that there are two ways in which double dark slides are constructed. In the one kind the slide opens on hinges into two divisions like a book, a plate is placed in each division, and the slide is then closed. In the other kind both plates are put into the slide from one side. In this latter case the first plate is placed in film side *downwards*, the blackened tin-plate is placed on it, and, last of all, the second plate is placed in the slide film side *upwards*. There is also a third kind, such as in our student and Oxford set cameras. In these the blackened tin-plate is fixed; consequently the emulsion plates must be placed one on either side, with the film upwards. Whatever the construction of the slide, when it is closed the plates must be in it *back to back*, and with a piece of blackened tin or paper between them.

When the slide is filled and closed, and when the remaining plates have been again carefully wrapped up or have been placed in a light-tight box, the photographer may issue from the dark room. The dark slide should be placed under the coat, or may be wrapped up in a piece of black cloth. It is not advisable to leave it

for any length of time in bright light, as the smallest fault would result in the destruction of one or both plates.

A subject must be chosen to make an experimental exposure on. The best thing is a brightly-lighted landscape, which should show as broad contrasts of light and shade as possible. The composition of the scene as a picture need not be considered at this stage. The camera is placed so that the subject will be lighted from the side,—that is to say, the position is such that the sun is neither before nor behind the camera.

The lens is fixed in position and the operation of focussing commences. As we said, the lens may be of any of the different varieties which are used. It is best, if possible, however, that it be not a portrait lens. If the lens have movable diaphragms or stops, they must be removed, so that the aperture or opening is the largest which the lens is constructed to work with.

On covering the head with the focussing cloth, so that the focussing screen or ground glass is in comparative darkness, and looking at this latter, an inverted image more or less distinct of the object opposite the camera will be seen. Now we work the adjustment which alters the difference between the lens and the ground glass, and which generally is either a screw or a rack and pinion. We try first one direction and then another till we find the image getting sharp. We then look at some bold object near the centre of the ground glass, and adjust till this appears quite sharp. We have now, in those lenses which are fitted with diaphragms or stops, to select a stop to insert in the slit of the lens. These are generally small plates of thin blackened brass, with

various-sized holes in the centre of them. The plates may, any one of them, be slipped into a slit in the brass-work of the lens, which is made for their reception. In the case of some lenses there is, in place of the set of separate stops or diaphragms, a disk, which is an attachment to the brasswork of the lens, but which can revolve so as to let any one of several different-sized holes in it take the desired central position. The use of the diaphragms will be fully explained in the chapter on photographic optics. Meantime, for the preliminary experiment, it will be best to use the smallest stop with which the lens is supplied. When this is adjusted we are ready to expose.

The cap is placed on the lens, the ground glass is removed or hinged up according to the construction of the camera, and the dark slide is put into its place. This latter operation is best done under cover of the focussing cloth, which should remain over the whole of the camera with the exception of the lens till the exposure is complete.

The shutter or sliding part of the dark slide is withdrawn, when it will be understood that nothing prevents the image from falling on the sensitive film except the lens cap. This latter is now gently removed. If the subject be a brightly-lighted landscape it may be kept off for two or three seconds, when it is replaced. The shutter of the slide is replaced. It will be best to make another exposure of longer duration on the other plate before the camera is shifted or the stop removed. A comparison of the two resulting negatives afterwards will be instructive. We may then, immediately after we have replaced the shutter, take

out the dark slide, reverse it, replace it, withdraw the other shutter and expose once more, giving this time, say, ten seconds. The times may be counted from the seconds hand of a watch, or if the photographer be tolerably good at counting seconds he may use that method. It is quite accurate enough.

After exposure the shutter is once more wrapped up or placed under the operator's coat, and the process of development may be performed.

CHAPTER VI.

DEVELOPMENT.

We would here pause for a few minutes to explain in as few words as possible what has taken place during exposure, and what is to take place during development. We request the special attention of the student to this explanation, because if he once thoroughly understands the matter—that is to say, the relation which exists between exposure and development—he will have passed the photographic *pons asinorum*, and will find his further way clear before him.

In the first place it is necessary to understand what is the meaning of a negative. We may define it as a picture where all the shades of nature are reversed, where what is in reality black is shown as white, whilst what in reality is white is shown as black. When we hold up a photographic negative between us and the light this is what we see. For example, if the subject be a man dressed in a black coat, with white collar, etc., his collar will appear quite black, and his face nearly so, whilst his coat will appear white.

We here give a print which will explain the appearance better than words can do. The first cut shows a negative, the second the positive, which may be produced from it by the printing process.

What we wish to produce thus by the camera is a negative representation of the picture on the ground glass. By the exposure which we have given we have got this negative, so to speak, *in potential*,—that is to

say, there is on the plate what is called a "latent image," that is to say, although there is as yet nothing visible, yet there is such a change of the silver bromide particles that, when the operation of development is performed, the negative will appear. We must further explain what is the effect if we have continued the exposure for a time either too short or too long, and how we can tell by the appearance of the negative whether or not the exposure has been sufficient.

Let us examine closely the landscape which we have chosen for our first experiment. We shall see that different parts of the subject reflect very different quantities of light; in other words, there are different degrees of brightness. Possibly, to take an extreme

case, there has been included a glaring whitewashed wall, or a line of clothes hung out to dry, whilst near this there is a widespreading tree with deep shadows under the branches. If we look with attention we shall see that certain small portions of the deepest shadow appear to be quite black. Apparently they send no light at all to the eye.

Now let us consider what takes place when the cap is removed from the lens. The image, which, as we know, is an exact counterpart of the landscape in front of the camera, and shows all the same gradation of light, falls on the plate. The brighter shades, or, as they are usually called, the "high lights," naturally impress themselves first, and were the exposure stopped at a very early stage nothing but these would be visible in the negative. All the half-tone and the darker tones, or, as they are usually called, the "detail in the shadows," would be quite unrepresented. To take the case that we have supposed, a very brief exposure would show nothing but the white wall or line of clothes. As the exposure is continued, however, darker and darker shades find their representation until at last every detail which is visible to the eye is impressed on the film,—not visibly, be it understood, but in a form which may be made visible by the after process of development. When this stage is reached the correct exposure has been given. It might be supposed that no harm could come of giving a much longer exposure, and it is true that less harm results from over-exposure than from under-exposure, yet excessive exposure has its evils as well as under-exposure. It must be understood that there is always in the camera, besides the light forming the image, a certain amount of diffused

light which arises from reflection from the sides of the bellows. If the exposure be much protracted this faint light will act on those portions of the plate which represent the blackest parts of the subject, and which ought to be represented by transparency, or a near approach to it.

Assuming that the student understands this explanation of what we may call the rationale of the matter, we pass on to the practical development of a plate.

The chemicals which we require are the following:—

Pyrogallic acid.

Strongest liquor ammonia (·880).

Bromide of ammonium.

Nitric acid.

Alum (powdered).

Hyposulphite of soda (usually called *hypo*).

The following solutions are prepared from these:—

No. 1.—Stock Solution.

Pyrogallic acid	1 ounce.
Bromide of ammonium . . .	600 grains.
Nitric acid	20 drops.
Water, up to	6 ounces.

No. 2.

Strongest liquor ammonia (·880) .	3 drachms.
Water	1 pint.

(This will keep some time if well stoppered.)

No. 3.

No. 1	1 ounce.
Water	19 ounces.

These are the developing solutions. They should be accurately prepared by weighing and measuring. Guess work will not do.

To prepare No. 1 the twenty drops of nitric acid are added to four ounces of water. This is poured over the pyrogallic acid and bromide of ammonia, and the quantity is then made up to six ounces. This solution will keep for a considerable time, certainly for some months.

No special precautions are necessary in mixing No. 2. It will keep as long as the bottle is kept quite securely stoppered.

No. 3 will keep for only a few hours, and is made by diluting No. 1 just before development is to be performed.

To save the amateur time and trouble we prepare bottles of developing solution ready for use.

Besides these solutions the following are required :—

ALUM SOLUTION.

Alum	2 ounces.
Water	1 pint.

FIXING SOLUTION.

Hyposulphite of soda . . .	5 ounces.
Water, up to	1 pint.

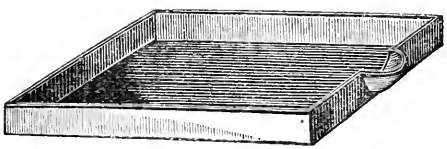
These latter solutions are best made by pouring warm water over the chemicals mentioned, and stirring till complete solution takes place. They may be used whenever they are cool, and will keep indefinitely. There is no necessity to be with them so exact as regards quantities as in the case of the developing solutions.

The only apparatus necessary is the following :—

A measuring glass to hold four or five ounces, and one to hold an ounce.

Three flat dishes of such a size as to hold the plates to be developed. These are best made of vulcanite or

papier-maché for the sake of lightness, and to prevent the breakage which is likely to take place if porcelain dishes be used. We here illustrate a flat or developing dish :—



When we are about to commence operations we take the three dishes and place them in a row along the front edge of the operating table. One dish is opposite the red light, the others are to the right of this one. Space is left between the dish opposite the light and the next one for the glass measure. The bottles containing the developing solutions may go beside the light, so that we may easily place a hand on them in the comparative obscurity in which we are about to work.

Into the middle dish we pour alum solution to a depth of about quarter of an inch. Into the right-hand dish we pour a similar quantity of fixing solution.

The dark slide being placed in readiness in any handy position on the table, we pour into the measure an ounce or an ounce and a quarter of developing solution No. 2, and a similar quantity of No. 3.

All light, except the ruby lamp, is now shut out or extinguished. The plate which was exposed first, and which received the shortest exposure, is removed from the dark slide and is carefully placed, film side upwards, on the bottom of the left-hand dish, which is the only one that is empty. The dish is now taken in the left hand and the measuring glass in the right. The edge of the

glass is lowered to the edge of the dish, and the developing solution is rapidly tipped on to the plate, a quick rocking motion being given to the dish to make it cover at almost the same instant the whole of the film. All splashing must be avoided, so as to have as few bubbles formed as possible.

The dish is now gently rocked, so as to keep the solution in motion, and the result is closely watched.

After a time, which may vary from five seconds to half a minute, a change will be seen to take place on the surface of the plate, which at first was quite white. Certain portions will be seen to darken. These are the high lights of the picture. To return to our example, the whitewashed wall or line of white clothes: next will appear the half-tones, probably the sky appearing first after the white objects just mentioned. Now we can judge whether or not our exposure has been correct. If it has, the whole of the plate will darken more or less, or, as it is said, will be "full of detail," except those parts representing the portions of the landscape which appeared to the eye quite black. These and these only will remain white, or very nearly so. If large portions of the negative remain white, it is a sign that the exposure has been too short. If the whole of the surface blacken, it shows that the exposure has been too long.

After it would appear that all action of the developer has ceased, which will probably be after a minute or two, we have to do what is the most difficult thing in connection with development, or indeed with the whole of dry-plate photography — we have to judge whether or not the density of the negative is sufficient. It will readily be understood that to get a print of the

desirable brilliancy from our negative the most opaque parts of it must have just a certain definite amount of opacity, not much more and not much less. We can, of course, only tell this by looking through the negative. To do so we take it out of the dish and hold it between our eyes and the ruby light. To judge of the correctness or otherwise of density requires some practice, as there is a certain loss during the after processes. We may say here that the very densest portions should appear nearly if not quite opaque. If they do not the plate is returned for a time to the solution, and is again examined after the lapse of half a minute or so. When the density is sufficient development is complete.

The plate is now taken from the dish and is well washed for a minute or two under the tap, or by pouring water on it from a jug. It is then placed in the alum solution, where it remains for five minutes. It is taken out and is again thoroughly washed. If the back of the plate be observed at this or any previous stage it will be found that it is still quite white. After the second washing the plate is placed in the dish containing the fixing solution. The whiteness will gradually disappear. When it is quite gone light may freely be admitted, but the plate must still be kept for a few minutes in the solution. In fact, a very long time in either the alum or fixing solution will in no way hurt it.

The negative is now complete, and requires only to be washed and dried. The washing should be very thorough. The plate should be kept in running water, in one of the zinc tanks made for the purpose, for at least an hour. It is then reared on edge in a plate-rack in any dry place to dry. Heat must on no account be applied.

If the beginner be able to secure a good negative to make comparison with, it will be well for him to notice whether the density of his is equal to that of the other, and be guided by the result in developing the next plate.

The plate which has received the longest exposure should be developed immediately after the first one, and whilst the action of the developer is fresh in the memory of the operator. A new quantity of solution is used. The image will come up more quickly than the first.

If the stop used with the lens has been as small as the smallest usually sent out with landscape lenses it is probable that the first plate will have been considerably under-exposed,—that is to say, there will remain after development considerable portions which have not been blackened. The second plate will very likely show signs of over-exposure,—that is to say, no portions of the film will remain quite, or nearly quite, white. It is, however, to be remembered that unless the deepest shadows darken or "veil over" very much indeed, this latter fault is not so grave as the other. In fact, the best result is produced when no portion of the plate remains *quite* white.

It should be noted that it is best to mix a fresh developer for every plate. The alum and hypo solutions may be used several times, but when they begin to be discoloured they should be replaced by fresh.

The object of the alum solution is to harden the gelatine film on the plate, and to improve the colour of the negative. It is quite possible to dispense with the use of it, but it is not desirable.

The object of the fixing-bath is to dissolve away such bromide of silver as is not reduced or blackened by the combined action of light and the developer.

We have described the process of development as taking place immediately after exposure. It must be borne in mind, however, that there is no need for this. It may be delayed for a very considerable length of time; how long is not known with certainty, but at any rate for some months. Thus the amateur may, if he be away from home, keep all his plates for development till he returns.

CHAPTER VII.

DEVELOPMENT (*Continued*).

Compensation for Under and Over Exposure.

We have so far been considering merely a case of "normal exposure" and "normal development," but we must go farther than this and give examples of abnormal exposures and the corresponding variations which require to be introduced in development to correct these.

One of the greatest advantages of dry plates is that, although there certainly is for every subject a correct exposure, any considerable deviation from which is to be as far as possible avoided, still it is quite possible to correct or compensate for considerable differences from this "normal exposure," as it is generally termed.

Thus if the normal exposure for a certain subject were ten seconds—that is to say, if ten seconds were the exposure which, with the developer as commonly mixed, would give the very best result—it would be quite possible, by somewhat varying the manner of mixing the solutions, to get an equally, or almost equally, good result with an exposure as short as seven or eight seconds or as long as sixty seconds, or even possibly longer.

This power to compensate gives what we term "latitude of exposure," and is one of the most useful powers which we possess in working dry plates, because it is impossible to judge with certainty of the intensity of light, and could we not compensate in some way for a slight error it would only be on rare occasions that we could have a perfect negative.

This compensating for under or over exposure is the chief reason for ever altering the proportions of the solutions used in development; but there is still another. The nature of the subject to be treated varies very much. We have some subjects which tend to give very strong contrasts of light and shade, whilst others exhibit no such strong differences of brightness. As an example of the first we may return to our old illustration, where we had side by side a whitewashed wall and a tree with widespreading branches and deep shadows. As an example of the other we may take an open landscape, a scene with possibly a river in the foreground, and beyond that roads and houses all brightly lighted. Now, were the plates exposed on these two very different subjects developed in precisely the same manner, the result would probably not be satisfactory. The first would make a chalky picture, in which the wall came out in a pure white mass showing no detail, the tree a deep black mass showing also almost no detail. The second would not show contrast enough, but would be flat and wanting in sparkle.

It is necessary then, at any rate occasionally, to vary the developer to suit the subject, even if the exposure have been correct.

Before going into these questions of variation of

developer we must say a few words on the functions of the various chemicals of which the developer is made up.

The three constituents are: (1) pryogallic acid; (2) ammonia; (3) bromide of ammonium. The function of the nitric acid is merely to preserve the pyrogallic acid.

This latter is the true developer. It is possible, if sufficient exposure be given to the plate, to develop with a solution of pyrogallic acid only, but not with either of the other chemicals.

The greater the portion of pyrogallic acid used, the denser will be the negative; but the addition of pyrogallic acid beyond what is necessary to make the image appear does not tend to increase the amount of detail which can be brought out on the plate.

The ammonia greatly increases the energy of the action of the pyrogallic acid. A certain quantity of it is necessary to secure sufficient density with normal exposure, but any increase beyond this has the effect of bringing out more detail until a point is reached where the developer has so much energy that it will reduce or blacken a film even when it has had no exposure to light.

The effect of the bromide of ammonium is to restrain the action of the developer. It may at first be thought strange that there should be added to the pyrogallic acid, first, a chemical to increase the energy of its actions, then another to restrain it, and it might be supposed that these two would merely counteract each other. This is not the case, however. The chief effect of the ammonium bromide is to make the action of the developer *slower* merely, but not to prevent it from ultimately doing its work. When in considerable quantity, how-

ever, it does actually counteract the effect of the ammonia. If a developer be used without bromide as a restrainer the action is so rapid that it cannot be watched, and it is consequently not under control. If very little ammonia be used with the idea of preventing this very rapid action, then sufficient density is not gained.

The result of increasing ammonium bromide is to make the action of the developer much slower, to keep back detail, and to increase the density of the image.

Now we will see how we can alter the proportion of our developer so as to suit different circumstances. The solutions are so mixed that the bromide and the pyrogallic are together, as these are in some respects similar in their action.

If we have under-exposed we have merely to increase the quantity of No. 2—the ammonia solution, and we shall increase the energy of the developer and thus bring out more detail. The power of the ammonia is, however, limited. When increased beyond a certain amount the effect is, as we explained before, that even those portions of the plate which have received no impress of light are blackened, the result being to produce a foggy negative which is useless.

On the other hand, if we have over-exposed we have merely to increase the proportion of the pyrogallic solution (No. 3), when we prevent the appearance of detail on account of the bromide, whilst at the same time the increased pyrogallic acid enables sufficient density to be gained. Unlike the last case, there is scarcely any limit to the amount of compensation which is possible in the case of over-exposure. It will thus be seen that where we are at all doubtful of what exposure

to give, we had better err on the side of over-exposure rather than under-exposure.

So far we have indicated the variations in the developer which it is necessary to make to compensate for errors of exposure, and it is evident that there is no difficulty involved if we know whether we have exposed too little, or too much, as may often be the case after we have developed the first of a series of plates which have been exposed at the same time.

It very frequently happens, however, that we have to develop plates concerning which we are quite uncertain as to whether the exposure has been too little, correct, or too much. We now describe the procedure to pursue when we are thus uncertain. First we will take the case which is common, for example, in studio work, where we know that our exposure cannot be *much* too little or too great. In this case we begin with the normal developer, but have in readiness the vessel containing No. 3. We watch the process very closely to see the first symptom of over-exposure. When a plate is over-exposed this is indicated by the manner in which the details appear. The high lights are a little quicker in showing themselves, and after they do so, the rest of the details, instead of coming up gradually in the order of their brightness, appear rapidly one after another, so that in the case of a very much over-exposed plate the whole surface darkens within a few seconds of the time when the high lights appear.

Whenever the operator observes by this quick coming up of detail that his plate is over-exposed, he pours away the solution that covers it, and pours No. 3 into the dish in place of it. This will stop the further appearance of

detail, but will allow density to continue increasing, and it is quite possible that the development may be thus completed. If, however, there appear to be insufficient detail the solution in the dish is emptied into a measure, and a little of No. 2 is added, and the solution repoured over the plate.

If, on the other hand, the high lights have been slow of appearing, and shortly after they do come action ceases, leaving large patches of unblackened film, this indicates under-exposure, and a certain quantity of solution No. 2 must be added as described above. The addition of this may be continued until the desired effect is produced, or until there is two or three times as much of No. 2 in the developer as there is of No. 3. It is not safe to go beyond this or fog will probably result. If sufficient detail be not by this time gained it may be assumed that the plate has been so much under-exposed as to be useless.

We now take the case which is very common in landscape work, where we do not know but that our plates may be very much over-exposed indeed. It would now be dangerous to begin with the normal developer, as detail would flash out before we had time to pour off the one solution and pour on the other. We now start with a solution consisting of one part of No. 2 and three parts of No. 3. For example, if we are about to develop a quarter plate we will take half an ounce of No. 2 and one and a half ounce of No. 3. With this developer the image will appear but slowly even if the plate has been over-exposed, and very slowly if it has been correctly exposed. Only practice enables us to be able to tell at once from the rapidity with which the image appears whether we have

over-exposed, under-exposed, or correctly exposed. If the former be the case we may continue development with the solution as we began with it, or even may increase No. 3 if it appears that the exposure has been very much too great. If the exposure appears to have been correct we add No. 2 till we have as much of it as there was of No. 3. If it appears to have been too short, we have to continue adding No. 2 as described before.

We have now only to explain how it is, at times, desirable to vary the developer so as to suit different subjects.

A consideration of what we said with regard to the properties of each of the constituents of the developer will show that, apart from considerations of exposure, the effect of increasing No. 3 in proportion to No. 2 is to increase density or contrast, whilst the effect of increasing No. 2 in proportion to No. 3 is to reduce contrast. All that we have to do then, if we have a subject in which contrast is excessive, and from which we expect to get a chalky print, is to increase the quantity of No. 2. If, on the other hand, our subject presents but weak contrasts we have to increase No. 3. We may thus at times, even if exposure has been correct, use the two solutions mentioned in proportions of three or four parts of one to one part of the other.

Some operators like to have in readiness, besides the solutions mentioned, a concentrated solution of bromide of ammonia and a strong mixture of ammonia and water. These may be useful in certain circumstances. One ounce of bromide of ammonia may be made up with water to ten ounces, and a mixture may be made of one ounce ammonia to nine ounces water; these will then each be ten per cent solutions.

CHAPTER VIII.

VARIATIONS IN DEVELOPMENT.

FERROUS OXALATE DEVELOPER—SODIC SULPHITE DEVELOPER—SODA AND POTASH DEVELOPERS—HYDROKINONE DEVELOPER.

Ferrous Oxalate Developer.

THE developer which we have described, and which is usually called the "alkaline pyrogallic developer," or, for the sake of brevity, simply the "alkaline developer," is the one which is the most popular in this country, and is admitted by almost all to be the one which allows the greatest latitude of exposure, and admits of the greatest amount of variation to suit different classes of subjects.

The ferrous oxalate or iron developer is, however, by far the most popular on the Continent, and with some few photographers in this country, and certainly it has some advantages.

Were the negative, instead of the print, the end at which the photographer aims, certainly the iron developer would be the one to adopt. The colour of the image given by it is very much more pleasing to the eye than is the colour given by the alkaline developer. Moreover, the manipulations are cleaner. It is quite

true that with ordinary care it is possible to work the alkaline developer without staining the hands, and it is also true that the stain even if made is not as indelible as a silver nitrate stain. The oxalate developer has, however, this advantage that it produces no stain at all.

The following chemicals are required for this developer :—

Sulphate of iron.

Oxalate of potash.

Bromide of ammonium.

Of the first two of these saturated solutions in water are made,—that is to say, as much of each of them is dissolved in water as it will take up.

This may be done in the following manner :—

A pound of protosulphate of iron is placed in a pint bottle. Over this is poured hot water almost to fill the bottle, and the whole is shaken till as much of the crystalline substance as will dissolve has done so. As the solution is used water may be added, the bottle being shaken each time that this is done.

The very same process is gone through with a pound of oxalate of potash.

It is quite true that this plan of using saturated solutions is not a very accurate one, as the amount of the chemicals which remains dissolved varies with the temperature. It appears, however, to be quite good enough for all practical purposes.

The solutions must, of course, not be used till they are cold.

The bromide of ammonium may be used in a ten per cent solution, as was described at the end of the last chapter.

We now have—

No. 1. Saturated solution of protosulphate of iron.

No. 2. Saturated solution of oxalate of potash.

No. 3. Ten per cent solution of bromide of ammonium.

Nos. 2 and 3 will keep indefinitely. No. 1 will keep for a considerable time in a well-stoppered bottle, but not indefinitely. It should be of a bright green colour. If it turns reddish it is a sign of deterioration.

Just before we commence development we take two ounces of No. 2; into this we pour half an ounce of No. 1; immediately the solution assumes a beautiful ruby-red colour, due to ferrous oxalate, which is formed.

Development is performed with this solution precisely as with the alkaline developer, but will, as a rule, be found to proceed more slowly. It is necessary also to make the apparent density of the negative somewhat greater than with the alkaline developer, as the colour of the film is less non-actinic. The time taken with most subjects will be about from three to five minutes.

It is not in most cases necessary to use any bromide of ammonium at all, unless the plate has been over-exposed, when a little is added to the developer to restrain its action. Many operators, however, prefer to have a little bromide in the solution in all cases, as clearer shadows are thereby obtained; but, as the restraining action of bromide is much more energetic in the case of the iron developer than is that of the alkaline, a less quantity is sufficient. Not more than about two or three drops of the ten per cent solution should be added to each ounce of developer unless there has been decided over-exposure. Ten drops to the ounce is

enough to compensate for very considerable excess of exposure.

With the oxalate developer there is no accelerator which can be used as ammonia is with the alkaline developer, but a slightly similar effect may be brought about by using a little hyposulphate of soda.

It is best to prepare a very weak solution of this. One containing five grains to the ounce of water is sufficient. A few drops of this added to the oxalate developer brings up somewhat more detail on a plate, but great care must be exerted or a reversed action will commence which will destroy the negative. More than twenty minims of the weak solution mentioned should never be added to each ounce of the developer.

Unlike the alkaline developer, the ferrous oxalate may be used to develop several plates in succession without the mixing of a fresh solution, if more than an hour or two do not intervene. By long exposure to the air, however, the strength of the developer is lost.

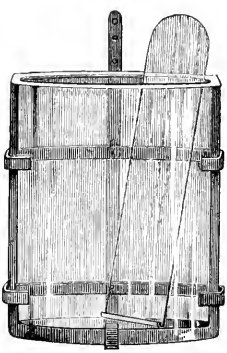
A more concentrated and consequently more energetic oxalate developer may be made in the following manner :—

A bottle—holding, say, a pint—is nearly filled with a saturated solution of oxalate of potash. The whole is slightly warmed, and protosulphate of iron is dropped in in crystals. The bottle is shaken to dissolve these, and more crystals are added till no more will dissolve. The solution will keep for some weeks in a tightly-stoppered bottle.

The operation of development with ferrous oxalate is, as we indicated, much cleanlier than that with alkaline pyro. For this reason it is likely to be a

favourite with many, and especially with ladies. We shall therefore briefly describe how it may be used so as to secure the greatest latitude of exposure which it is possible to have with it.

For the method of working which we are about to describe, three "dipping baths," large enough to hold the plates to be developed, are required, and one dipper. We illustrate a dipping bath. It will be seen that it is



simply a vertical vessel so shaped as to hold a plate surrounded with solution. The best material is glass. The dipper is a little piece of apparatus for lowering a plate into the bath.

We shall call the baths Nos. 1, 2, and 3.

Into No. 1 there is poured concentrated ferrous oxalate solution, made as just described.

Into No. 2 is poured the ordinary ferrous oxalate developer, made as described first of all.

Into No. 3 is poured the same developer as goes into No. 2, but there is added ten minims of the ten per cent

solution of bromide of ammonium to each ounce of this developer.

When we have a plate to develop and do not feel certain whether the exposure is correct or not, we place it on the dipper and lower it into bath No. 2 or 3, according to the amount of our uncertainty. If we know that our exposure cannot be very much wrong it goes into No. 2. If all proceeds satisfactorily it remains there till development is complete. If exposure appears to have been too great it goes into No. 3 to be finished. If it appears to have been too little it goes into No. 1.

If we are very uncertain of our exposure, and think that it may have been very much too great, we commence with No. 3. It is less necessary to use the alum solution after ferrous oxalate development than after alkaline pyro. The fixing is performed in exactly the same manner in the one case as in the other.

Sodic Sulphite Developer.

The brownish or yellowish colour which a gelatine plate negative, which has been developed with the ordinary alkaline pyro developer, exhibits is considered objectional by many.

To avoid it an addition to the developer was proposed by Mr. Herbert Berkeley some time ago, and the result obtained by his modification is certainly very excellent.

The addition consists of sodic sulphite or sulphite of soda, which is used in the proportion of four parts to every one part of pyrogallic acid.

The stock solutions may be mixed in the following manner :—

No. 1.

Pyrogallic acid	1 ounce.
Bromide of ammonium . . .	600 grains.
Sulphite of soda	4 ounces.
Citric acid	60 grains.
Water, up to	12 ounces.

No. 2.

Strongest liquid ammonia (·880) .	3 drachms.
Water	1 pint.

No. 3.

No. 1	2 ounces.
Water	18 ounces.

No. 1 is mixed in the following manner: The sulphite (not sulphate) of soda is dissolved in eight ounces of water, a little heat being used. The citric acid is added. The solution is poured over the pyrogallic acid and bromide of ammonium, and is then made up to twelve ounces with cold water.

Solutions Nos. 2 and 3 are used precisely as the solutions of the ordinary developer which bear the same numbers.

Development will be slightly slower, but the result will be a negative of a very fine black colour.

Soda and Potash Developers.

Some operators prefer to use common washing-soda or caustic potash instead of ammonia. It would appear that thereby a slightly shorter exposure may be given. For this developer solutions may be mixed as follows:—

No. 1.

Pyrogallic acid	1 ounce.
Nitric acid	20 drops.
Water, up to	6 ounces.

No. 2.

Carbonate of soda (common washing-soda)	6 drachms.
Water, up to	1 pint.

No. 3.

No. 2	1 ounce.
Water	19 ounces.

Or,

No. 1.

Pyrogallic acid	1 ounce.
Bromide of ammonium	600 grains.
Nitric acid	20 drops.
Water, up to	6 ounces.

No. 2.

Caustic potash	3 drachms.
Water, up to	1 pint.

No. 3.

No. 1	1 ounce.
Water	19 ounces.

These solutions are used precisely as the ordinary solutions.

Hydrokinone Developer.

Two or three years ago Captain Abney recommended hydrokinone as a developer instead of pyrogallic acid. At that time the substance was so dear as to prohibit its being used except experimentally. Now it is comparatively cheap, and the developer is becoming a popular

one. It may be used without a restrainer, and when first it was described it was claimed for it that it would enable plates to be worked with from one-half to one-third the exposure required when the ordinary developer is used.

It would appear that this is a mistake; nevertheless some prefer the developer to any other. It is at least worthy of a trial by those who are of an experimental turn.

Solutions may be mixed as follows:—

No. 1.

Hydrokinone	½ ounce.
Nitric acid	20 drops.
Water, up to	6 ounces.

No. 2.

Strongest liquor ammonia (·880) .	80 minims.
Water	1 pint.

No. 3.

No. 1	1 ounce.
Water	19 ounces.

No. 4.

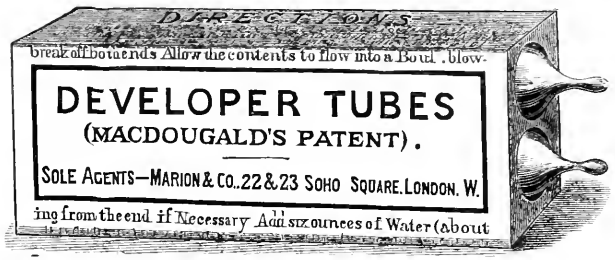
Bromide of ammonium . .	1 ounce.
Water, up to	10 ounces.

Nos. 2 and 3 are used as with the ordinary developer when exposure is normal. No. 4 is only to be used in cases of over-exposure when a few drops are added to the developer.

This may be a good place to illustrate and briefly describe "MacDougald's Patent Developing Tubes."

These consist of two glass tubes with closed ends

and fitted into a solid block of wood, so that they can be carried in the pocket or sent per post without fear of breakage. One contains the "stock solution" No. 1, given on page 36. The other contains—in a concentrated form —the "stock solution" No. 2, given on the same page. It



is simply necessary to break the tubes and to dilute the solutions with water, when we have all ready for immediate use—the stock solutions Nos. 2 and 3 of page 36. The tubes are made of two sizes. In the case of the smaller size the contents of each tube is diluted to six ounces with water, in the case of the larger to twelve ounces.

When travelling at a distance from home, or even when near home, in the case where we wish to develop in the field, these tubes will be found specially useful, it being difficult or inconvenient to carry the solutions in the ordinary form.

CHAPTER IX.

DEFECTS AND REMEDIES.

No photographic manual would be complete without a description of the defects which may occur in the production of negatives and the remedies which may be applied. Now that the manufacture of dry plates has reached the state of perfection that it has, by far the greater number of defects which occur are due to faults in manipulation. Here we must remark that beginners, and occasionally too those who are not beginners and ought to know better, are very liable to lay the blame of faults on the plates when they themselves ought in reality to bear it.

Of the defects which, for the sake of completeness, we mention as existing in plates, few will ever be come across in the present day, whilst we think we may say with confidence that none of them will be found in the Britannia plates, as every batch of these is tested, not only by ourselves, but by an independent photographer, before a plate is allowed to go to the public.

If the enthusiasm of the amateur at any time reach such a pitch that he determines to make his own plates, he is likely to meet with any or all of the faults which we describe.

General Fog.

When we described the development of a plate we said that small portions of the film should remain quite white, and after fixing should appear quite transparent. If there be no such transparent portions, but on the contrary every portion of the plate be more or less opaque, it is said that there is fog; and according as the least opaque portions are of the same colour as the denser or are of a different colour, the terms "general fog," "green fog," etc., are applied. General fog may be of any degree of intensity, from the smallest possible veil over the shadows to such density that the whole negative is almost opaque. It almost always exists in a gelatine negative to a slight extent, and in fact a negative which shows *absolute* clearness in any part is not so good as one which shows a *very* slight veil.

Apart from a defect in the plates rarely met with in commercial articles of the present day, the fog must be due either to the access of light at some time or another or to development. Most probably it is due to the first-mentioned cause.

Light may act in either of the three following manners: First, by an unsafe light in the dark room; second, by a defect in the camera; and third, by over-exposure.

If the plate after fixing be examined and it be found that the portions which are protected in the camera by the wires or rebates of the dark slide are clear, then we know that the fog-producing action is exerted in the camera, and must be either one or other of the following. There must be a defect in the camera, or the plate must have been over-exposed.

To judge which it is, the cap is placed on the lens; the camera is placed in the most brightly-lighted spot which can be found, the ground glass is removed or hinged back, the photographer covers his head with the focussing cloth and looks for any hole which may admit light. A few seconds' examination is not sufficient. He must keep his head under the covering till his eyes have become accustomed to the darkness before he can be sure that there is no defect. If there be one discovered it has of course to be made good. If there be none, the dark slide must be examined, and if this also be perfectly light-tight there can be no other assumption but that over-exposure has been the cause of the fog.

If it be found that the protected portions of the plate have fogged as well as the others, then it may be assumed that the fog is produced either by unsafe light in the dark room, by error in development, or is due to defect in the plates.

To discover which of these it is we may develop an unexposed plate in total darkness. This is easily done, the operations being guided by feeling alone. The plate need be only developed and washed. Fixing is unnecessary. If there be still fog it is due to either faulty plates or faulty developer. If there be no fog this time it may be assumed that the fog which was visible before was produced by unsafe light in the dark room. To corroborate this a plate is placed in the dark slide. The shutter of the slide is drawn half-way up, so that one half of the plate is exposed to the light of the dark room. The slide is placed in the position usually occupied by the plate during development, and is left there for three to five minutes. The plate is now developed. If the half

which was unprotected by the shutter of the dark slide blacken, it is proof positive that the light in the dark room is not safe. The red and all other lights are extinguished, and the photographer looks for any chink or cranny which might admit white light. If he finds none the assumption is that he is using too much red light. It must be understood that dry plates are slightly sensitive even to red light. An unlimited amount of this must therefore not be used. The lamp must be turned lower or the developing dish must be placed farther from it during development.

If fog has appeared on the plate developed in total darkness, we must try the effect of mixing a little fresh developing solution, being very careful to adhere to the instructions given. We remember a case of one amateur who had persistent fog, and eventually discovered that he had forgotten to put any bromide of ammonium into the No. 1 solution. Another discovered at last that he was using *ounces* of strong liquor ammonia instead of drachms! If the developing solution is certainly correct, then the plates are at fault.

Colour Fog.

This includes red, brown, yellow, and green fog, all of which appear to be different degrees of the same disease, the first-mentioned being the most malignant variety, the last-mentioned the least so. It is unusual in the present day to meet with any but the green fog. When a negative showing the defect is examined by reflected light, a dark object being behind it, the shadows or most transparent parts appear of one or other of the three last-mentioned colours—brown, yellow, or green.

If the case be a bad one, on looking *through* the plate these shadows will appear of a red colour, the intensity of which may vary from ruby to a faint pinkness. If the defect be the slight green fog which may be met with under certain circumstances in the case of the best of plates, it is not visible by transmitted light, and is quite harmless.

In good plates colour fog makes its appearance only when insufficient exposure has been given, and excessive forcing with ammonia has been resorted to, and then particularly in hot weather. The remedy is to give ample exposure, or to use ferrous oxalate developer, with which latter the defect is never visible unless the chemicals be impure.

Frilling.

In the early days of gelatine work frilling was one of the commonest of defects. The film of gelatine adhered so loosely to the glass that it *frilled* off when washing was being performed. The frilling generally commenced at the edge of the plate, and extended inwards, possibly only a quarter of an inch, possibly to the very centre of the plate. As the frilled portion stretched it could not be caused to lie flat on the plate, but, if the attempt were made, folded itself into wrinkles and spoiled the negative. At times frilling commenced in the centre, and the film rose in blisters.

At the present time frilling seldom makes its appearance unless very soft water be used for washing. If only soft water can be had, a few grains of Epsom salts should be added to each ounce of it, and the alum bath should be used without fail.

Flatness or Thinness of Image.

With good gelatine plates there is never any impossibility in obtaining plenty of density or opacity, but it is quite likely that an error of judgment may be made, especially if the plate has been over-exposed, and the development may be stopped too soon. In this case it is necessary to intensify the plate,—that is to say, to increase the density of the image.

The following solutions are prepared :—

A.

Water	1 quart.
Bichloride of mercury . . .	5 drachms.
Bromide of potassium . . .	5 drachms.

B.

Water	1 quart.
[1] Cyanide of potassium . .	5 drachms.
Nitrate of silver	5 drachms.

After fixing, A is poured over the plate in a developing dish till the film appears to be whitened or bleached through its entire thickness. A very thorough washing follows, and then B is applied till the required density is got. Again the plate is thoroughly washed.

It is well, if a plate be found on printing to require intensification, to give it quarter of an hour or so in the fixing-bath first (afterwards washing). Intensification often reveals the fact that a plate, which appeared to be thoroughly fixed, is in fact not.

[1] Cyanide in crystals is the only kind that will answer the purpose.

Too Great Density of Image

is an error of the precisely opposite nature to that described last. It occurs if the development be allowed to go too far.

A solution of thirty grains of ferric chloride in three ounces of water is prepared. The plate is placed in a flat dish, and the solution is allowed to act on it for a short time. The plate is then washed and is placed in the fixing solution. It will now be found that the density of the image is considerably reduced. If it be not sufficiently so the operation may be repeated.

Spots.

Various kinds of spots appear in the finished negative at times. Opaque spots are due to defect in plates. Transparent spots with irregular outlines are also due to defect in the plates.

Perfectly circular transparent spots with well-defined outlines are due to bubbles in the developer adhering to the film; they are liable to occur if too little solution be used. If the photographer be much troubled with this defect he should use a broad camel's-hair brush in development, sweeping it across the plate immediately after the solution is applied.

Flare Spot.

Sometimes it will be noticed in the case of a landscape negative that the central portion of the plate for a space of possibly a third of its length is fogged, whilst the rest remains clear. This defect is called "flare spot." It is due to a defect in the lens, and makes itself evident in

the case of certain subjects. If there be a very bright light ahead, as, for example, may be reflected from the sky, and at the same time there be very deep shadows, so that a comparatively long exposure is necessary, the defect may be seen. It scarcely ever occurs except when a lens of the kind known as the single achromatic is used. The lens may be so altered as to make it cease giving a flare spot by slightly changing the distance between the stop and the glass.

Ghost Images.

This is a defect somewhat similar to the last. If a subject consist almost entirely of dark shadow, but with a few points of very bright light, as, for example, would be the case with a cathedral interior in which there were small windows through which the sky could be seen, a second faint image of the bright spots may be impressed on the films. This second image would appear to be due to reflection from some part of the glass of the lens. When a subject such as the one we have described is attempted, we should avoid the use of a lens which we find produces the defect.

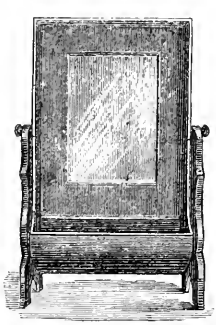
Brown Colour of the Negative.

Sometimes a negative, instead of showing a black or olive-green colour in the densest parts, shows a brownness in these, and a yellowness in the parts which ought to be transparent. This defect is to be distinguished from the yellow variety of colour fog by the fact that it is visible only by transmitted light and not by reflected light at all. It does not in any way affect the quality of the print which is got from the negative, but it

greatly protracts the time taken in printing. It occurs if alkaline development have been continued for a very long time, and if the alum bath have not been used between development and fixing. To get rid of it we take half a pint of the alum solution, and pour half an ounce of hydrochloric acid into it. If the plate be dipped in this solution for a few minutes the brown or yellow colour will disappear. The plate must be afterwards very carefully washed.

Lines across the Negative.

If the developing solution has not been caused to flow in one wave across the plate, but has left one portion of the film dry whilst another has been wetted with the developer, the result is that there is a line which distinctly marks the outline of the wetted portion. A camel's-hair brush, used as we directed to prevent air-bubbles, will also prevent this defect if the operator has not enough skill to avoid it otherwise. A better



plan is, however, to make use of the rocking developing-dish, which we here illustrate.

In this not only is there the advantage that there can be no difficulty in flowing the developer, but besides this the negative may be examined in regard to density without removing it from the dish.

It will be seen that the apparatus consists in a dish suspended on "trunnions," so that it may rock, and having a trough at one end to contain developing solution. The bottom of the dish is of glass, so that all that is necessary to watch the course of development is to raise the dish till it is nearly vertical, when we may look through the plate at the red light.

Florescent Appearance of Films.

It will sometimes be found after a negative is finished that there is upon it, and particularly towards the edge, a peculiar florescent or metallic lustre; the negative appears at these places somewhat fogged when examined by transmitted light.

This occurs if the plates have been kept for a long time—say, many months—in an impure atmosphere; for example, if they have been kept on a shelf near the roof of a room in which much gas is burned. The defect is, so far as we know, incurable. To prevent it, the plates, if they are to be kept for long, should be stored in an attic or some such place where the air is pure and dry. They will there keep for a very long time; we do not know for how long, but certainly for a time measured by years. Dampness is to be particularly avoided. Heat to any moderate extent appears to be harmless.

A Powdery Deposit on the Films.

This sometimes occurs after ferrous oxalate development. It also may occur in the fixing bath if the negative have not been sufficiently washed after the alum bath. The cause is different in the two cases. In the first case the deposit may be removed by placing the negative in a mixture of one pint of water to a quarter of an ounce of hydrochloric acid. In the other case it is to be avoided by thorough washing of the negative after it has come from the alum bath.

Halation.

Sometimes when particularly trying subjects are photographed a peculiar defect is produced which goes under the name of "halation" or sometimes "blurring." If there be a very bright part in a scene which is so dark in parts as to require a long exposure, halation will be visible round the bright spot. The case which we gave as an example of a scene from which a ghost image might be expected will do as an example of one which will possibly give halation also. Around the dense portions of the negative which represent the windows there will be found a halo of fog, extending to possibly only one-eighth of an inch, possibly to one or two inches. In the print this shows as a light halo, and the effect is very disagreeable.

Where subjects have to be treated in which there are very bright parts in close juxtaposition to deep shadows, the plate, before exposure, should be laid face downwards on a pad of clean blotting-paper, and over the back of it

there should be brushed a solution of bitumen in coal-tar naphtha. The precise strength of this solution is not of importance, but it should be of such strength that when spread on glass the film is nearly opaque.

The application of the solution prevents reflection from the back of the glass plate. Before development the "backing" is rubbed off by the help of a rag dipped in coal-tar naphtha.

Solarization.

This curious defect is seen when the conditions mentioned as giving rise to halation are present in an extreme degree. The appearance is sometimes entitled "reversal of the image," and this term well describes it. The very brightest parts of the subject, instead of being represented by great density in the negative, are represented by comparatively transparent portions. In fact a *positive* is produced instead of a negative. In the days of collodion dry plates reversal of the image was very common; so much so that at times the sky would be a positive whilst the landscape was negative. With gelatine plates it only occurs in very extreme cases. If, however, for example, the sun be included in the negative there may be reversal. If it be suspected that there may be such the only precaution which can be taken is to use a somewhat increased amount of bromide in the developer and to keep the solution in very rapid motion during development.

Reversal may be produced if too much hyposulphite of soda be added to the oxalate developer to accelerate its action.

CHAPTER X.

PHOTOGRAPHIC OPTICS.

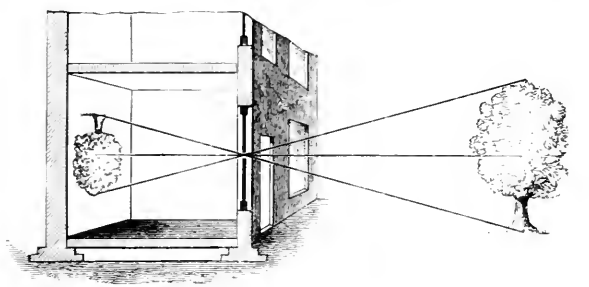
We do not intend to enter at all deeply into the subject of the principles involved in the chief instrument used in the photographic art,—namely, the lens; but to give very simple explanations of the why and wherefore of certain properties which it possesses, and of certain of the manipulations connected with it.

If a room be completely darkened, and if there be made in the shutters of the window a small hole so bevelled away on each side that it shall not be in the form of a tube, we shall have on the wall opposite an inverted image of any brightly-lighted object which may be over against the window.

Here we see opposite the shutter with a hole in it a tree. From every point in the tree there passes in a straight line through the hole and against the wall opposite a beam of light. We show in our sketch three such beams, and all three go to make up an image of the tree on the wall.

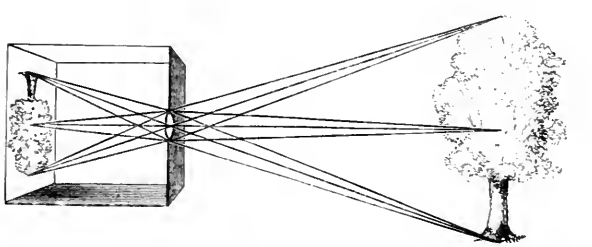
We should here have a very perfect camera obscura but for one circumstance. The hole in the shutter must have some definite size. The consequence is that the rays reflected from a point of the tree do not come to-

gether at a point on the wall, but spread over a disc a little larger than the hole in the shutter. If we make



the hole very small, so as to get sharp definitions, we let through so little light that the image is scarcely visible at all.

What we want in this case is a *lens*. The effect of placing a lens in the hole will be that, although the opening is of large size, the rays of light will nevertheless meet at a point instead of forming a disc. This we illustrate here.



The lens which we show here is the simplest possible, and is one which, although by its means photographs of a kind might be taken, yet is not by any means a very perfect instrument. Still, however complicated a photographic lens may be, its sole object is to produce the

effect which we have shown here,—that is to say, to bring a set of rays of light which are either diverging or parallel to meet at a point. Photographic lenses are never made of one piece of glass only, but always of two at least, various valuable qualities being thereby obtained.

We must here explain certain terms which are continually used with relation to lenses.

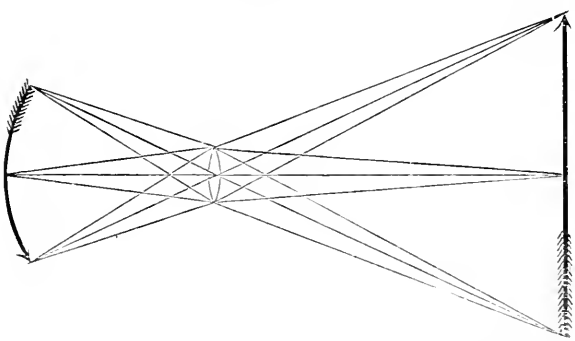
Combinations of a lens.—When a lens consists of several distinct pieces of glass, although these appear each to be only one piece, they are, as a matter of fact, built up of two or even three pieces. Each of these built-up structures is called a "combination," and we speak of the front and back combinations of a lens, meaning those which are nearest and farthest from the object to be photographed.

Aperture is the opening of a lens which admits light. When a stop is used, it is the opening of this. Where no stop is used, it is the opening of the smallest of the combinations of the lens, or, if these be all of the same size, the front one.

Focal length is the distance between the lens and the ground glass where the image is sharply focussed. It is measured from the lens in the case of a single combination one, from the stop or diaphragm in a double combination one. It is common to speak of *focus* instead of *focal length*. When we say that the *focus* of a lens is so many inches, it will be understood that we mean the *focal length*. Unless it is stated to be otherwise, it is to be understood that the focal length of a lens is measured when a *distant* object is focussed.

Flatness and roundness of field.—In the last diagram

which we gave, we showed the various rays of light as if they all met on the flat plane of the wall. As a matter of fact, with the lens which we showed, they would not, but would all meet at points equally distant from the lens, so that a sharp image could only be got by the use of a spherical screen, could such be had. We illustrate this here. The field is said to be round. Certain of

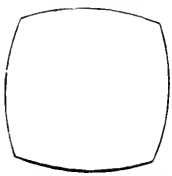


the complications found in photographic lenses are introduced with a view to get rid of this roundness of field, and to give a comparatively *flat field.*

Distortion is produced at times by certain kinds of lenses. That known as the single achromatic, or simply the single lens (see page 81), is the only one which gives this defect to any marked extent. If such a lens be used to photograph any object which is made up of straight lines which are near to its edge, these lines will not appear quite straight in the negative, but will be slightly curved. Thus a square object will appear somewhat like the following cut.

We have exaggerated the amount of the distortion, which is slight even if the square cover almost the whole

of the plate. If it cover only a small portion towards the centre it may be disregarded altogether.



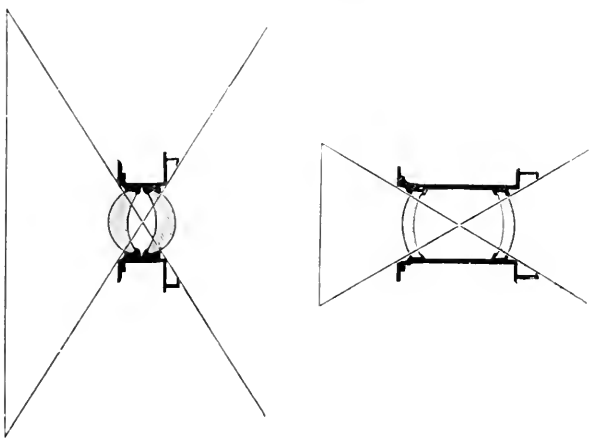
It is almost unnecessary to say that when the subject is such that there are no straight lines—as, for example, in an ordinary landscape—the distortion is not perceptible.

Depth of focus.—The beginner, the very first time that he focussed a landscape or other object, will have noticed that objects whose distance from the camera is greatly different are not in focus at the same time, and that to bring a nearer object into focus he has to increase the distance between the lens and the ground glass. He will also have noticed that this difficulty of getting objects of various distances into focus is greatly decreased when a stop is inserted.

The quality which the stop has introduced is entitled "depth of focus." Depth of focus decreases with the aperture of a lens, and also with its focal length. No other modification (form, etc.) has any effect on it.

Width of angle.—If we cannot get far enough away from an object, but yet wish to include the whole of it in a photograph, we must include in our picture a very wide angle. Certain lenses are so constructed that they will include a very wide angle, and are called wide-angle lenses. The accompanying sketch, which shows, slightly exaggerated, the differences of form which exist between narrow and wide angle lenses, will illustrate the point.

When we want to include a wide angle we must either use a larger plate or a lens of shorter focus than if we wish to include only a narrow angle.



It may be asked, Why not use at all times the wide-angle lens, and simply employ a smaller plate, if we do not wish to include all the angle which it will take in? The reason is this:—The surface of the glasses of a lens which has to include a very wide angle are so ground that even for a narrow angle it will not give definition, unless a small stop be used, and therefore it is at best a slow lens.

Rapidity.—With different lenses the length of the exposure necessary with the same subject and with the same light varies enormously. According as a long or short exposure is required with a certain lens, that lens is said to be slow or rapid.

The relation between the focal length and the aperture

regulates the rapidity of a lens. This we can explain by a very simple illustration. The lens may be considered as *lighting* the ground glass or sensitive plate just as a window would light the wall of a room which is opposite it. Let us imagine a large room lighted by only one small window. We will now notice that if the size of the window were increased the wall opposite would be more brightly lighted, while if the size of the window were decreased the wall would be less brightly lighted. Here we have precisely what takes place when the aperture of a lens is increased or decreased. There is, however, still another means whereby the light on the wall may be increased or decreased, besides increasing or diminishing the size of the window. Let us suppose that the wall opposite the window is not fixed, but is in the form of a movable screen. We are now quite aware that if we move the screen nearer the window it will be more brightly lighted; if we move it away it will be less brightly lighted. If, on the other hand, we both increase the distance between the screen and the window and increase the size of the window proportionately, the amount of brightness will remain the same. Thus, if we increase the size of the window to twice its former size in each direction, and at the same time increase the distance between the screen and the window to twice what it was before, we shall not in any way alter the brightness.

The precise same as this takes place in the case of lenses. If we use two lenses having the same aperture, but one of longer focus than the other—that is, involving a greater distance between the lens and the ground glass—it will give less light on the ground glass or sensitive plate than with the other.

If, however, the *relation* between the aperture and the focal length remain the same, the amount of light or rapidity will remain the same. For example, however different in size two lenses be, if in each the diameter of the aperture is one quarter the focal length, the rapidity will be the same in both cases. This relation between the aperture of a lens and the focal length is usually expressed thus—

$$\frac{f}{4},\ \frac{f}{8},\ \frac{f}{10}.$$

These various expressions would refer to lenses in the first of which the diameter of the aperture is one-fourth the focal length, in the second of which it is one-eighth, in the third of which it is one-tenth.

Now we have in this means of stating the ratio of aperture a means of performing a most useful operation, —namely, of testing not only whether one lens is less or more rapid than another, but by what precise amount it is less or more rapid. That this is a thing most useful to be able to know must be evident. We are continually using different kinds of lenses, and, as we explained before, we require at different times to use various sizes of stops. Now it is most useful to be able to say, when we are about to expose, "On such and such an occasion a subject just like this took so many seconds with such a lens and such a stop; therefore, with the lens and stop which I am at present using I shall have to give so many seconds of exposure."

The calculation necessary to make to be able to do this is a very easy one.

We have only to *square* the denominator of the

fractions $\frac{f}{4}$, $\frac{f}{8}$, $\frac{f}{10}$, etc., when we will have precisely the relative exposures. We would remind those who are rusty in their arithmetic that the denominator of a fraction is the lower figure, and that to square a number is to multiply it by itself. Thus 4×4 or 16 is 4 squared, 8×8 or 64 is 8 squared, 10×10 or 100 is 10 squared. And in the examples given of three lenses, one working at $\frac{f}{4}$, another at $\frac{f}{8}$, and the third at $\frac{f}{10}$, the relative exposures will be 16, 64, and 100,—that is to say, if the first required an exposure of 16 seconds, the others would require respectively 64 seconds and 100 seconds; and if the first required a half or a quarter of 16 seconds—that is to say, 8 or 4 seconds—the others would require respectively a half and a quarter of 64 and 100 seconds—that is to say, 16 seconds and 25 seconds.

Possibly one more case will be useful. We have been working in an ordinary room using a lens of the "rapid landscape" type for portraits. We find that we have had to give 12 seconds. We want to discover what advantage we would gain by using a portrait lens.

We measure the aperture of our landscape lens, and find that it is 1 inch. The distance between the diaphragm and the ground glass we find to be $9\frac{1}{4}$ inches. We may disregard the fraction and say that the lens works at $\frac{f}{9}$. We take a portrait lens and on measurement find that the aperture of the front lens is $2\frac{1}{2}$ inches, whilst the distance between the diaphragm and the ground glass or the focal length is 10 inches. This lens works at exactly $\frac{f}{4}$. We now square 9 and 4 and we

get 81 and 16. The exposures with the two lenses will be as 81 to 16,—that is to say, with the portrait lens they will require a shade less than a fifth of what was required with the landscape lens. The landscape lens required 12 seconds, the portrait lens will require about $2\frac{1}{2}$ seconds. The ability to make this simple calculation might be enough to determine us whether or not to purchase a lens of the last-mentioned description. A little further on is given a table where the average exposures under various conditions are given for different apertures.

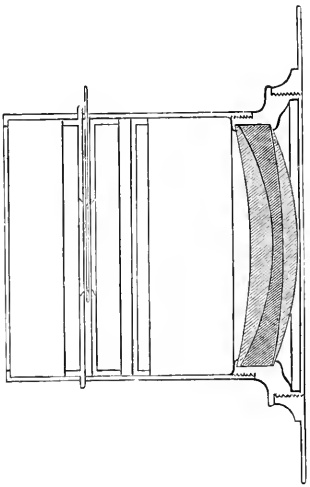
We now pass on to a description of the various forms of lenses which have been designed to suit different kinds of photographic work. We take first of all, as being the simplest, that known as

The Single Lens,

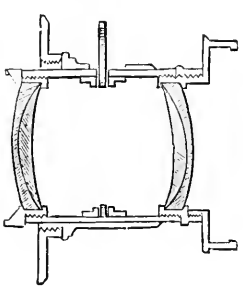
or at times the *single achromatic* or the *single combination lens*. The particular variety of this lens, which we illustrate, is known as the *wide-angle landscape lens;* it differs from all other single lenses inasmuch as there go three pieces to make up the combination instead of two only, as is commonly the case. Certain advantages accrue from this.

The single lens is the most generally useful of all for landscape purposes. Its simplicity of form, there being only two reflecting surfaces, is a great advantage. The definition which it gives is exquisite; it is fairly rapid, its largest aperture being about $\frac{f}{16}$; and it will, if it be desired, include a fairly wide angle. In fact, it will take in far more than is necessary except in certain circum-

stances, which will be described in connection with land-



scape work. Its only drawback is that, as explained before, it will with some subjects give slight distortion.



The Rapid Rectilinear or Rapid Symmetrical Lens.

We here illustrate the lens which bears the above

title. It may be taken as typical of a class of lenses which are generally known as "rapid" landscape lenses. The different kinds vary slightly, but each consists essentially of two lenses like single achromatic lenses fixed a little distance apart, and with the concave sides towards each other. The "rapid" lens is about the most useful of any, and is the one which the amateur should purchase if he wishes to work with one lens only. It will do for any kind of landscape work. It is specially adapted for instantaneous photography. It may be used for portraiture even in an ordinary room if the light be good and it gives no distortion.

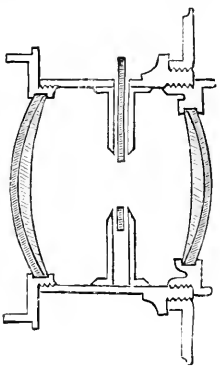
It works with a maximum aperture of about $\frac{f}{8}$, and is therefore four times as rapid as the lens described last. It does not, however, include quite so wide an angle as the wide-angle variety of the single lens. Still, the angle which it will include is enough and more than enough for all ordinary cases.

The Wide-angle Rectilinear and Wide-angle Symmetrical Lenses.

We here illustrate the wide-angle rectilinear lens, which may be taken as typical of a number of lenses which are made to include a very wide angle. They are all constructed of two combinations placed opposite each other, with the concave sides facing one another.

Such lenses should only be used when it is absolutely impossible to get far enough away from the subject to use a lens of longer focus—that is to say, they should never be made to include all the angle which they are capable of doing, unless it is unavoidable. There is no harm

in using for ordinary circumstances a long focus lens of this type so as to take in only a narrow angle, but then



the special property which the lens possesses, and to obtain which other properties are sacrificed, is not utilised at all, and another lens might be used instead.

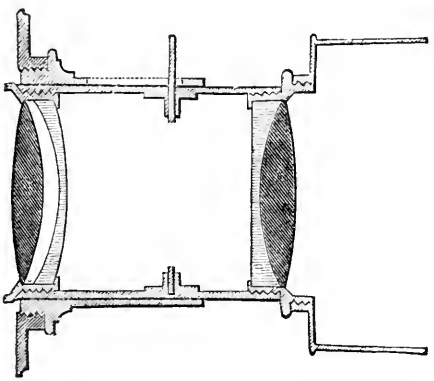
The subjects for which a very wide-angle lens are most useful are chiefly interiors, when it is impossible to get far away from the object to be photographed.

The lenses of this type give no distortion. They are not rapid, having a maximum aperture of about $\frac{f}{18}$. Indeed, they are the slowest lenses which are made, except certain old-fashioned forms of the single lens.

The Portrait Lens.

This lens is the one on which the optician has expended his greater ingenuity. It was the outcome of working the slower photographic processes, which are now things of the past. In it everything has been strained to get rapidity, so that the exposure for portraits might be as

short as possible. Rapidity has certainly been gained. The largest apertures of portrait lenses vary from $\frac{f}{4}$ in the ordinary portrait lens to $\frac{f}{2\frac{1}{2}}$ in the extra rapid portrait lens. It is thus from four to ten times as rapid as the



rapid landscape lenses. At the same time that rapidity has been gained the qualities which are required in a lens to be used for portraiture *only* have not been sacrificed. The definition given through a very narrow angle is exquisite, and the field is fairly flat. The great difficulty in the portrait lens is that, especially in large sizes, the depth of focus is very slight, unless a small stop is used, in which latter case the sole advantage which a portrait lens possesses—namely, rapidity—is sacrificed.

The Group, or Universal Lens.

This lens may be considered as a compromise between the rapid landscape lens and the ordinary portrait lens.

It is not so rapid as the latter nor so slow as the former. It may be considered as a slow portrait lens, whilst on the other hand, if it be used with a small stop, it will include a moderately wide angle, and may be used for landscapes. It works at about $\frac{f}{6}$, and is therefore about twice as quick as the rapid landscape lens and twice as slow as the ordinary portrait lens. We do not consider it necessary to illustrate this lens, as in construction it does not materially differ from those already described.

The Use of One of the Combinations of a Double Combination Lens.

One of the combinations of a double combination lens may be unscrewed and removed, and the other combination being left in its place may be used alone. In this case we get a lens of double the former focal length of the instrument complete, which is often useful if our camera will open wide enough, but we cannot expect to get any but a very slow lens by this device. The combination not being specially ground to work as a single lens will probably not work at a larger aperture than about $\frac{f}{20}$ or even $\frac{f}{30}$.

Either combination may be used, except in the case of a portrait lens, in which case the front combination is the only one which will do.

CHAPTER XI.

OPTICS.

The Use of the Swing-Back—Table of Exposures.

THE use of the swing-back will be found to be referred to both in connection with landscape work and with portraiture. It is therefore advisable that a few words be said in explanation of the function of this very valuable adjunct to the camera.

The very first time that any object was focussed it will have been observed that the nearer the object was to the camera the greater was the distance required between the lens and the ground glass to make the object sharp. In other words, the focus of a lens is longer when a near object is focussed than when a distant one is. Now, if we consider almost any subject which we are likely to photograph, it will be evident that there are in it different parts which are at different distances from the camera. Could we so arrange our ground glass and our sensitive films that those portions which received the impressions from distant parts of the subject were nearer the lens than those which received the impression of near parts, we might have everything in sharp focus even with the largest aperture of any

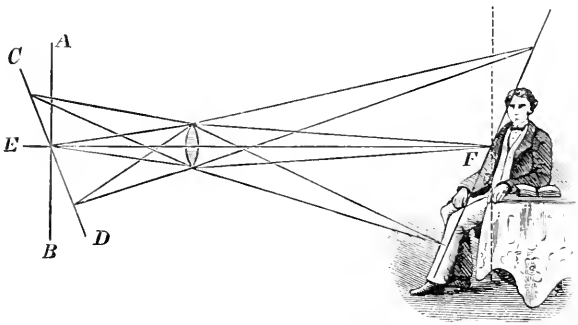
lens. Now something approaching this can be brought about in certain cases. If we have either at the top or bottom of our subject a portion which is nearer the camera than the rest is, or if the same takes place with regard to the two sides, we may have such a state of affairs that, by sloping the ground glass, and consequently afterwards the sensitive film, either backwards or forwards, or to one side or the other, we may get both the nearer and the more distant parts in focus.

The sloping of the ground glass is made possible by what is called the "swing-back." This arrangement is shown in the cut on the chapter on portraiture. It simply consists in causing the back portion of the camera to be movable on a hinge, instead of being rigid. There is of course a means of clamping it tightly after the desired obliquity to the axis of the lens has been given. When the back can be adjusted backwards and forwards from the perpendicular the swing is called a "vertical swing." This is the most useful adjustment, and in many of the best cameras it is the only one. In some, however, there is besides this a side-swing, whereby one side or end of the plate may be caused to be farther from the lens than the other.

All this of the differences of focal length and swinging of plates, so as to be oblique to the axis of the lens, sounds complicated when it is put in words, but we think that an illustration will make it very clear.

We illustrate the case of a subject in which one portion is nearer the lens than another. We take the case of a sitter who sits with his face pretty well towards the camera and lens. His feet are placed somewhat forward, and are nearer the camera than his head.

It will be seen at once that if the ground glass were to have the position A B perpendicular to the axis E F of



the lens, the rays of light coming from the head would focus in front of it, those coming from the feet would focus behind it. If, however, we *swing* the ground glass so as to occupy the position C D, then both the rays from the head and the feet will come to a focus approximately upon it.

This is about the commonest use to make of the swing-back in connection with portraiture. It is also used to bring both the face and chest into focus when a head and shoulders form the subject of a picture.

In landscape work there are quite as many cases in which the swing-back is as useful as in portraiture. A moment's thought will show that in almost every case the foreground is nearer the camera than is the rest of the picture. The rays from it will focus farther from the lens—that is, farther back—than will the rays from the rest of the subject. Consequently it will be an advantage to swing the ground glass backwards.

Again, in landscape work the side-swing is frequently

useful. For example, we may have on one side of our picture a tree or a house or what not, which is comparatively near the camera, whilst the rest of the picture is more distant. Here we may use the *side*-swing, swinging the back of the camera so that the side of the ground glass which receives the image of the near subject shall be farther from the lens than the other side. It is quite possible to use both swings at the same time.

It will be understood that in every case mentioned the same effect of bringing different planes into focus could be produced by the use of a small stop quite as well as by the use of the swing-back, the result being, however, the necessity of giving a much longer exposure. This may not be objectionable in the case of landscape subjects, but it always is in the case of portraits. The swing-back is therefore particularly useful in portraiture, and specially so where this is conducted in an ordinary room where every possible saving in exposure is to be taken advantage of.

In the chapter on landscape work will be found reference made to the use of the swing-back for quite a different purpose from that which we have just described, and for one which must by no means be confounded with it. This is for the mere purpose of keeping the ground glass vertical when architectural subjects, which are on the whole above the level of the camera, are being treated.

Without our giving any detailed explanation of the matter, we may here state that if the ground glass of the camera is not vertical when a subject including vertical lines is included, these lines will not come out parallel in the resulting photograph, but will converge or diverge

at the top according as the camera has been tipped backwards or forwards. Accordingly, when the camera has to be tipped up so as to include the top of a building, the swing-back is used in the reverse direction to what is shown in the last cut. It is leaned forwards so as to make the ground glass again vertical instead of *backwards*. This will cause the vertical lines to be shown as parallel, but will by no means enable a larger stop to be used than would otherwise be required. On the contrary, it will necessitate the use of a much smaller one. It will therefore be understood that the swing-back is an appliance not to use for the purpose just described until the lens has been raised as high as the movable front of the camera renders possible.

We now pass on to the subject of the length of exposure which it is necessary to give to plates on various subjects.

We append—by permission of the author—a table which was first constructed by Mr. W. K. Burton, and was published in the *British Journal of Photography*.

We have altered one or two of the figures, somewhat reducing them, as we have found necessary, to agree with the exposures which we have been giving on Britannia plates.

A few words must be said as to the subjects which have been chosen as typical. It will be understood that even with the same light every different subject requires a different exposure. It has been stated as a golden rule that we should "expose for the shadows, and let the high lights take care of themselves;" and although the high lights do not always take particularly good care of themselves, at times going in for solariza-

tion and such like vagaries, the rule is on the whole sound. It is the darker parts of our picture that must be considered in guiding us to the exposure which should be given.

A little consideration will show that all subjects cannot come under any of the headings which we find given to the various columns of the table, but that many will come between the one and the other. Besides this, certain of these headings—such, for example, as "Fairly-lighted interiors," and "Badly-lighted interiors"—are exceedingly vague. It is probable that the subjects chosen are as good typical cases as could readily be found, but they must only be taken as giving an idea of the exposure, nothing more.

We will take each column and say a few words on it. First, we have one headed "Apertures calculated on the standard system of the Photographic Society" (of Great Britain).

A committee of this Society decided some time ago to take as a standard, with which to compare other lenses, one whose aperture is one-fourth of its focal length, or which works at $\frac{f}{4}$, and to call this No. 1. A lens which necessitated twice the exposure, or a stop which reduced the same lens to twice the slowness, had attached to it the figure 2. That which reduced it to four times the slowness was called 4, and so it went on—8, 16, 32, etc.

"Sea and sky" refers evidently to such marine subjects as will make pictures without any further objects than the two mentioned, no boats or ships being introduced, except perhaps in the distance.

"Open landscape" means that type of landscape sub-

ject in which there are no very dark shadows. We have such subjects often in river scenes, or, in fact, in almost any scene where there are no heavy shadows in the foreground. It must be explained that a shadow in the distance never has to the photographic film the same or nearly the same darkness as a shadow in the foreground. The water vapour, dust, etc., which intervene between the distant shadow and the lens reflect a small amount of excessively actinic light.

These two subjects are the ones most suitable for instantaneous work. Sea scenes with yachts, ships, boats, etc., in the foreground require exposures lying between these two.

The heading of the next column, "Landscape with heavy foliage in the foreground," if taken in conjunction with what we have just said, explains itself.

In connection with it, it is well to say that green is a colour which does not have a very energetic action on the photographic film, and that if there be trees or shrubs—especially those of the evergreen nature—in the foreground the exposure must be long.

"Under trees, up to" is what is given in the next column. We may say that the exposure of woodland glades, and such scenes as are entirely under the cover of foliage, is much longer than would be imagined. A great portion of the light is entirely shut off by the foliage, and a great portion of that which penetrates has been filtered through the leaves, and is of a green colour.

The exposures which are given in this column would be required under trees even when the subject appeared to a person who had been for some time in the shade to be pretty good.

The interiors must be taken as those of cathedrals, churches, etc.

The portraits out of doors are supposed to be taken under such conditions as will be described in the chapters on portraiture.

The exposures in studios are such as would be required when a somewhat large portion of the glass is left uncovered.

The portraits in ordinary rooms are supposed to be taken under the conditions which will be described in the chapter on portraiture.

Where there is a very large window the exposure may be only one-half that given, or where there is a bow-window it may be only one-third.

We may say that all the exposures will be found to apply rather to work in the country, or in small towns, than in large towns. The atmosphere in large towns, and especially in London, is always more or less yellow. It is only in exceptionally fine weather that exposures of less than double those given will suffice in London.

The remark concerning yellowness of atmosphere applies to all parts, both of country and town, for certain parts of the year. During the winter months, when the sun never rises high above the horizon, it will be found necessary everywhere to give two or three times the exposures mentioned.

	Apertures calculated on the standard system of the Photographic Society.	Sea and sky.	Open landscape.	Landscape with heavy foliage in the foreground.	Under trees, up to	Fairly lighted interiors.	Badly lighted interiors, up to	Portraits in bright diffused light out of doors.	In studio.	Portraits in ordinary rooms.
		secs.	secs.	secs.	mins. secs.	mins. secs.	hrs. mins.	secs.	secs.	mins. secs.
A	·25, or $\frac{f}{2}$	$\frac{1}{640}$	$\frac{1}{256}$	$\frac{1}{32}$	0 $2\frac{1}{2}$	0 $2\frac{1}{2}$	0 $\frac{1}{2}$	$\frac{1}{24}$	$\frac{1}{8}$	0 $\frac{3}{4}$
A	·5, or $\frac{f}{2{\cdot}828}$	$\frac{1}{320}$	$\frac{1}{128}$	$\frac{1}{16}$	0 5	0 5	0 1	$\frac{1}{12}$	$\frac{1}{4}$	0 $1\frac{1}{2}$
A	1, or $\frac{f}{4}$	$\frac{1}{160}$	$\frac{1}{64}$	$\frac{1}{8}$	0 10	0 10	0 2	$\frac{1}{6}$	$\frac{1}{2}$	0 3
A	2, or $\frac{f}{5{\cdot}657}$	$\frac{1}{80}$	$\frac{1}{32}$	$\frac{1}{4}$	0 20	0 20	0 4	$\frac{1}{3}$	1	0 6
B	4, or $\frac{f}{8}$	$\frac{1}{40}$	$\frac{1}{16}$	$\frac{1}{2}$	0 40	0 40	0 8	$\frac{2}{3}$	2	0 12
B	8, or $\frac{f}{11{\cdot}314}$	$\frac{1}{20}$	$\frac{1}{8}$	1	1 20	1 20	0 16	$1\frac{1}{3}$	4	0 24
C	16, or $\frac{f}{16}$	$\frac{1}{10}$	$\frac{1}{4}$	2	2 40	2 40	0 32	$2\frac{2}{3}$	8	0 48
C	32, or $\frac{f}{22{\cdot}627}$	$\frac{1}{5}$	$\frac{1}{2}$	4	5 20	5 20	1 4	$5\frac{1}{3}$	16	1 36
C	64, or $\frac{f}{32}$	$\frac{2}{5}$	1	8	10 40	10 40	2 8	$10\frac{2}{3}$	32	3 12
C	128, or $\frac{f}{44{\cdot}255}$	$\frac{4}{5}$	2	16	21 0	21 0	4 16	21	64	6 24
C	256, or $\frac{f}{64}$	$1\frac{1}{2}$	4	32	42 0	42 0	8 32	42	128	12 48

A, portrait lenses; B, rapid view lenses; C, landscape lenses.

CHAPTER XII.

THE CAMERA IN THE FIELD, THE WORKSHOP, ETC.

We have, we hope, given in the foregoing chapters such instruction as will teach the student everything that can be learned about the manipulation of plates after exposure, except what can be acquired by practice and experience only.

We must now say a few words on the different subjects which come to be depicted by the camera, for it must be evident that the manipulations and apparatus will be very different according as the desire is to portray possibly a building, or shipping in motion, or the face of a friend.

We will first take the case of landscape work, which is what the amateur more often confines himself to.

This will possibly be the best place to say a few words on the size of plate to be used. By reference to advertisements at the end of the book it will be seen that not only are the designs of cameras various, but that the size of plates for which cameras are made also varies greatly.

It is true that very satisfactory results can be got by the use of the simplest of cameras—of small size, fitted

with only one lens, such as is comprised in our "Students' Set." On the other hand, it cannot be denied that the various adjustments with which some of the more complicated instruments—for example, the "Enjalbert"—are fitted afford great facilities for the production of effects which could not otherwise be obtained, nor can it be denied that much more scope is given to the artist if his camera is furnished with several lenses of different focal lengths, any one of which may be used, than if he had but one. Besides this, many photographers are not satisfied with a picture of the smallest dimensions, but aspire to the taking of something considerably larger than 5 by 4.

We would suggest $8\frac{1}{2}$ by $6\frac{1}{2}$ as a good size for such as intend to take the field unassisted. All the necessary apparatus may easily be carried in the hand by a man of average strength. An active man can carry apparatus for a somewhat larger size—say up to 10 inches by 8 inches. For any size beyond this it is necessary, if any distance is to be walked, that the photographer should have some assistance. Two men can easily carry all that is necessary for working very large plates—say up to 15 inches by 12 inches.

As regards the subjects which may be selected for photographic representation, we may make the somewhat wide statement that *almost* any brightly-lighted object which appears beautiful to the eye, and which owes its beauty to form or light and shade, not to colour, will make a picture.

Landscapes which include trees and houses, rivers, lakes, quiet pools of water, or any of the objects which make a pleasing picture to the eye, will make a pleasing

picture by the assistance of the camera. Buildings and all that is of interest to the architect, archæologist, or antiquary will be rendered with a truth and reality which excels what is possible by any hand process. Admirable pictures have been made of mountains, but the subject is not an easy one to treat. The difficulty of giving a faithful rendering of distance by photography is great. It can, however, be done by taking advantage of proper atmospheric conditions, and particularly by avoiding those conditions of intense transparency which cause distant objects to appear even to the eye near and small.

In selecting subjects it should be borne in mind that if the object is to make artistic pictures something more than mere beauty is required. A landscape may be most beautiful and may give the utmost pleasure to one who looks upon it, whilst we know that it does not possess the elements of a picture.

It would appear that what is necessary for a picture is that there should be a certain harmony of the whole; that it should not consist of a number of disjointed objects of beauty, but that every part should appear to bear a certain relation to every other.

We often look about us when in a picturesque country and see with pleasure and admiration the objects around us, and yet are not looking on a picture. We are glancing our eyes from one object to another, and get a general impression of beauty. It is when we can look at some certain object and find that others near it appear to so fall in with it as to *compose* well, or give a harmony of form, light, and shade, that we should bring out our camera and try to make a picture.

To descend from the general to the particular, it is common to say that there is necessary for a landscape picture a foreground, a middle distance, a distance, and a principal object which is usually situated well forward in the middle distance. It is impossible to lay down any such rule as absolute, but it is certain that these elements enter into the majority of good pictures.

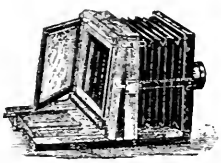
The foreground may be a few shrubs, boulders or large stones, a pool of water, a fallen tree, or almost any object which does not look inappropriate to the rest of the picture. Often a very slight alteration of the position of the camera will enable various objects to be selected for foreground, without changing the middle distance, or distance to any considerable degree. The middle distance may consist of any of the objects which we have mentioned, and forms the greater part of the picture. Of the distance it may be said that it is only necessary that a very small portion of the picture be occupied by it, although there is no harm in allowing it to cover as much as a third or a fourth of the surface. A small spot of distance, seen, it may be, between the branches of a tree or through a gateway of a stone wall, will just make the difference between a picture and no picture. The finished picture should generally show some sky. This is generally best "printed in" from a separate negative, as will be described hereafter. If, however, there be—when the plate is exposed—clouds which appear to be particularly appropriate to the subject, these should be secured. Unfortunately it is seldom that the same plate will secure both clouds and landscape, —exceptions to this rule will be mentioned in connection with instantaneous work,—because the exposure which

is sufficient to bring out all the necessary detail in the landscape generally over-exposes the clouds, so that no trace of them is to be had. The photographer, therefore, if he wishes to secure the clouds which he sees with a certain landscape first exposes for the landscape, then gives an exposure of about one-fifth as long for the clouds, a second plate being used. These two are used for double printing, which we shall explain hereafter.

Let us suppose we have selected a subject which we think will make a picture. There must be no hurry in the selection of the precise spot from which we are to take it. A few yards to the right or left may, as we indicated before, so alter the foreground as to vastly improve the composition. If now we are working with the most simple of apparatus, as indeed is the best at first, we have only to erect our camera and focus as we described in a former chapter. To use the tripod-stand properly requires a little attention. It should be placed on the ground with its three legs fairly wide apart, and with one leg inclining towards the position of the centre of our proposed picture. Between what then forms the two back legs the operator stands. If his picture be a landscape he may tip up the camera by drawing the front leg towards him. If the picture be of an architectural design, or of such a nature that vertical straight lines are included, the ground glass must be kept in a vertical plane, otherwise the lines will appear in the picture not vertical, but converging either to the top or to the bottom, according as the ground glass has sloped backwards or forwards.

It is here that the various motions which are included

in the more expensive class of cameras will be found useful. These motions are chiefly a means of raising or lowering the front of the camera, on to which the lens is attached, and a means of swinging the back,—that is to say, of sloping it either somewhat backwards or somewhat forwards relatively to the lens. There is also in some cameras a side-swing whereby the back can be swung backwards. We here illustrate the camera which will show these motions.



Let us now return to our manipulations. We have so far selected our view, have planted our camera, and have focussed to such an extent that we can judge somewhat of how much will be visible on our ground glass. We shall generally find that, if the camera be horizontal, there is too much foreground and too little height. If we are not right as regards horizontal direction we simply swing the camera on the screw which attaches it to the tripod-top.

To get more height, if there are no vertical lines, we may simply tip up the camera to a moderate extent. If we are taking an architectural subject we must not do so, but must raise the lens, being careful to keep the ground glass of the camera vertical. If we require to take in still more height we must tip up the camera and bring the ground glass once more to the vertical position by the use of the swing-back.

We have so far written on the assumption that we have but one lens for use in landscape work, and that therefore we have no choice as to the amount of subject or width of angle which we can take in.

It is evident, however, that we are very limited in the effects which we can obtain if we have the use of but one lens. It requires but little reflection to show that different subjects subtend very different angles to the eye. To take two typical cases: We require to take the photograph of a large house, but are unable to get very far away from it. It will be evident that the house occupies a very large field of view, or, in other words, subtends a large angle. But suppose, on the other hand, that we wish to photograph a yacht or ship on the sea. We are seldom able to get so near it that it occupies a large field of view. On the contrary it subtends a very small angle, and were our picture to include as wide an angle in the second case as in the first, the result would be that we should see a long stretch of sea-line with the ship on it showing as a mere speck.

To enable different angles to be included, the photographer usually employs several lenses of different *focal length*,—that is to say, certain of these are so constructed that the distance will be greater between the lens and the ground glass, which requires the camera to be farther racked out than in the case of others. This we have already explained in the chapter on optics. The greater the focal length of the lens the *less* will be the angle included, and the larger will appear such objects as are included.

Now we will suppose that we have not only selected

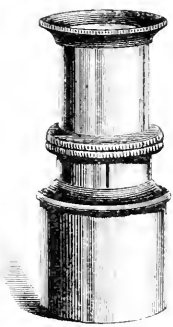
our subject, but have considered where our picture is to stop on each side,—that is to say, how much subject is to be included in it. Here a word of warning must be given. The beginner always inclines to include too *much* subject. He casts his eye about, and, seeing several picturesque points, wants to include all of them in his picture. By this means he fails to get a real picture, but has what possibly might have been the elements of several. He should understand that no more should be included in his picture than he can see with his eye at one time and without altering in the least the direction of his gaze.

There are certain cases in which it is impossible to hold to this rule. Such, for example, is the case with the house which we took as an illustration some time ago, where the photographer cannot get far enough away. Here, if he have to photograph at all, he will have to include more subject than he can see with his eye without moving it.

We will suppose, then, that we have determined what are to be the limits of our picture. We try the lens which previous experience has taught us is likely to take in as nearly what we want as may be. If we find that we have taken in the right amount or not much more, we may rest satisfied. If we have taken in much more than enough or too little, we must try the next lens—a longer-focus one if we have taken in too much, a shorter-focus one if we have taken in too little.

Three is a sufficient number of lenses for almost all cases, especially if some or all of these be double-combination lenses, as then one-half of the lens may be used as a lens of double the focal length of the whole. (See Chapter on Optics.)

We now come to the process of exactly focussing the view. We use the lens' full aperture,—that is to say, we put no stop into the diaphragm slit, or if the diaphragms be rotary we turn the diaphragm disc so that the largest hole occupies the central position. We now focus very accurately for the principal object. We may with great advantage make use of a focussing-magnifier to do this. We illustrate the instrument here.



Now we have to select the diaphragm to use. We shall probably perceive that, although the principal object is now quite sharp, neither the distance nor the foreground is so. We place the stop with the largest aperture in position, when we shall perceive a notable improvement on the definition of these parts. We try another and another stop till we get to the one which gives everything *just* sharp. With this we expose.

The time of exposure can only be judged by experience. We have given, however, at the end of the chapter on optics, a short table, which will be of some assistance.

We have said that the best lighting is a side lighting.

This holds generally true, but is by no means to be taken as an absolute rule. Lighting from behind occasionally gives good effects. Lighting from the front very often does, but the work is difficult to do. The sun itself should never, or at least very rarely, be included in the picture. It must be either above or to one side, a shade being used to prevent the direct rays from falling on the lens; or the shadow of a tree or some such object may be taken advantage of.

On pages 18 and 19 we have referred to the use which photography may be to the architect and to the engineer.

Concerning the photographing of buildings we need say little except that the following conditions should be observed:—

When a photograph is to be taken very close to the building the lens should be of the type known as the "wide-angle rectilinear," or a "rectilinear," when more distant, otherwise the straight lines of the building will be represented by curves towards the edges of the picture.

The ground glass—and, of course, afterwards the sensitive plate—should be vertical, otherwise vertical lines in the building will be shown in the picture converging either towards the top or the bottom.

Except where it is impossible to avoid it a wide angle of view should not be included,—that is to say, the camera should not be placed very near the building, otherwise a strained perspective will be the result.

With regard to engineering photography we may say that whether the subjects be bridges, etc., or be machinery, the same conditions should be observed as for architectural subjects; whilst in the case of machinery

an additional condition ought to be observed—namely, that the painted parts of the machine have a suitable surface. A very disagreeable effect is generally produced if the dark-coloured and gloomy paint with which machinery is commonly painted is photographed. We are indebted to *The Year Book of Photography* for the following receipt for a "colour for coating machinery previous to photographing" it :—

Dry white lead . . .	5 lbs.
Lamp-black	2 to 5 ounces.
Gold size	1 pint.
Turpentine	$1\frac{1}{2}$ pints.

"The amount of lamp-black is varied to suit machine and lighting. This paint is easily removed with turpentine."[1]

The use of photography by engineers, builders, etc., for keeping records of their work, and so forth, is now so much on the increase that we have thought it advisable to get up a special set for their use. This we have called "The Engineers' and Builders' Photographic Set." There is contained in it complete apparatus of a substantial and efficient nature for taking negatives of any size up to 12 × 10.

[1] *The Year Book of Photography for* 1885, p. 204.

CHAPTER XIII.

INSTANTANEOUS PHOTOGRAPHY.

It is in the particular branch of the photographic art which bears the above title that the greatest revolution has been brought about by the use of dry-gelatine plates.

The photographing of objects which, being in more or less rapid motion, required that the exposure should be very brief, so that the motion might not produce noticeable blurring, was, previous to the advent of dry plates, a very difficult matter, and one in which only occasional success was met with, even when the conditions were most favourable. Everything had, so to speak, to be strained. The light required to be at its very best, the lens required to be one more rapid than would give the best of results as regards depth of focus, etc., and the chemicals had to be used in certain conditions which made the working of them even more troublesome than usual. It may be conceived what an alteration was brought about when plates were invented which required but a tenth or twentieth of the amount of light action to impress the image. Immediately all straining ceased, and conditions very slightly different from those required for ordinary landscape photography were found to be adapted to instantaneous work.

The subjects which are adapted for instantaneous treatment are innumerable. We may mention a few. First we may place sea-views, either sea and sky alone, which often make a beautiful picture, or the sea with all the various forms of vessels which float on its surface. Yachts, steamers, pleasure-boats, and such like may be depicted and may be made to afford beautiful pictures.

River scenes may be rendered as well as seascapes. Crowds of people in the street may be portrayed, and afford marvellous studies of life as it is in our crowded cities. Horse-races, foot-races—subjects without end—may be thought of; thus not merely dead life, but living things and motion are portrayed.

These are the subjects which make pictures. There are others which may be treated that do not give in themselves results that can be considered as artistic; yet they are highly interesting and instructive from a scientific point of view. More has been learned in the last few years of the positions which the limbs of animals take in rapid motion than had been learned through all the time which had gone before, and this is solely on account of the use which has been made of instantaneous photography.

The only condition necessary in any of the subjects which we have mentioned is that it should be brightly lighted, and that it should not be of such a nature as to consist in great part of heavy shadow.

The only apparatus necessary, in addition to that used for ordinary landscape work, is a lens of the "rapid" landscape type (which may constitute one of the several which most photographers use for ordinary view-taking) and an instantaneous shutter.

A rapid lens we have mentioned as a necessity, although, in fact, it can scarcely be said to be so. It is a most useful piece of apparatus to be in the possession of photographers who take up instantaneous work, because it enables them to work on subjects and under conditions which would otherwise be impossible. We have seen a very fair picture of a train in motion taken with the camera of the Students' Set and the single achromatic lens which accompanies it.

There are certain subjects which can almost always be taken without the use of a rapid lens, or an instantaneous shutter either, and these are the ones on which the beginner at instantaneous work should make his first essay. They consist of sea and sky without shipping, or with such only in the distance, and of river scenes in which it is desired to secure the ripple of the water but not boats in motion.

Whilst mentioning sky, we should point out that one of the chief charms of instantaneous work is that almost always it is possible to secure not only the land or seascape alone, but at the same time any clouds which there may be along with it. The subjects being such as have no very deep shadow require comparatively short exposures, and as a consequence the sky is not greatly over-exposed.

Suppose such an easy subject selected as we have mentioned; we operate in the following manner:—

We take our standpoint and manipulate our camera as we would were we taking an ordinary landscape. We then put the dark slide in position, cover the camera with the focussing-cloth, and wait for the effect which we desire, which may be a certain formation of cloud in

relation to the sea or river which we are photographing.

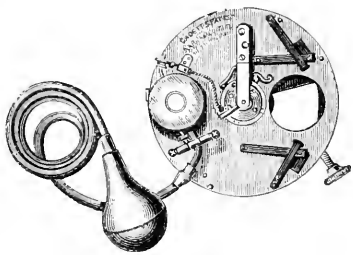
We then draw out the shutter of our slide, gently ease the cap of the lens till it is almost loose, then with a rapid motion lift it a few inches, and replace it. The exposure given should not exceed one-third or a quarter of a second, and will be quite brief enough to ensure the faithful rendering of a ripple on the water, or of any waves, except such as may be breaking violently on the shore.

For the majority of subjects which come under the heading of instantaneous an instrument usually designated an "instantaneous shutter" is required; and indeed, even for the subjects which we have mentioned, it will be found far more convenient to expose by the means of a shutter than by hand, although with a little care perfect results can be got by the latter method. The object to be effected by every instantaneous shutter is the quick opening and again closing of the aperture of the lens, so that the image of whatever is opposite the camera falls on the plate for a very brief space only.

The duration of so-called instantaneous exposures varies according to the subject. It is evident that the more rapidly an object is moving the briefer must the exposure be. For almost any subject an exposure of from one-fifth to one-twentieth of a second is brief enough, but for some special ones shorter exposures are necessary. In most instantaneous shutters there are provided means of giving exposures of various different lengths.

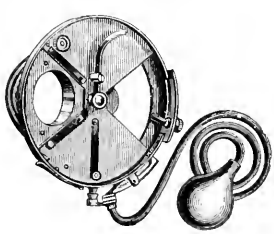
We here illustrate Cadett's patent pneumatic view

shutter. This shutter fills all these requirements, for it will give exposures from the one-hundredth part of a



second to any longer period of time without limit, and these results are obtained by the simplest of means;—a revolving ebonite disc, worked by a coiled spring in the centre, two catches, and with Cadett's pneumatic apparatus. Five minutes' careful inspection will enable any one to work it.

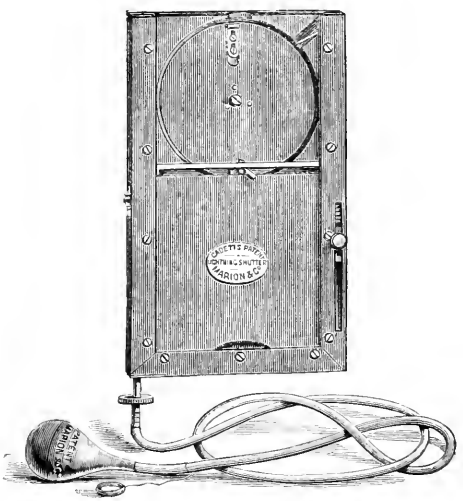
Chadwick's patent view shutter, with Cadett's patent



pneumatic apparatus, is a very serviceable one, and permits an adjustment for various times of exposure, but not to such a full extent as Cadett's view illustrated above. It is simple, light, and easily adjusted.

Since we published the first edition of Marion's *Practi-*

cal Guide to Photography Mr. Cadett has invented a new shutter of most ingenious construction. We illustrate it here. The principle on which it works is as



follows: The disc which is seen towards the top will, when a trigger is released by pressure on the pneumatic ball, revolve, performing a complete circle. As it revolves the pin which will be seen near its circumference works in the slot of a rectangular shutter, which it lifts and again lowers, uncovering and again covering the lens in a marvellously brief space of time if desired. The little button which may be seen at the side of the instrument is for adjusting the tension on the spring which carries the disc round, so as to vary the length of exposure at will. Besides this there is an adjustment, by applying which the shutter will remain open as long as

the pressure on the indiarubber ball is sustained, closing as soon as the pressure is relieved. This adjustment makes the instrument very useful for portrait work.

It should be mentioned that the shutter is made of ebonite, and that the moving part is so exceedingly light that, although the motion is a reciprocating one, the camera is not shaken even when the briefest exposure is given.

The method of using these shutters is simple. The point of view is selected, and the camera is fixed up and manipulated up till the time of exposure, precisely as for ordinary work, the only difference being that the instantaneous shutter replaces the lens cap.

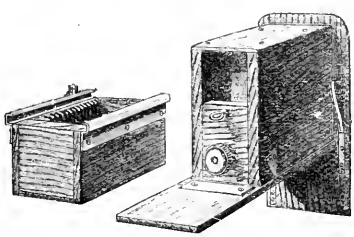
The effect is again waited for. The shutter is set to give the length of exposure which is judged to be the best. Shortly before the expected combination of boats, ships, crowd of people, or whatever may form the picture, the shutter of the camera is withdrawn, and the photographer waits and watches with the pneumatic ball in his hand. At the correct instant he squeezes the ball, and the picture is taken.

If the subject be such as a ship, yacht, or boat, crossing the field of view not far from the camera, it wants great nicety of judgment to be sure of getting it properly on the plate. It is not unusual, when the photographer makes sure that he has such a subject right in the centre of his plate, to find on development that only half his subject is on the glass, the remainder being nowhere, or even to find that there is no trace of the subject at all.

To obviate this difficulty, "finders" have been contrived. These are arrangements whereby, a supplementary lens and ground glass being used, the operator is able to keep his eye on this, and thus knows better

when the image will occupy the centre of the sensitive film.

A very compact apparatus of this kind has been designed, and is entitled the Academy Camera. We illustrate it here. The lower portion of the cut shows the instantaneous shutter, behind which is the principal lens. Above this is the supplementary lens. The instrument is so constructed that a dozen plates are carried in it, and can be exposed one after another without the use of any dark slides at all.

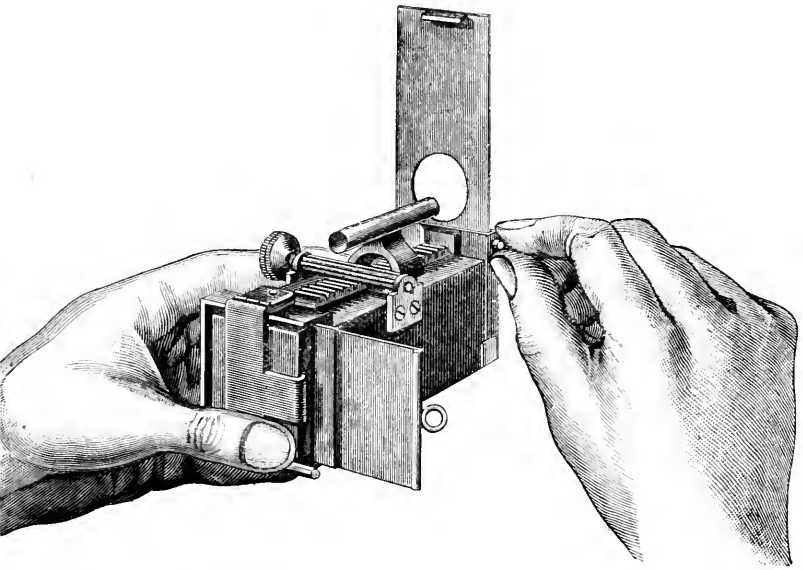


The photographer may hold the instrument in his hand, watching the ground glass behind the upper lens, till the effect he wishes is produced, when he lets off the shutter. The larger sizes are constructed to hang on a stand of such construction that motion in any direction can be obtained, so that the subject may be as readily followed as if the instrument were held in the hand.

A piece of apparatus, possibly still more compact than the Academy Camera, is that which we here illustrate. It is known as "the Miniature Camera."

The picture shows the camera half size, so that it will be seen that it is indeed in miniature. The principal

differences between the Academy and the Miniature are that in the case of the latter, instead of, as in the case of the Academy, watching the picture to be taken on the ground glass, it is "sighted"—after focussing on a separate ground glass—through the little tube which is seen on the top. This is a far easier operation than watching



the inverted image on the ground glass. Also that the shutter is a drop instead of a revolving one. This makes sheeling of the camera less likely. Lastly, that instead of the plates being carried in the apparatus, they are carried in small separate shutters, of which the photographer may carry any number he pleases. By this arrangement the bulk of the apparatus actually to

be held in the hand during exposure is reduced to a minimum. The cut shows the apparatus with a slide in position, ready for exposure.

Of course it will be understood that the very small negatives produced in the Academy and Miniature cameras may be enlarged to a much greater size. For the method of performing this operation the reader is referred to a subsequent chapter.

With regard to the development of pictures which have received so-called "instantaneous" exposure, little requires to be said, as it scarcely differs from that applied to ordinary subjects. We may, however, say that patience is the great thing. Development must not be hurried. It is better to wait than to hurry on the process by the use of an excessive quantity of the ammonia solution. We may start with a developer containing a slightly larger proportion of the ammonia solution than we generally use. Possibly three parts of ammonia solution to two of pyro and bromide, or even one part of the one to two of the other.

A final piece of advice we may give to the instantaneous photographer. Let him avoid hurry and nervousness in exposing. It is difficult to do so, but the effect, unless everything be done with calmness and consideration, generally is to expose either just too soon or just too late.

CHAPTER XIV.

PORTRAITURE OUT-OF-DOORS.

We have now arrived at the description of that department of photography the practice of which will, in all probability, afford more pleasure to the amateur than any other. Even under all the difficulties of the wet-plate process the amateur was prone to portraiture. The difficulties he had to contend with were such that his results were seldom successful, in spite of which he persevered. Now his labours may be rewarded with, at least, very fair success. If it is true that he cannot hope to produce anything which will compare with the beautifully lighted and posed portraits of actresses and professional beauties which are exhibited in so many of our shop-windows, it is equally true that he may quite hope to produce pictures which may be of a very satisfactory quality, and give great pleasure to himself and his friends.

The amateur will naturally make his first attempts out-of-doors, because there the light is so good that he will be able to operate with precisely the same apparatus which he uses for landscape work. If he has a rapid lens, such as we mentioned as desirable for instantaneous work, so much the better, but such is by no means a necessity.

The two conditions which we must secure for a portrait are—first, a suitable lighting; and, secondly, a suitable background.

With regard to the first, a few words may be said which will apply to portraiture both out-of-doors and indoors. On looking at any set of good portraits, either photographic or otherwise, it will be at once evident that a great deal of the pleasing effect which is produced depends on the fact that the face is not lighted equally from all sides, but that the light coming from one direction is stronger than that coming from another. This has the effect of causing the features to stand in relief, and gives roundness. There is nothing worse from an artistic point of view than a portrait lighted in such a way that there is no shadow—mouth, nose, and eyes appearing merely as so many spots on the face. On the other hand, there is to be avoided too much contrast, such as gives a harsh effect; and it must be borne in mind that the shadows on the face of a photographic portrait almost always appear darker than they in reality were.

It will be observed that unless advantage be taken of some object which shades the light from one side, the lighting out-of-doors will be equal on all sides, or nearly so. It is taken for granted that direct sunshine is avoided. It will also be found that the general direction of the light is from above. There is a great deal of what artists term "top light." Indeed, there is far too much, and unless care be taken to shade off a portion of it the effect will be to produce an unpleasant likeness. The lines under the eyes will be intensified, and there will be produced an effect as if the cheek bones were abnor-

mally high. The general effect will be an unfavourable portrait, making the sitter look old and ill-tempered.

In working out-of-doors we have to take advantage of some objects which will give a certain shadow on one side of the sitter, and will shade off some of the top light. To get shade on one side is almost always easy, but to stop off the top light is not always so. It is often possible to take advantage of the spreading branch of a tree or such like, but where this is not to be had a sheet or shawl should be used, so as to form a sort of awning.

With regard to a background, it is best when out-of-doors to have a natural one if possible. An ivy-covered wall, the stem of a large tree, an evergreen bush, a rock, or even at times a wall with a little curving to relieve the monotony, may make a good background. The sitter should be caused to sit or stand not very far from the background, so that both may be fairly well in focus.

The position having been decided upon, and it having been determined how much of the figure is to appear,—whether the portrait is to be a full-length standing or sitting, or a half-length, or merely a head and shoulders,—the next thing to do is to pose the sitter. This is the point at which the amateur may show whether or not he possesses any artistic feeling. Even presuming he has he must not expect all at once to achieve success in this most difficult art of posing. It is needless to say that the object to be attained is to place the sitter in such a position that he (or she) will look his (or her) best. No rule can be given for this. Pleasing portraits have been made with the sitter looking in any possible direction,

towards the lens, at right angles to it, and looking upwards and downwards. The best course to pursue for the beginner is to cause the sitter to place himself in a chair in an easy attitude, and to make him look in first one direction, then in another. When what appears to be the most pleasing phase of the face is obtained, the next thing is to get a *corresponding* satisfactory pose of the body that shall harmonise with the features. The photographer must now direct the subject as to the placing of his hands and feet so as to give an appearance of unconstraint. It should be borne in mind that it is well to avoid having a hand or a foot projecting much forward, as such may then come out too large, especially if the lens be not one of very long focus.

The height at which the camera is placed is of importance in the case of a portrait. It should be, as a rule, about level with the face. In the case of a sitting figure this involves shortening the legs of the camera considerably, and the operator will find it most convenient to sit whilst focussing. A focussing magnifier is particularly useful in portraiture, as the lens will, as a rule, be used full aperture or nearly so, so that if there be a small error in focussing, this will not be improved, as would be the case were a small stop used.

The eye of the sitter is, as a rule, the best spot to focus most sharply. If the face be three-quarters, so that both eyes are seen, but are not at the same distance from the camera, it is usual to focus first for the one, then for the other, then to divide as equally as possible the distance between them, so that there may be an equal slight want of definition in each. To bring into

fairly good focus portions of the figure which are at different distances from the camera—for instance, the face and the chest, or, with a sitting figure, the face and the knees—the swing-back may be used if the camera be fitted with such.

After all the preliminaries are arranged as we have described, the exposure is made, the manipulations being precisely the same as in landscape work. From the table given at the end of the chapter on optics will be gained some idea of the length which this should last.

The sitter should be instructed to keep his eyes fixed on the same spot during the whole of the exposure. Any motion of them will spoil the expression. There is, however, no harm in his blinking.

CHAPTER XV.

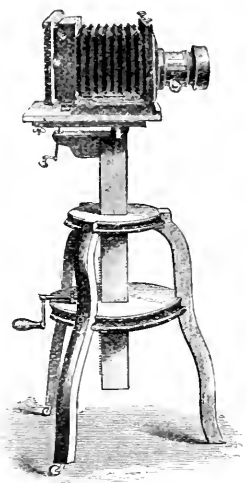
PORTRAITURE IN AN ORDINARY ROOM.

THE effects in portraiture which may be produced indoors are superior as a rule to those which can be got in the open air, but, on the other hand, there is a little more skill required in the various operations.

First, as to the extra apparatus which is required. Cameras and camera-stands are made specially for studio work, and these will be found much more convenient for indoor work than the cameras prepared for field work. It is not, however, by any means necessary that the amateur should provide himself with such. He may use his landscape camera and will produce quite as good results with it as with any other. The only difference is that he will require to work a little harder and to suffer some inconvenience in finding places for the legs of his tripod and so forth.

We illustrate here a camera and stand specially designed for studio work. It will be seen that the camera differs from the ordinary one, chiefly in being more massive and not folding up into so small a space, portability being no object. The same may be said of the stand. There are also in the latter motions for raising the camera and for tipping it forwards.

The next question has regard to a lens. The portrait lens, which is an expensive article, is not nowadays an

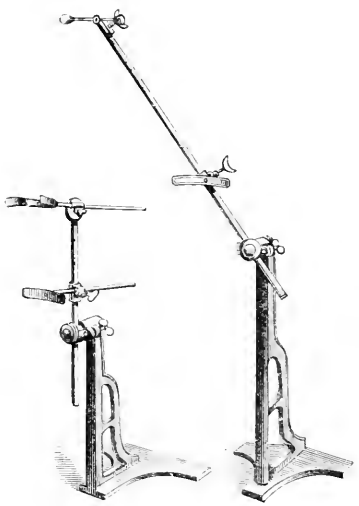


absolute necessity for portraiture indoors, as it was in wet-plate days. If a room can be used which has a large window facing the sky, and more especially if the place be either in the country or in a small town where the atmosphere is clear, the light may be so good that a landscape lens of the "rapid" type may be used, and the exposures will not be excessive. If, however, the operator desires to excel, or the conditions of lighting be imperfect, a portrait lens will be found a *desideratum*.

A head-rest is another instrument which may be dispensed with in the case of good sitters, but which will be found a very great convenience when unsteady sitters are taken, or if the light be poor. It will be

found almost a necessity if lenses of the landscape class be used. The object of the head-rest is, as is implied in the name, to give rest to the head. There is also in most cases provision made for rest for the body.

We here illustrate head-rests of the ordinary type.



The frame is made of cast-iron so as to be heavy and give a sufficient support. There is an adjustable piece for the waist and another for the head.

The head-rest is an instrument against which many have a prejudice, but this is merely because it is at times used without discretion. We often hear people who have been photographed talking of having had their heads "clamped up in a machine." There is no excuse for doing this, as it is quite unnecessary. When the rest is used, the sitter should be first posed without

any regard to it, and then gently supported by the instrument at the head and waist. If the exposure be of short duration, the shoulders may be supported instead of the head.

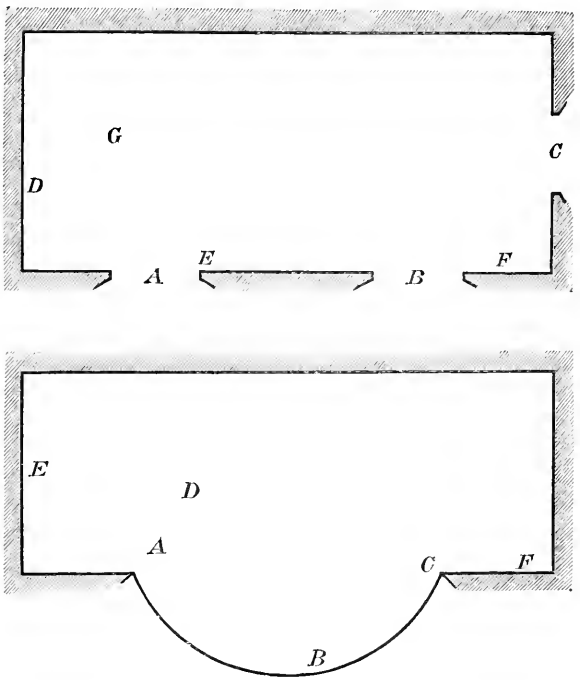
In regard to lighting, the difficulty will be found to be the exact opposite to that which is experienced in the case of work out-of-doors. Indoors the difficulty is to get enough shadow to give relief and roundness. To do so, we must be very careful in selecting the position for our sitter and for the camera.

The best form of room to use, when it can be had, is one which has considerable length and which is lighted on one side by one or more windows. The broader these windows are the better. A bow window is the best of all, not so much on account of its particular form (although that too is sometimes useful) as because it offers so great an extent of lighting surface. We have mentioned several windows, because a long room generally is lighted by several, but it will be understood that only one is effective in throwing light on the sitter. Indeed, many prefer to darken all the windows except one. If there be any window behind or nearly behind the sitter, that at any rate should be darkened.

Here we have two sketch plans of rooms such as the photographer is likely to have at his command. The first is the most usual shape, and therefore we will consider it before the other.

Here we have three windows which we may call A, B, and C. A sitter directly opposite one of those windows, and very close to it, will be on one side of the face most brilliantly lighted, probably more so than in most photographic studios. The other side will, however,

be in comparatively deep shadow, even if reflectors be used to the best possible advantage. Moreover, wherever the camera be placed it will be impossible to get more than one-half of the face lighted.



If, on the other hand, the sitter be placed a little away from and behind the window, at such a position as D, the shadow will not be so deep in comparison with the light, and, moreover, it will be possible, by placing the camera anywhere between E and F, to get more than

one-half of the face lighted. Therefore, at about D will be found the best position to place the sitter; and for the style of portrait which is likely to be most popular with amateurs—that is, the head and shoulders—the best place for the camera will be a little on the F side of E.

Even with the sitter at D it will be found that there is too deep a shadow on one side of the face. It may not appear so to the eye, but a photograph taken as an experiment will prove it to be a fact. A reflector is therefore required, which is placed or held at about G. If the photographer can secure assistance, the very best reflector consists of a sheet held by persons standing on chairs. A slight degree of motion given to the reflector during exposure will somewhat soften the gradation from light to shadow. If the photographer has no assistance he must use either a light wooden screen with white paper stretched on it, or he may throw a sheet over either a clothes-horse or a folding-screen. A little experience will show that practically the whole of the light which falls on the sitter comes through the window A, and that B and C may be entirely darkened without much altering the effect. On the whole, it is an advantage to do so. "False lights" are thus avoided, and there is less chance of dazzling the sitter.

Now, as to the other form of room. It will be found that the effects which can be procured by its means are superior to what can be obtained with the first mentioned. This especially applies to head and shoulder portraits, the lighting of which will be quite as good as can be got in any studio. For these effects the sitter

is placed at A, and the camera anywhere between B and C, according to the relative amount of light and shadow which is required. The reflector is used at D. For full-length portraits, either standing or sitting, the subject is placed at E, and the camera between C and F.

As to background something must be said. For mere head and shoulders, a quite plain background is, in most cases, to be preferred. The same is often suitable for half-length portraits; but is seldom so for full length.

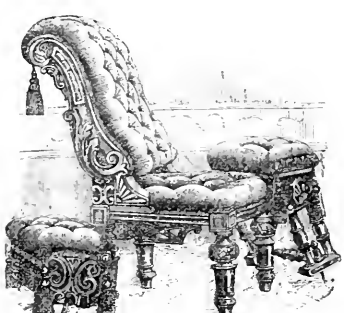
At times, especially now, when distemper is so much used for colouring walls, the side of the room which is behind the sitter may make a good background. Possibly this may not be the case, however, and as no one tint is suitable for all cases, it would not do ever to rely on it. Still it may be used occasionally.

An artificial background is the best. The amateur can make one by stretching brown paper (sold in great widths and in continuous rolls as carpet-paper) on a wooden framework, and colouring it with distemper. Probably, however, he will find it best to purchase a background ready-made. He should have two different shades—a light one for vignettes, and a dark one for ordinary heads. Backgrounds are made with a suitable colour on *each* side, and go under the name of the Empire Background.

For full-length portraits it very often happens that one of the modern wall-papers makes an excellent background. No finer background can be had than a curtain, if of suitable colour, gracefully draped. In distemper the amateur may prepare backgrounds himself if he

be sufficiently an artist. The carpet-paper is again good enough. It is stretched on a large light wooden frame, and the design is produced with distemper. It is made very sketchy with the gradation nowhere hard. It is to be understood that the background must be distinctly subordinate to the figure. Here again, in most cases, the photographer will find it best to purchase his backgrounds, either selecting from the stock of the dealer or getting it painted to order.

The beginner will use an ordinary chair for posing; but the amateur who goes the length of making photography a hobby should purchase a studio-chair, the form and colour of which are particularly adapted to photography.



A few words on the manipulation.

In posing the photographer should give freedom to the sitter so that he may have the opportunity of freely arranging himself into suitable posture.

It has been of course by this time decided whether the portrait shall be bust, half-length, or full-length. The beginner will have observed that to get a large scale

for head alone, or for head and shoulders, he must bring the camera nearer to the sitter, whilst for the small scale necessary in sitting or standing figures he has to do the reverse. It is somewhat difficult for the beginner to be quite sure, in the case of head and shoulder pictures, that he has not got the head either too small or too large. If he finds this difficulty he should look out from his album a portrait, the head of which is about the scale desired. He should measure this, from the top of the forehead to the bottom of the chin, and should focus his camera till he gets the head on the ground glass of the same size. Great care must be given to get the head the correct height on the ground glass. It should be remembered that, especially where a portrait lens is used, the definition is much better towards the centre of the plate than near the edges. The nearer therefore the head is kept to the centre the better, but care must be taken that it will not be too low on the paper in the resulting print.

The use of the stop and swing-back may be explained here. Focussing is performed for the eyes, as explained before. It will now probably be found that the chest if a head and shoulders be taken, or the knees and feet if a sitting position be adopted, will be much out of focus, because they are nearer the camera than the eyes.

If the camera is fitted with a swing-back, this is tilted somewhat *backwards*,—that is to say, away from the sitter and towards the operator. Focussing is again performed, when matters will be found to be vastly improved.

By trying various angles of the swing-back *any two points* may be brought into correct focus ; if the camera

have no swing-back, stops must be introduced till the desired definition is secured. If the camera be without swing-back a much smaller stop will have to be used than if it be fitted with this adjustment. The exposure will consequently be longer.

In working indoors it is not necessary to keep the camera or the dark slide covered with cloth during manipulation.

CHAPTER XVI.

GROUPS.

GROUPS, at any rate of more than two or three together, are seldom very artistic productions; the taking of them, nevertheless, is one of the most pleasing departments of photography, and the photographs, if not, strictly speaking, very good pictures, are very often greatly valued for the associations connected with them.

The taking of groups out-of-doors is, since the introduction of dry plates, a very easy branch of photography.

If the number of persons to be taken be small—two to half a dozen—an attempt should be made to group them with some purpose or intention. The ordinary method is to attempt the representation of a group in ordinary conversation. More ambitious subjects to attempt the representation of are such as may be imagined when the members of a family receive a letter from one who is abroad; or when a book or a paper is read to a set of young people or children who are each occupied in some especial employment; or a card-party may be represented, and so on. Out of certain of these subjects very perfect pictures have been produced, but great artistic taste is necessary to do this.

Where the group consists of a large number the

attempt to pose each individual may be at once put on one side, and the only thing to look to is to so arrange the members that all may be as much in focus as possible. To do this it is best to place them in a semicircle, or something approaching it, so that the end figures may be nearer the camera than the centre ones. There may be a row reclining on the ground, immediately behind them a row sitting on chairs or other seats, and behind these again a row standing up.

Groups in an ordinary room are never easy. If more than two or three persons are included they are very difficult, because it is impossible to get all in focus without using a small stop in the lens. When this is done the exposure is much lengthened, whilst the likelihood of a number of persons remaining still is manifestly much less than when there is only one.

It is unnecessary to add much on the method of operating, as almost all necessary information is to be found in the instructions on taking single portraits indoors and in taking groups out-of-doors. Even the professional photographer is not likely to have a head-rest for every member of a group, far less is the amateur. Such positions should therefore be selected as it is easy to retain during some space of time. If it be found that any one individual is a bad sitter he may have the benefit of the head-rest.

Out-of-doors the same remarks apply to backgrounds for groups as for portraits. Indoors the same background which serves for a sitting or standing figure may do for a group of two or three. For a number a special background is required, or, failing that, the walls of the room are made use of.

CHAPTER XVII.

PRINTING WITH READY SENSITISED PAPER.

THE photographer who has reached the stage of having produced a finished negative is sure to be impatient to see some more agreeable result than the reversed picture which the negative presents.

This is to be brought about by *printing*, a process whereby the shades of the negative are reversed, and a positive is obtained as has been already explained.

There are many printing processes, but there is one which has held its own against all competition, and which, in spite of the propheeies which were ventured when first rival processes took the field, is still the popular process of the day. This is what is known as "silver printing," or to be more precise, printing on albumenised paper, rendered sensitive with chloride of silver.

It is useless to disguise the fact that this process has certain drawbacks, or rather has one very great drawback. The results cannot be relied on as permanent. Silver prints of thirty years' standing are to be met with as fresh as they were on the day when they were done, but they are the exception rather than the rule. Fading of some sort generally sets in after some ten or fifteen years. To be placed against this, there is the incom-

parable beauty of the results. There is something in a silver print which cannot be imitated by means of any other process; and, whatever may be said as to the inadvisability of issuing prints which are not permanent, the fact remains the same that the silver-printing process continues the favourite one both with professionals and amateurs, and bids fair to do so for many a long day. For this reason we describe it here.[1]

Most professional photographers purchase what is known as salted albumenised paper. This is paper coated with albumen containing a certain quantity of chloride in it—either chloride of sodium (common salt) or some other chloride, or a mixture of several. This is sensitised, as will be afterwards described, the nitrate of silver which is used decomposing the chloride in the albumen and forming chloride of silver.

Until recent years the amateur as well as the professional could follow no other course than this one, which was troublesome, and involved the very great inconvenience of having to prepare paper, print on it, and finish it all within a few hours,—twenty-four at the most,—because the paper once prepared would not keep, but turned brown by exposure to the air, even in a dark room.

Some twenty years ago a paper was invented which will keep for months without turning in colour. This is now a regular article of commerce. It is called "ready sensitised paper," and the convenience of it is enormous, especially to amateurs who have very often to print, tone, etc., at such odd hours as they can spare from other

[1] See subsequent chapters on "Alpha paper," which had not been produced when this was written.

duties. Indeed we can only compare the difference between an amateur working ordinary paper—sensitising it as he requires it, and finishing his prints immediately afterwards—and one purchasing ready sensitised paper—printing at what times he can, and possibly finishing his prints at the end of the week or even the month—to the worker with wet plates and that with dry.

The writer has worked both ready sensitised paper and has sensitised paper himself, and he is of the opinion that, with such sensitised paper as is sold by Marion and Co. at the present day, *better* results can be got than by sensitising paper as it is required.

The necessary appliances for printing with ready sensitised paper are—

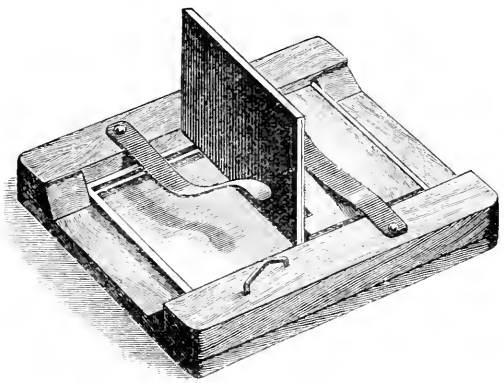
(1) One or more printing frames.
(2) Three porcelain flat dishes, somewhat larger than the largest print to be manipulated.
(3) Some ready sensitised paper.

The chemicals required are—

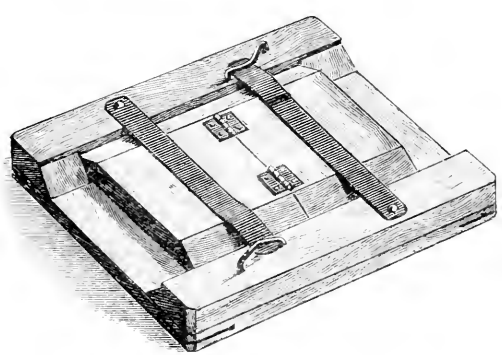
(1) A tube containing fifteen grains of chloride of gold.
(2) An ounce or two of either acetate of soda or of borax.
(3) Hyposulphite of soda (already mentioned as the chemical used for fixing dry plates).

A printing frame is a frame for holding the negative, having a back hinged in two pieces, which is pressed against the negative by two springs. One spring bears against each half of the hinged back, and it is thus possible to open away from the negative either half of the back. It will be seen that if the negative be placed in the frame, if a piece of paper be laid upon it, and if the back be laid on this paper and be pressed into it

by the springs, then the paper will be kept in close contact with the negative, whilst at the same time, by easing one spring at a time, and by opening one-half of the back, one-half of the print can be viewed without



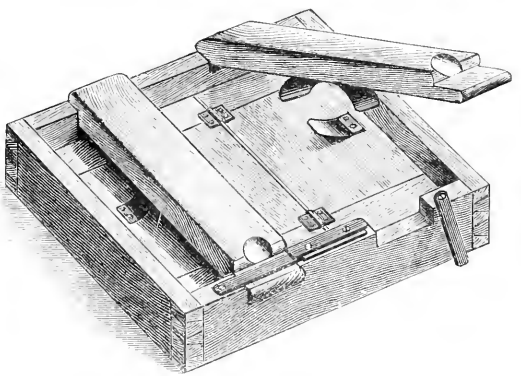
danger of shifting the relative positions of the print and the negative.



We here illustrate the more common style of frame,

such as is used for small negatives, usually not for sizes larger than whole plate ($8\frac{1}{2} \times 6\frac{1}{2}$). In this the negative itself is laid on to the rebate of the frame, so that such a frame serves for one size of negative only.

Here, on the other hand, we have one of the better class of frames, such as is used for printing large negatives. There is in it a piece of plate-glass, against which the negative is placed. By this device all danger



of breakage is avoided, whilst it becomes possible to use the same frame for different sized negatives. Such a frame is, however, too cumbersome for very small plates, and as common printing frames are very cheap, the photographer should have several by him for such small plates as he works.

The porcelain dishes are much the same as we have already been using for development. They have the advantage over black-coloured dishes that it is easier to see when they are thoroughly clean, and it must be under-

stood that for the delicate process of printing the utmost attention to cleanliness is absolutely necessary.

The sensitised paper is purchased in sheets tightly rolled up, and should be kept so until it is desired to use it. We believe that in the original rolls in which it is issued it would keep for years. After it is unrolled it will still keep for at least a month or two.

The paper is sensitive,—that is to say, it is darkened when light acts upon it, but it is not sensitive in at all the same degree that a dry plate is. No special room is necessary to work it in. It may be manipulated in a room brightly lit by gas or into which there is admitted quite enough white light to see easily to work by. If the photographer happen to have a room, the window blinds of which are of the very common yellow colour, he may pull those down and may afterwards work with complete freedom.

When prints are to be taken the paper is unrolled, and a sheet is cut up of about the size which the prints are required to be. A quarter of an inch should be allowed in both length and breadth beyond the ultimate size of the print. This is afterwards trimmed off. In a future chapter will be found hints on the best way to cut paper so as to get the greatest possible number of different sized pieces from one sheet.

During the operation of cutting and all subsequent ones the operator must be careful to let his fingers rest as little as possible on either side of the paper, but especially on that which is albumenised. If his hands have a tendency to perspire he should wash them in cold water immediately before handling the paper.

Before any number of prints are taken from a negative

it should be varnished; but as a proof—or indeed, when sensitised paper is used, several proofs—may be taken before varnishing without endangering the negative, we describe the process of varnishing after that of printing.

A printing frame to suit the negative from which a proof is wanted is placed front downwards on a table. The back of the frame is removed. The negative is placed *film side upwards* in the frame, and on it there is placed the paper albumenised side downwards, all dust having first been removed from the negative by a camel's-hair brush or a handkerchief. If the paper is of the same size as the plate the back of the frame is immediately applied, but if, as is very often the case, it is desired to have the print somewhat smaller than the negative, we have to adjust the paper. To do this the frame is lifted in both hands, so that it is held between the face of the operator and a light—say from a window. The side on which is laid the paper is towards the operator. The thumb of each hand bears on the paper, and both serve to keep the negative from falling out of the frame, and to adjust the paper by pushing it in any desired direction. After the correct position of the paper is set it is kept in that position with the thumb of the left hand, whilst with the right hand the back is placed over the paper and the springs are applied. This sounds very complicated, but it is the work of a few seconds. We have at the moment of writing a half-plate printing frame before us, and have gone through all the manipulations in less than ten seconds.

When the negative and paper are in the frame the whole is placed out-of-doors to print, and here we may

say a few words about the best light to print in. Afterwards will be found described special cases in which it is best to print in a particularly strong or a particularly weak light, but for the majority of cases it is safe to say that the brightest diffused light (that is, light other than direct sunshine) which can be had is the best light to print in. The light which can be had on the window sill or balcony on the north side of a house is excellent, or in fact any place where shade can be had; but if no place can be found except such as where the sun shines on, the difficulty can be entirely got over by placing white tissue paper over the frames.

The time which a frame must remain in the light before the print is completed varies enormously; but as it is always possible to examine the print and ascertain how far the process has gone, this need not trouble the photographer. The time varies of course with the light, but also very greatly with the nature of the negative. Those which show great contrast and are fogged in the shadows require a very long time for printing. Those which are not very dense and are quite transparent in the shadows yield prints very quickly.

The shortest time in which we can reasonably expect a print from a good negative with the brightest diffused light is ten minutes, and many negatives will be found which require one or two hours, or even more.

After the exposure has gone on for a few minutes the frame may be taken into a room where the light is moderate, and one-half of the back of the frame being opened, the progress may be examined. The print must be made considerably darker than it will eventually be required, for the reason that the after processes somewhat reduce

it. The precise amount of depth of tone which is required will soon be ascertained by practice. Those parts which it is intended shall be eventually white should appear slightly coloured when printing is complete. If the negative be of the proper density the deepest shadows will by this time have turned as dark as the paper is capable of becoming.

The prints when they are finished are placed in a drawer or in any other place where they will be kept from the light, and when the desired number is done, they are kept for toning.

CHAPTER XVIII.

TONING AND FIXING OF PRINTS.

THE photographer has now arrived at what is one of the most delicate of photographic processes, that is, the toning of the prints which he has just produced. The process is one in which there is scope for exercise of much taste and discrimination. The most casual glance at any collection of photographs will show that there is a great variety in the colour, and that whilst some are of a beautifully artistic warm purple or brown, others are of a slaty gray and altogether disagreeable shade, or show a general want of clearness and brightness of colour. These differences are due to the manner in which toning is performed. The process consists in treating the print with a weak solution of chloride of gold till the colour changes. The change is supposed to be due to the deposition of a very thin film of gold on the silver which forms the image.

Various toning-baths are used by different photographers, each one as a rule considering that he finds some special virtues in the bath which he uses. We will give several baths, all of which we have found to work excellently with both ready sensitised paper and

paper prepared as required. We will give first that known as the borax bath.

The tube of chloride of gold which contains fifteen grains is dropped into a pint bottle. A glass rod is taken and the tube is broken with it. Fifteen ounces of water are now poured over the chloride of gold, and the bottle is labelled "Chloride of gold solution; one grain to the ounce."

When we are about to tone we count our prints and calculate how many sheets of paper there are, or how great a fraction of one sheet if we have been printing only a few small proofs. This is for the sake of finding how much toning solution we ought to mix up. For each sheet of paper measuring 17×22 inches we take ninety grains of borax, which should be in the form of a powder. On this we pour a few ounces of hot water to dissolve the salt. We now make up with cold water to fifteen ounces, and add one ounce of the stock solution of chloride of gold.

This forms our toning-bath. It must be mixed within an hour or so of the time when it is to be used, as it does not keep well. Care must, moreover, be taken not to add the gold while the borax solution is still very warm, or the gold may be thrown down.

All the processes in connection with toning and fixing of prints must be performed in a light not strong enough to act upon them. The best arrangement of all is to have a yellow light for all processes except that of toning, for which white light is necessary to enable judgment of the colour to be made. It is quite possible, however, to perform all the processes in a white light so feeble that no hurt will come from its use.

The first operation is to wash the prints. If a special

piece of washing apparatus is not used this is best done in the following manner: One of the flat dishes is laid on the operating table filled with water, and the prints are laid one by one face downwards in this. When all have been so laid in the dish the water is poured off. More water is poured into the dish over the prints, and a second dish is placed, full of water, alongside the first. The prints are lifted one by one from the first to the second dish till all are in the latter, when the water is once more drained away. Clean water is again poured into both dishes, and the transference from the second to the first is commenced.

It will be noticed that the water which is poured from the prints is no longer clear, but has a milky appearance. This is because some of the silver nitrate—which it is the object to wash away—combines with salts, which are always present in tap water to a greater or less extent, and produces a precipitate. This is a very convenient test for the amount of washing which is necessary. As long as the water which drains from the prints appears when placed in a tumbler or glass measure to be in the least cloudy, the washing process has to be continued. When there is no more cloudiness we may commence toning.

The three dishes are arranged in a row along the front of the operating table. In the first or left-hand dish there are the prints which are about to be toned, the dish being kept full of clean water. In the second or middle dish is poured the toning solution. In the third or right hand dish goes clean water, into which some like to place a little common salt, so as to quickly arrest the toning process when the prints are placed in

it. If salt is used it does not matter very much what quantity is taken, but there should be enough to make the water taste briny.

It will have been noticed that, whilst the washing was going on, the prints turned from the brown colour which they had in the frames to something very nearly approaching brick-red.

The prints are now placed one by one face downwards in the toning-bath, great care being taken that each print is thoroughly saturated with the toning solution, and that no two are allowed to stick together. When about half a dozen prints are in the toning-bath the lowest is drawn from under the others. It is placed on the top face upwards for a moment to enable the colour to be judged of when it is again turned face downwards, and the one which is now at the bottom is similarly treated. Before this has gone on for many minutes it will be observed that the colour of the print begins to change. It becomes gradually browner and browner, and eventually turns to a purplish colour, and, if the process be allowed to go far enough, to a slaty gray colour.

It depends upon the taste of the operator at what stage the process is to be stopped. At one time almost all photographers preferred to get a deep purple colour in their prints, and allowed the toning process to go very far. At the present time most prefer a light brown colour, the most admired tone of all being an approach to sepia. When the desired colour is reached in the case of any print it is lifted from the toning solution and is placed face downwards in the salt-water dish. Another print may at the same time be taken from the left-hand dish.

The time which toning takes, if the bath is correctly mixed, varies from five minutes to fifteen or twenty. The best results are got when it is taking from ten to fifteen minutes. We have mentioned half a dozen prints as a good number for the beginner to have in his dish at one time, but when he gains confidence in himself, and has acquired the little skill necessary to enable him easily to turn over the prints without the likelihood of tearing them, he may have a much greater number of prints in his dish at one time. During toning the prints should be kept in constant motion.

When all the prints are toned, they have to be washed. This is best done in the same manner that was described for the untoned prints. Ten minutes of washing is sufficient at this stage. After this washing then comes fixing. The fixing solution is mixed as follows :—

Hyposulphite of soda . . .	2½ ounces.
Water, up to	1 pint.

This is placed in one of the dishes, and the prints are placed in it one by one. After all have been placed in the fixing solution, they are turned over, the bottom one being raised to the top, as described before. This may be done once or twice, after which the prints may be left at rest in the solution for quarter of an hour. After once they are in the fixing solution, it is of no consequence whether they lie face downwards or face upwards.

It will be noticed that besides the change of colour which takes place in the toning-bath, there is a general reduction of the darkness of the print both in the toning and in the fixing-bath. When the prints are first placed in the fixing-bath there is likely to be an almost

complete loss of tone, but in a few minutes there will be a return of the colour.

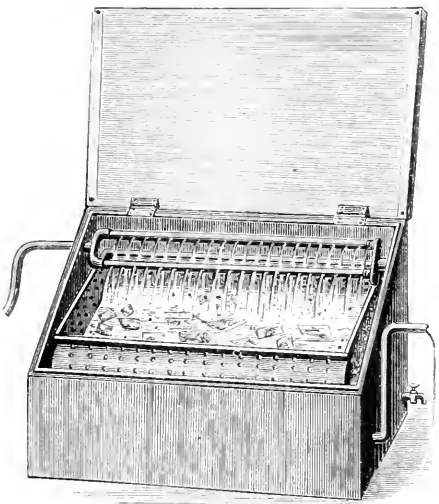
Any hyposulphite of soda left in the prints will infallibly produce fading. It is for this reason necessary to have recourse to very thorough washing to get rid of all trace of the fixing solution.

When a sufficient stream of water can be had, it is a common practice to let the prints remain in a large vessel of water with a constant stream through it. Another plan is to pour water on the prints in a large vessel, and to change this every half hour. In either case this process is usually continued from twelve to twenty-four hours. There are various ingenious automatic washing appliances whereby prints may be very thoroughly washed in a much briefer space of time than this, and there is a great advantage in this brief washing, inasmuch as the very long washings mentioned appear to cause a slight deterioration in the colour of the print. If the amateur has patience to continue for an hour the process of washing by transferring the prints from one dish to another, he will get as good a result as can be got by any other means. But all the trouble may be saved by using the washing apparatus, which we illustrate here, and which will be found fully described in our advertising columns.

In this apparatus the system of inflow and outflow of the water is such that the prints circulate continually in the trough, neither curling up nor sticking together, so that the washing is very thoroughly performed in a comparatively brief space of time.

After washing is finished, the prints have next to be dried; then they are finished. Some place them between

sheets of ordinary white blotting-paper, but this is not a safe proceeding, as hyposulphite of soda is often used in



paper-works in an "anti-chlor,"—that is to say, as a means of getting rid of the chlorine which has been used to bleach the paper. As a consequence, hypo may be transmitted to the prints, which may fade. What are known as drying boards may however be used, and this is the very best way of drying prints. A drying board is a piece of very thick, stiff, and smooth blotting-paper, the surface of which is free from all "fluff," and into the composition of which there enters no "hypo." Next to the use of drying boards the best method of drying prints is to spread a clean sheet or table-cloth on a table or floor, and to place the prints face upwards on it, having previously drained off such water as will run from the surface.

Various Toning-Baths.

The borax toning-bath which we have described above gives with us at all times excellent results, and has the great advantage that it is ready for use immediately after it is mixed. Either of the following baths will, however, also give excellent results, and may be preferred by some. The first is perhaps the best bath of any to use if purple tones be desired. The second is a very good one, where very warm or light browns are wished.

ACETATE BATH.

Stock solution of chloride of gold	1 ounce.
Water	14 ounces.
Acetate of soda	20 grains.

This bath must be mixed at least twenty-four hours before it is required for use. If it be used immediately after mixing, it will give what are termed "mealy" prints,—that is to say, prints of an uneven and disagreeable dull colour.

The bath will not keep indefinitely, but will remain good for at least some weeks if it be kept out of any strong light. If it be found that a black powdery deposit is forming at the bottom of the bottle, it will be known that the solution is becoming useless, this deposit being in fact the gold.

CARBONATE OF SODA BATH.

Stock solution of chloride of gold	1 ounce.
Water	14 ounces.
Bicarbonate of soda (baking soda)	3 grains.

This is mixed immediately before use. More should not be mixed than is required, as it does not keep very well.

Platinum Toning-Bath.

There are certain subjects for which a very black tone is considered desirable. Copies of engravings and such like may be taken as examples. Such a tone may be had by using chloride of platinum instead of chloride of gold. We believe that any of the formulæ may be used, but our experience has only extended to the acetate bath. By using varying proportions of platinum and gold different tones may be got.

CHAPTER XIX.

VARNISHING THE NEGATIVE; SENSITISING PAPER.

We said that a negative should not be extensively printed from till the film is protected by coating it with varnish. This is the case when ready sensitised paper is used. When paper which has been recently sensitised is employed it is not advisable to print from an unvarnished negative at all.

There is a double object in the varnish. The first is simply to protect the gelatine film from accidental abrasion. The second is to protect it from dampness. Dry gelatine has a great affinity for water, soaking it up readily. If ready sensitised paper is used there is little danger from damp, but paper recently sensitised is sometimes put in the frames before it is absolutely dry, thus an unvarnished negative is likely to be spoiled.

A varnish particularly suitable for dry plates is now extensively sold. That known as Hubbard's will be found excellent.

A little skill is necessary to varnish plates properly, and possibly the first few attempts may result in failure. The plate to be varnished is warmed to a temperature of about 100° Fahr. This is a temperature which feels pleasantly warm to the hand. The

plate is held with the film side upwards by the left-hand bottom corner, and on it sufficient varnish is then poured to form a pool. This pool should cover about half the area of the plate. This latter is now gently "tipped," or sloped, so that the varnish will flow towards the corner opposite that by which the plate is held. The tipping must be very gentle, or the varnish will flow off the plate. When the varnish has reached the corner opposite the one by which the plate is held, the position is slightly altered so as to cause the varnish to flow to the left, and in that direction round to the corner by which the plate is held, and eventually to the corner immediately to the right of this. By this time the whole plate will be covered, but there will be on it far too much varnish. The bottle is brought under the last corner to which the varnish has flowed, and the plate is gently brought up to a vertical position. Whilst it is being so raised it is rocked in its own plane, otherwise crapey lines will result. On the two lower edges there will now be a thick edge of varnish. This is removed by running a piece of blotting-paper along each of these edges whilst the plate still retains the vertical position. For a few minutes the plate is now laid on one side to set. It should if possible be placed in a plate-rack with that corner downwards from which the varnish runs. It may, however, be laid against a wall standing on either of the edges next to this corner. In a minute or two the varnish will have set stiff, and it is only necessary to heat the plate once more when the process is complete. This time the temperature should be raised considerably higher than before. About 150° Fahr., or quite as high a temperature as the hand can

bear to touch for a second or so, will not be too high. The plate is now set on one side to cool.

The warming of the plate before varnishing, and the heating afterwards, may be performed either before an ordinary clear fire or over a gas burner, the plate being kept a few inches clear of the flame. Better perhaps than either of these is an Argand burner or a large paraffin lamp with a chimney.

The plate is ready to be printed from after it has become cool for the second time. The varnish should cover it in a perfectly even film, although even in the case of skilful operators there is at times found a line marking a thick edge along each of the edges next the corner from which the varnish was returned to the bottle. Such a slight defect as this is of no consequence, but as the beginner is likely to have much more serious faults it is well to know how the varnish may be removed so as to go through the process a second time.

One of the flat dishes is thoroughly cleaned, and is warmed to about as high a temperature as can be conveniently borne by the hand. The plate from which we wish to remove the varnish is similarly warmed, and is placed in the dish film side upwards. Over it there is now poured sufficient methylated spirit to cover the film. It is allowed to remain so for a few seconds, the dish being rocked. A small piece of cotton wool or a camel's-hair brush is now gently passed over the film under the surface of the warm spirit. The greater quantity of the varnish is thus removed, and if the desire be simply to varnish the film again it may be done at once. It is, however, sometimes required to remove the varnish very completely so as to enable, for example, intensification

to be performed. In this case the plate is removed from the dish after what has been described is done, is warmed again to about the same temperature as before, and is held over the flat dish whilst some clear methylated spirit is poured over it.

The spirit which is now in the dish may be put into a separate bottle, to be used again for the same purpose if there be need of it.

Sensitising Paper.

The process of sensitising paper, although it presents no grave difficulties, is one which is somewhat troublesome and is rather messy. It is almost impossible to perform it unless some special apartment can be put aside for photographic work, at least for the time being.

The apparatus, materials, and chemicals necessary are as follows :—

A flat dish, somewhat larger in each direction than the largest piece of paper to be sensitised.

A number of American clips.

Albumenised paper—as much as may be required.

Nitrate of silver—enough to make up the solution to be afterwards described.

An argentometer.

A small quantity of kaolin.

A funnel and filtering paper.

The flat dish differs in no way from the ones which we have been already using in the manipulation of prints. It should, however, be kept for the one purpose of sensitising paper alone.

American clips are after the nature of diminutive

letter clips, and are used to suspend a piece of paper from a string stretched across a room.

The albumenised paper is bought in rolls like the sensitised paper already described, and does not differ from it in appearance. It will keep for a very long time.

The argentometer is an instrument used to discover the strength of the silver solution to be afterwards described. It is simply a cheap form of hydrometer,—that is to say, it consists of a bulb of glass with a stem, as shown in the cut. The bulb is so weighted that when the whole apparatus is dipped into clean water it will sink till the stem is nearly submerged. When, however, the specific gravity of the water is increased by dissolving nitrate of silver in it, the stem is floated up to a certain extent, and by observing to what degree this takes place we can tell the strength of the solution. The stem is graduated, and by reading off the figure at the surface of the liquid we can find, with a sufficient degree of correctness, how many grains of silver nitrate there are to each ounce of solution. An argentometer is usually provided with a tall glass vessel, which will hold just enough solution to float it.

The funnel used for filtering is a well-known piece of apparatus. It is best to have a good large one. It is usual to support a funnel on a retort-stand whilst filtering is being performed, and if the photographer happen to have such a piece of apparatus he may by all means

use it, but it is scarcely advisable to purchase one for the special purpose. If a fairly wide-mouthed bottle be used to hold the silver nitrate solution, the funnel may be caused to stand in the neck of the bottle.

Preparation is made for sensitising paper in the following manner: The room is either lighted through a yellow calico blind or else all outside light is shut out, as much lamp light as is desired being used. If the weather is cold, a fire is lighted, or there may be used a gas or other stove of any description, so long as there are provided means of getting rid of the products of combustion. Strings are stretched across the room in any direction convenient, to be used to attach pieces of paper to for drying.

The paper is cut up into pieces of the size which is desired. If very small prints are to be used, it is best to sensitise the paper in such sizes as will cut up to make several prints. Of course the size of the pieces of paper to be sensitised regulates the size of the bath.

Enough solution to cover the bottom of the dish to a depth of a quarter of an inch is prepared as follows:—

Silver nitrate	60 grains.
Distilled water	1 ounce.

The solution is poured into the dish.

A piece of the paper is taken by two opposite corners; it is allowed to drop in the middle between these, so that when it is lowered on to the solution the first part which will touch the liquid will be a line between the two corners not held in the hand. When the paper has been so lowered on to the solution, the corner held first in one hand, then that in the other, is gently lowered,

till the whole is floating on the surface of the silver bath.

The object of this particular method of laying down the paper is to avoid any air-bubbles being imprisoned under it, as such would leave white circular spots when printing was performed. If the process be carefully performed there will probably be no bubbles, but it is always best to make sure, for which reason, after the paper has remained floating for one minute or so, it is taken in the fingers by two adjacent corners and is gently lifted till all except a narrow portion of the other end is lifted from the solution. If we see any bubbles, they must be broken. This can generally be done by moving about the piece of paper, whilst one portion is kept floating on the solution and the rest is held above it. If the bubble will not break with this treatment it may be touched with the end of a glass rod or with a clean quill.

During the whole of this process great care must be taken not to allow any solution to get on to the back of the paper.

After we have assured ourselves that there are no air-bubbles under the paper it is left floating for two or three minutes. It is probable that, whilst the paper is so floating, the edges may be noticed to curl up and rise from the solution. If we breathe gently upon these, they will be lowered.

At the end of the time mentioned the paper is to be removed from the solution. To do this, it is taken by two adjacent corners and is lifted *very slowly* from the solution. By this means all superfluous liquid is drained from the surface by capillary attraction.

The paper is fixed by one corner to one of the pieces of string by an American clip. A fragment of blotting-paper about an inch square is brought into contact with the lower corner. It will stick to the albumenised paper by capillary attraction, and will absorb a drop or two of silver solution which otherwise would fall.

Another piece of paper is meantime floated on the bath. It has to be borne in mind that as paper continues to be sensitised the bath loses strength. After a time it will require some silver nitrate added. Each sheet of paper, measuring 17×22 inches, will extract something like 40 or 50 grains of the silver salt from the solution. The solution is reduced both in quantity and in strength. For this reason we should add to it, after every three sheets of paper 17×22 inches have been sensitised, one ounce of a solution made up as follows:—

Silver nitrate	90 grains.
Water, up to	1 ounce.

This will keep the bath approximately constant both as regards quantity and strength. At the end of a day's work we must test the strength of the solution by means of the argentometer, and correct any slight error which may have arisen even in spite of the additions of strong solution made. It will probably be found that the bath is slightly reduced in bulk, because, except in the most careful working, every three sheets of paper take up a little more than an ounce of liquid. In the first place, then, we make up the bulk to the original amount. We now pour a little of the solution into the argentometer tube and place the argentometer floating in the liquid.

We will suppose that we find that the surface of the liquid crosses the stem at 55. This indicates that we have lost 5 grains of silver nitrate for each ounce of solution. We therefore add this amount to each ounce of "bath" that we have made up. If, as is quite possible, the solution indicates *about* 60, we may reduce the strength by the addition of a little water.

The bath which we have given is a very strong one, and no ill will result if it become considerably weaker during use. It will certainly work well when reduced to 45 grains of silver per ounce of solution.

After we have done using the bath for the day we must filter it before replacing it in its bottle. We may then shake it up with a little of the kaolin, which is a white chalky-looking powder. It takes some time to subside, and as it does so carries with it such organic matter as was in too fine a state of division to be retained in the filter.

One of the greatest troubles in connection with sensitising paper is that, if it be allowed to hang up till it is dry it will curl up so tightly as to be almost unmanageable. The writer has found the following plan an excellent one to prevent such curling up:—

The paper is allowed to hang up only till, if the piece of blotting-paper be removed from the corner, no solution will drop from it. It is then laid, albumenised side upwards, on one of the "drying boards"—already described—a second drying board is placed over the paper, and the greater portion of the solution is blotted off. The paper is now laid *face down* on a second drying board, and other pieces are treated similarly. As soon as the first piece of paper has so far dried that the edges *begin* to

turn stiffly inwards, it is laid face upwards on a piece of drying board a little larger each way than itself. A second piece of drying board is placed over it, and above this a flat wooden board with a weight over it. When the next piece of paper is ready it is placed over the second piece of drying board, and a third piece of drying board is placed over *it*. In this way all the paper is piled, and it will dry quite flat.

The paper gives the best results when not absolutely dry, but when very nearly so. It will be in the very best condition after it has been between the drying boards for perhaps half an hour or an hour.

If before use the drying boards be dipped in a saturated solution of carbonate of soda (washing soda) and be then dried, the paper lying between them will keep white for at least a week.

For paper to become surface dry requires only a few minutes if the draining have been properly performed and if the room be dry. If the paper become quite dry it curls up in a way which at times makes it very difficult to get it flat enough to lay it in the frame. It may in this case be straightened in the following manner: A pad of blotting-paper and a blunt paper-knife are required. The print is laid out as nearly flat on the blotting-paper as it can be by hand, the back being upwards. The paper-knife is now drawn across the back, considerable pressure being given by the edge. After this has been done for some time the paper will retain its flatness.

Ammonia Fuming of Paper.

When paper is sensitised as it is required it is com-

mon to fume it with ammonia. If such be done the paper will print somewhat more quickly than when unfumed, and, at least with some operators, gives a more brilliant print.

Boxes or chests are made specially for fuming paper. The operation consists simply in exposing the paper to fumes of liquor ammonia. The boxes are pieces of apparatus wherein the paper is laid on string nettings, or is otherwise supported whilst it is acted upon by a mixture of one part of ammonia and three or four of water, which is placed in a dish under it.

The amateur who wishes to fume his paper on a small scale will easily think of means whereby such may be done. For example, in an ordinary cupboard or wardrobe a dish of ammonia may be placed whilst over it the paper flattened out, as already described, hangs on American clips. The usual time of fuming is a quarter of an hour or twenty minutes.

The operations of printing, toning, fixing, and washing of prints are almost precisely similar for the paper sensitised as we have described as for paper purchased ready sensitised.

It will probably be found, and especially in the case of fumed paper, that the print fresh from the frame has none of the brown colour which the print on ready sensitised paper had, but appears as if it were already toned. Sometimes this colour will go off in the washing, giving place to the brick-red colour which we have already mentioned. If it will not, the desired change may be brought about by dipping the prints in water into which a little salt has been put. The precise amount of salt does not signify. The water should be made to

taste slightly briny. The prints are dipped in this salt water, after they have been washed, till they are fairly free from silver nitrate. They are left in it for a few minutes, and are again washed for a like period.

It might be supposed that if a print appear when it comes from the frame to have the same colour as a toned print there can be no need to tone at all. This is by no means the case, however. The fixing-bath would soon remove the apparent tone, reducing the print to a very disagreeable yellowish-red shade.

Paper sensitised as required, and not fumed, takes somewhat longer to print than ready sensitised paper. That which is fumed takes about the same length of time to gain the same amount of darkness in the frame, but as it loses somewhat more in toning and fixing than ready sensitised paper does, it is necessary to print a little longer.

Before concluding our remarks on printing we must say a few words on the different effects produced by printing in a weak or a strong light. If a print be taken from a negative of average density in the fullest mid-summer sunshine, and if another be taken in light so dull that it will require say a dozen times as long to print, the two will on comparison show a marked difference. The print taken in bright sunshine will show less contrast than the other. From this it follows that if we have a negative which gives a print slightly hard, but not so hard that we incline to apply a reducer, our best course is to print in bright sunshine. If, on the other hand, the print got is a *little* too soft we should print in a very weak light.

CHAPTER XX.

DEFECTS IN PRINTS, AND REMEDIES.

The Print refuses to tone.

SOMETIMES the change of colour which ought to take place in the toning-bath fails to appear. This is usually caused by the fact that the bath is in an acid state. It must be understood that chloride of gold is usually somewhat acid, and that borax, bicarbonate of soda, or whatever is used with it is intended to neutralise this acidity and, moreover, to render the solution slightly alkaline. If the bath refuse to tone, the test papers must be used to find out whether it is alkaline or not. If red litmus papers be placed in an alkaline solution its colour is changed to blue. A book of test paper slips should be purchased, and a little piece of red litmus should be placed in the toning solution. If no change of colour takes place in the paper after a minute or so we may assume that the solution is either acid or neutral. In either case we have to add some more of the salt which was mixed with the chloride of gold to constitute the toning-bath. We may add a little at a time till the red litmus shows signs of changing its colour. If we add so much that the red colour of the paper is

changed to blue the moment it is placed in the solution, we have rendered it too alkaline.

If the bath adopted be one which has to be kept for some time before it is used we must notice that the gold has not deposited itself at the bottom and on the sides of the bottle as we described already. The stock gold solution without any alkaline reaction is generally very stable, but we have known cases in which the gold has thrown itself down. Of course when the gold has become deposited in the bottom of the vessel we have not far to go to seek for the cause of the refusal of the bath to tone.

If the toning solution be very cold, toning may take a long time, or the prints may even refuse to tone at all. In winter time the temperature of the bath may be raised somewhat, but never above 70° or 80° Fahr.

Some papers, without being in any way defective, require a toning-bath of greater strength than the one we have given. If we find that prints take too long to tone, and at the same time we are sure that our bath is not faulty, we may strengthen it by adding gold and whatever other chemical we are using. The bath may be made even double as strong as we have described.

The Prints tone sufficiently well, but the greater part of the Tone is lost in the Fixing-Bath and does not return.

Before entering on particulars of this fault we should say that all photographers are not agreed as to the necessity of giving to the prints before they are toned the thorough washing that we have described. There is

no doubt that if but a slight washing be given, the process being stopped whilst the water which runs from the prints is still cloudy, indicating that considerable silver nitrate remains still in the paper, toning will go on *much more rapidly*. It is our experience, however, that the tone thus readily gained with only partially washed prints is very liable to be lost, or at least to deteriorate in the fixing-bath. We have, moreover, reason to believe that prints toned whilst there is still considerable free silver nitrate in the paper are less permanent than those toned after thorough washing. The greater number of photographers prefer to wash their prints thoroughly before toning them.

Another cause of loss of tone in the fixing-bath is the use of too strong a solution of hyposulphite of soda. The fixing solution for plates may be made up by guess after a little experience, but weighing should always be resorted to for the print-fixing solution. Some recommend for prints the use of a fixing-bath containing five ounces of hyposulphite of soda to each pint of solution. This we consider far too strong.

The Prints tone unevenly.

The most common cause of this defect is to be found in the sticking together of prints through *insufficient motion* during toning, and especially if a solution so strong as to bring about the change of colour in a few minutes be used. The prints should be kept in *constant* motion till they are all toned.

Finger-marks on the albumenised side of the paper are liable to come out as untoned marks in the print.

Finger-marks on the back of the paper, although they always show very plainly whilst the print is wet, usually disappear entirely when it is dry.

If paper has been fumed, and the action of the ammonia has not been even, unevenness of tone is sure to result.

The portions of the Print which ought to be white are yellow.

This is a very common and most annoying defect. A great portion of the beauty of a photographic print depends on the pureness of the whites; and this is especially true in the case of vignettes.

There are several causes of the defect. The first which we will take lies in the paper itself. If ready sensitised paper be kept too long, or be kept for a comparatively short time, in a damp place, or in a place where it is exposed to gas fumes, it will turn first yellow then brown. It is unreasonable to expect from such paper prints which will have pure whites. Exposure to the air will also cause the change of colour. The paper therefore should be kept tightly rolled up; it will then keep almost indefinitely. If it be found necessary to keep for any length of time paper which has been unrolled and cut up, it is best to put it under pressure; it may be placed under a flat board with a weight over it, or it may be placed in a printing frame, the back of which will afford the necessary pressure. In this latter case a sheet of ordinary paper should be placed between the sensitised paper and the back of the frame; otherwise there will appear in time a dark line on the paper corresponding with the division between the two halves of the back.

Printed paper, such as newspaper, etc., should on no account be placed in contact with sensitised paper, otherwise the printing will become visible on the sensitive surface.

It has already been said that paper sensitised as required will not keep, except under certain conditions, for more than about twenty-four hours. It sometimes happens that it is necessary to leave a negative in the frame for a longer time than this before a single proof can be got from it. This may be the case with very dense negatives, and when the weather is very dull. In this case there should be placed between the sensitive paper and the back of the frame a piece of blotting-paper which has been soaked in a saturated solution of washing soda, and has been dried.

The yellowness and brownness which we have described is unobjectionable compared with that which we are about to describe, inasmuch as it is evident on the paper before this is even put in the frame, so that we know what to expect. Moreover, it is much reduced in the toning and fixing baths. In fact, a piece of paper which is quite perceptibly brown before it is put in the frame *may* give a perfect print. There is, however, a defect which is caused in the toning or fixing-bath, and which is, so far as we know, incurable, and moreover is accompanied by a general degradation of tone which makes the print totally useless. It is often accompanied by a curious metallic lustre on the surface of the print. This is to be distinguished from bronzing (to be afterwards described) by the fact that, whereas bronzing appears only in the deeper shadows of the print, this metallic lustre covers the whole surface, or, at any rate,

the whole of that portion of the print which is affected with the fault, irrespective of lights and shadows.

There are several parts of the process at which this defect may make its appearance. The first is when the print is first being washed before toning; and this is, we believe, the most common. If the prints are allowed to remain for any length of time in the first washing water, which contains a considerable quantity of nitrate of silver, they will almost certainly be turned yellow in the high lights. This is still more certain to take place if they be allowed to stick together, and yellowness will give place to brownness if too much light get access to the washing water at this stage.

The prints should be kept in as constant motion as possible in the first and second waters, and should be as quickly as possible transferred from the first to the second, and from the second to the third waters.

The next possible cause of the fault is in the toning-bath. If too much light reaches the prints whilst here, the defect will occur. Further than this, if any of several foreign substances find their way by accident into the toning-bath, the same is likely to occur. The most likely substance, and one which will infallibly bring about the defect, is hyposulphite of soda. If a few drops of the fixing-bath get into the toning-bath the latter is ruined.

Another danger of the defect is to be found in the fixing-bath itself. If this be acid, it is likely to come about. It is well to make sure that the fixing-bath is not acid by putting into each pint of it a piece of washing soda the size of a hazel-nut, or by pouring into it a few drops of ammonia until the solution slightly smells of it, thereby indicating that it has been rendered a little

alkaline. The alkalinity of the fixing-bath can do no harm, and ensures its not being acid, which latter *is* most hurtful.

If the prints be allowed to stick together, either during fixing or immediately after in the washing water, yellowness of the lights may occur.

The Shadows of the Print have a bronzed appearance.

This appearance only occurs when a negative having very strong contrasts is used with paper which has been sensitised on a very strong silver bath. Very often the disagreeable appearance will pass away in the fixing-bath. At times, however, it is so strong that it does not. In such a case we must use a weaker sensitising bath.

The Prints lack contrast.

If this defect be not due to the negative it is due to the sensitising bath being too weak. In this latter case there accompanies the lack of contrast a peculiar defect to which the name of "mealiness" has been given. This we describe here.

The Prints are "mealy."

This word is used to describe an appearance of print which is most disagreeable. Instead of the deeper shadows being of an even dark hue, they are of a freckled nature, and as a rule the colour of them is not agreeable.

As just mentioned, this defect may arise from the fact that the sensitising bath is too weak. In this case the evident course is to strengthen it. It also arises from

the use of an acetate toning-bath which has been kept for too short a period. If it be found that an acetate bath which has been kept for twenty-four hours gives mealy prints, the next one used should be mixed up with boiling instead of cold water.

There is a powdery deposit over the surface of the Prints.

This defect may make its appearance if the prints have been allowed to lie face upwards in the washing water before toning. The evident remedy is not to leave them so.

CHAPTER XXI.

VIGNETTING.

EVERY one who has looked at a set of photographs must have observed in the case of some the very agreeable effect of a certain class of print to which the name of "vignette" has been given. In this, instead of the photograph covering the whole of the paper, it is confined to the central portion, there being a gradual shading off towards the edges, which latter are pure white.

For a long time the means of producing this pleasing effect was known only by a few, and was sold as a secret process for large sums. There are now known many ways by which it can be produced. Before describing these a few words are necessary as to the nature of subject which is best treated in this manner.

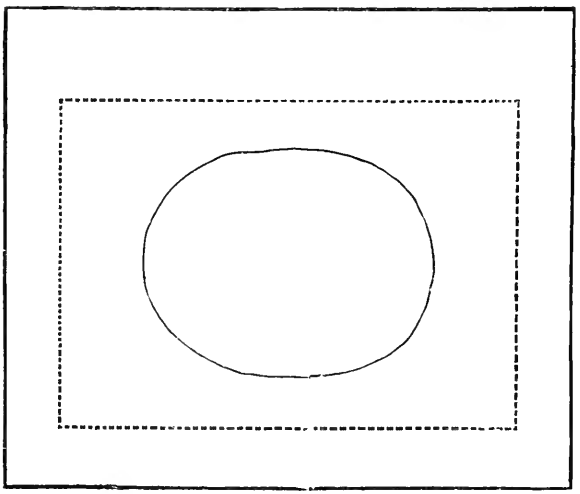
Both landscapes and portraits make excellent vignettes if certain conditions be observed. The first of these is that the negative be one which may be described as *delicate*,—that is to say, it must be full of detail and at the same time without excessive contrast in large masses of light and shade. A negative which might otherwise be considered slightly over-exposed is excellent for a vignette. Another necessity is that there should be no very deep shadow of great extent, which in an ordinary

print extends over the portion which is fully printed and into that which in the vignette is to be white margin. With such deep shadows it is impossible to avoid an abrupt transition from dark to white, and the delicacy of the vignette is destroyed. For this reason a portrait with a dark background is not suitable for vignetting, nor is a head and shoulders of a sitter with a dress having a very dark body.

We will take first of all the case of a landscape, and describe how the first experiments may be made. A negative showing the qualities which we have described is taken. A piece of ordinary cardboard is cut into such a shape and size that it will cover the whole front of the frame. From the centre of this piece of cardboard there is now cut an oval hole about two-thirds as long as the length of the plate and also two-thirds as wide as its breadth. The following cut will give an idea of the relative sizes of the hole and the plate. The outside line shows the whole extent of the piece of pasteboard, the dotted line shows the size of the plate, and the oval portion is that which is removed. It is not necessary to draw the oval with any degree of accuracy. A rough line such as we show is quite good enough.

The piece of cardboard is fixed to the frame. This may be done either by means of a little glue or by drawing-pins; the latter method is the best. Printing is performed in diffused light, or still better in sunlight, a piece of tissue paper being placed over the opening. It is necessary to get a broad expanse of sky opposite the frame to produce good vignettes if diffused light be employed. The reason of this is evident. The shading off is produced by light which passes angularly under the edge of the opening in

the pasteboard. Now it is evident that if there be not plenty of light striking the frame obliquely no rays will



pass beyond the edge of the aperture in the pasteboard. It is therefore necessary if, as sometimes happens, especially in a town, a light from only a narrow portion of the sky can be obtained, to use tissue paper over the opening even when we are printing by diffused light. The effect of the tissue paper is to produce artificial diffusion spreading the light in all directions.

It is best to cut the oval opening somewhat too small at first, and after a proof is taken, or even when the first is in progress, to alter it as appears desirable.

The first proof that is taken will show whether the arrangement of the pasteboard is correct. The distance between it and the negative should be for small plates

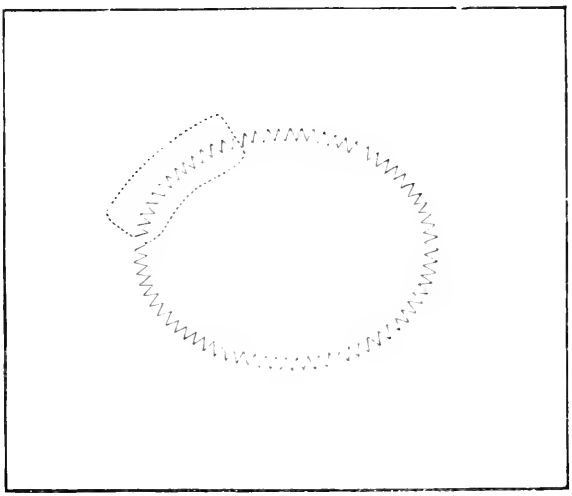
half to three-quarters of an inch, for large plates proportionately more. With this distance between the vignettes and the glass the shading off should be soft enough, but sometimes it happens that it is not. In this case the following course may be pursued. The edges of the cardboard are taken between the finger and thumb, and are bent upwards as far as is possible without producing wide cracks. The section of the cardboard will then be something like the following. We have tried to show it as if it had been cut into two pieces, one only of them being represented.

A very soft vignette will generally result from this. Another course which is sometimes adopted is to serrate the edges of the aperture as shown here. This also produces a soft vignette.

If it be considered that the vignette does not extend far enough at any place the aperture may be widened, as in the following cut. If it extend too far a piece of paper may be gummed on to the pasteboard so as to project beyond the edge. We show in the accompanying cut, in dotted lines, an example of how such a piece of paper might be applied. At times it will be found that the negative is of such a character that the shading tends to extend farther in one general direction than in another. In such a case the vignettes may be brought nearer the negative at that end or side where the shading tends to extend too far.

For portraits the proceeding is quite similar to that

for landscapes. The opening in the paper is, however, in this case usually unequal at the two ends—is, in fact, a



true oval or egg-shape, the broadest end being downwards.

The background needs special attention in the case of portraits which are to be vignetted. It must be light, but should not be so light that it will print white. A blanket generally gives just about the right shade of colour for a background for vignetted portraits. This may be used by amateurs, but if it is, care must be taken to keep it at such a distance behind the sitter that it will be so much out of focus that the texture will not be visible in the negative or print.

It is necessary, in cutting the oval for a portrait, to be very careful as to its size. We here give a sketch

which shows the general shape of a head and shoulders, such as would be suitable for a vignette, and in dotted lines we give about the shape of the aperture in the piece of pasteboard.

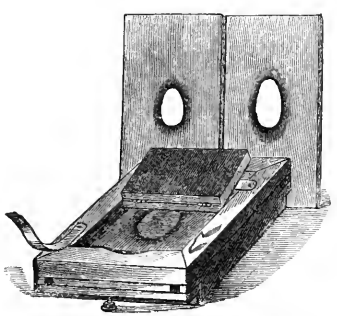
A vignette should be printed scarcely so deeply as an

ordinary print, the great aim, as we have said, being to secure delicacy.

The extemporised piece of apparatus which we have described will do very well for the first experiments of the amateur, and indeed is the only thing that is used

by many experienced photographers; but there are several very neat little appliances whereby the process may be much facilitated. We may mention amongst these vignetting-glasses. These are plates of glass of about the same size as the negative to be printed from. There is a transparent oval in the centre, whilst the sides are of a ruby colour, so that no actinic light passes. The ruby colour is gently shaded off, so that great softness is produced in the vignette. The vignetting-glass takes precisely the same position that the cardboard with the oval opening did.

One of the best vignetters which can be had is cut out of a piece of wood a quarter to three-eighths of an inch thick. A hole is cut in this precisely as in the case of the cardboard, and this is bevelled away on the under



side so as to produce the same effect that the pinching up of the cardboard at the edge did.

Marion's new vignetting-frame, which we here illustrate, is an extremely useful piece of apparatus. It will be seen that besides the ordinary frame with a folding back, there is a space for slipping in a piece of wood,

with aperture cut and bevelled as we have described. There are, moreover, means whereby the position of the vignettes may be altered, and whereby it may be clamped fast when the proper position is discovered. Several vignetters are provided with each frame. It is very easy to get others made if they are required for special purposes.

CHAPTER XXII.

THE ALPHA PAPER AND THE ALPHA OPAL PLATES.

WHILST writing of prints on albumenised paper we stated that the process commonly entitled "silver printing" had held its own against all competition.

We by no means wish to take up the business of prophesying what may or what may not be the future of photographic printing; but we will venture to say that in the Alpha paper, which has been brought before the public since the first edition of this work was published, albumenised paper will have a formidable rival, and that for certain purposes at any rate the use of "Alpha" paper will entirely supersede that of albumenised paper.

Prints produced on Alpha paper can scarcely be distinguished from those on albumenised paper, whilst the new process has the following decided advantages:—

First. The time required for exposure, instead of being from perhaps a quarter of an hour to several days, according to the nature of the negative and the condition of the weather, is but a second or two when daylight is in question, only a minute or two even with gaslight or lamplight.

Second. There is every reason to believe that the

prints on Alpha paper are more permanent than those on sensitised albumenised paper.

Concerning the matter of the reduction of exposure, it is scarcely necessary to point out how advantageous it may be in many circumstances. Notably it will make the paper useful where it is desired to produce a number of impressions from a negative in a short space of time. Possibly the amateur will feel the benefit of the introduction of the new paper more than any other. It is generally in the printing that he gets bothered; it is so slow a process with the ordinary paper. Then the amateur is often engaged in business during the daytime —the only time when printing on albumenised paper is possible. His few holidays he likes to spend with the camera in the field, and, as a result, he often takes negatives from which he never gets a print, or he sends his negatives away from home to be printed from by a professional photographer. With the Alpha paper he will be able, with an ordinary gas-burner or lamp, to produce as many prints in an hour as he could on albumenised paper in a day.

As to permanency, of course nothing *absolute* can be said at present,—time alone can prove this. But it is the general opinion of experts that the prints are at least far more lasting than those on albumenised paper. As we state this with considerable confidence we ought to give our reasons.

There can be no doubt that in the case of prints on albumenised paper, at least one cause of the deterioration which takes place through time—the chief cause, in the writer's opinion—is the organic compound produced by the action of the excess of nitrate of silver on

the organic materials in and on the paper. An organic compound is formed,—albumenate of silver we are told,—and this compound gives rise to an unstable image. Now during no part of the manufacture of the Alpha paper is free silver nitrate brought into contact with any organic substance. For this reason the organic compound of silver already mentioned cannot exist in the paper.

Briefly stated the method of working is as follows:—

Alpha paper is placed in a printing frame in the usual manner, manipulations being performed in the dark room, or, still better, in a room lighted with a good amount of red or yellow light.

The paper is now exposed to light. There will be no visible image with the correct exposure unless the negative is a very dense one, when the deepest shadows will be faintly visible.

The paper is *developed*, an operation which takes less than a minute.

It is then washed, treated for a quarter of an hour with alum solution, washed for a few minutes again, toned in the usual manner, then fixed.

It is necessary to go somewhat more minutely into a description of these various processes.

The length of exposure necessary will, of course, vary with the nature of the light and with the negative.

With a negative of average density, and a distance of six or eight inches from an ordinary fish-tail burner, the exposure will be two to four minutes. By the use of an "albo carbon" light and a tin reflector the exposure may be reduced from ten seconds to half a minute. In bright summer diffused light the exposure may be

about as brief as can be given. Certainly under a second will do. The exposure to bright sunshine is too brief to be under command, except in the case of negatives of extraordinary density.

In an ordinary room, at about the distance from the window at which we recommend portraits to be taken, the exposure will be five to ten seconds. It is far better to work with such exposures which are under control than with the very brief ones which *may* be given with a brighter light.

For development the following solutions are mixed :—

No. 1.

Oxalate of potash . . .	1 lb.
Bromide of ammonium . .	320 grains.
Warm water, up to . . .	80 ounces.

No. 2.

Proto-sulphate of iron .	4 oz. 250 grains.
Water, up to	80 ounces.

When prints are exposed a dish is taken somewhat larger in size than the prints to be developed. Enough developer is made by taking equal proportions of Nos. 1 and 2 to fill the dish to a depth of at least half an inch. In mixing the solutions, No. 2 must be poured into No. 1, not *vice versâ*. Doubtless the photographer will recognise the developer as a modification of that used for dry plates, and called the "ferrous oxalate" developer.

The prints are placed dry into the solution, not more than three or four at a time. They must then be kept in constant motion. The development goes on more

rapidly than that of a dry plate, and it is necessary to watch intently as it gets near completion. The print must be taken out of the solution immediately that it has got as dark as it ought finally to be;—if anything *before* rather than *after* it looks dark enough, because whereas no depth is lost in toning and fixing, development is liable to continue for a second or two after the print is removed from the developing bath.

The print, as soon as development is over, is placed in a dish of clean water, and is rapidly transferred to a second and then to a third dish, each containing clean water. It then goes into a fourth, where it may remain for three or four minutes.

The developer must not be used within more than about a quarter of an hour of the time that the first print has been placed in it; but during that quarter of an hour as many prints as is possible may be passed through it.

It is immediately after development that it is first possible to tell whether or not the exposure has been correct. This is ascertained chiefly by the *colour* which the print assumes during development. The print will show a colour tending towards red if the exposure has been correct. If it has been too short the prints will be black or of a greenish-black. If too long they will be *very* red, and will appear weak or lacking in contrast.

It is sometimes desirable to get prints of an engraving black tone. In this case an exposure of only perhaps a third or a quarter of what we have mentioned must be given.

After the prints have been washed they are placed in a bath composed as follows:—

Ground alum	6 ounces.
Water, up to	80 ounces.

The water is poured over the alum hot, but the solution must not be used till it has become quite cold.

The prints, after they have been for a quarter of an hour in the alum, are washed as before. They are then ready for toning. They may be toned by the aid of light of the same nature as that in which prints on albumenised paper are toned. Toning is performed in precisely the same manner as in the case of prints on albumenised paper, except that when we wish to judge of the change of colour we look *through* the prints, holding them in the hand, not down upon them. The surface of the print will have assumed a purple tint long before toning is complete.

The prints may be toned in any toning-bath, but as the baths generally used for albumenised paper are very slow in their action on Alpha paper the following bath is recommended :—

Water	1 pint.
Acetate of soda	60 grains.
Chloride of lime (fresh) . .	4 grains.
Chloride of gold	2 grains.

The water is poured *hot* over the acetate of soda and the chloride of lime, and when the solution has become cold the gold chloride is added.

After toning the prints are washed once more. They are then placed for five minutes or longer in a fixing solution, composed as follows :—

Hypo	1 lb.
Water	80 ounces.

The colour will change to a foxy red in the fixing-bath if the prints have been properly exposed, developed, and toned; but this red will give place to a colour varying from warm brown to rich purple when the prints are dry.

After the prints have been fixed they are washed exactly as are prints on albumenised paper.

This may be a good place to give a word or two of caution.

Absolute cleanliness in manipulation is quite as necessary in the case of prints on Alpha paper as in the case of prints on albumenised paper. The dishes must be most carefully washed before operations are commenced, and on no account must a drop of one bath be allowed to get into another.

The prints must be kept in continual motion in all the solutions and also in all the washing waters, otherwise irregularity of tone and impure whites will result.

Prints which show large expanses of white, especially vignettes, should be developed before others, so that they may have the advantage of freshly-mixed developer.

After the final washing the prints may be mounted in the same manner as albumenised prints, and rolled or burnished in the usual way.

A beautiful enamel surface may be obtained in the following manner:—

A piece of glass somewhat larger than the print is thoroughly cleaned. Powered talc, commonly known as French chalk, is now dusted over one surface of the glass. It is then polished off with a piece of dry flannel. The wet print is placed face downwards on the glass and a squeegee is gently passed over the back of it to expel the

moisture. The whole is placed on one side to dry *in a warm room.* When dry the print may easily be stripped off the glass. When it is removed it will be found that it has a splendid surface.

If it be desired to mount such prints so as to retain the full gloss, the following method is pursued :—

On the back of the prints upon the glass, when they have become about half dry, there is pasted with thick starch a piece of "three sheet board." When the whole is dry the print will strip, as in the former case, but will of course come off attached to the thin board. This thin board may be attached to an ordinary mount with glue or mounting solution.

By pursuing a far simpler course a surface almost equal to "enamel" is obtained.

On to the back of prints when half dried on the glasses is brushed some very thick starch. The prints are then allowed to dry and are stripped from the glass. For each print an ordinary mount is taken. It is damped on one surface with a wet sponge. The back of the print is placed in contact with it, and the mount and print together are passed through the rolling press *cold.* Perfect adhesion of the print to the mount will ensue.

Alpha Opal Plates.

Positives on "opal" glass have a most charming effect. The absolute purity of the white of the matt-surface of the glass is like alabaster. There are various methods whereby prints on opal glass may be obtained, but the one to which we now refer has certain advantages over others. In regard to briefness of exposure and perma-

nence of results it has precisely the same advantages that the Alpha paper has, whilst it is the only process that we know of in which the positives may be toned to any colour that is desired, exactly as silver prints are.

If the opals are to be viewed as prints by reflected light the manipulations are precisely the same as for the paper, except that, in the case of plates, it is of course possible to have but one in a dish at a time.

If they are to be viewed as transparencies hung up against a window or in some such position they must be somewhat more fully developed than in the other case.

CHAPTER XXIII.

PRINTING SKIES INTO LANDSCAPE NEGATIVES; COMBINATION PRINTING.

A LANDSCAPE in which the sky is represented by an expanse of white is a most inartistic production. One in which there is a uniform light tint is somewhat better, but it lacks much of what is wanted to make a picture. A graduated sky—that is to say, one which is slightly tinted all over, but is somewhat darker towards the top than at the bottom—is again an improvement, but all these fall very far short in effect to what is produced by the introduction of a few clouds, even if there be merely an indication of them.

We have already said that in certain cases suitable clouds can be got on the same plate as the landscape, but this is a very rare exception. In nine cases out of ten a landscape negative shows no clouds or only such as are unsuitable for making a picture. In this case it is necessary to print in clouds from another negative.

In our chapter on landscape work we mentioned cases in which it is desirable to take a cloud negative for the sole purpose of printing into a certain landscape. This is a thing which may be done on the rare occasions when

the clouds which are in the sky at the time of exposure appear to compose better with the picture than any others could. The landscape photographer cannot, however, consider that he has all the necessities for printing until he has a set of negatives of clouds of all the various kinds which are to be seen, and lighted from all the different directions, so that he may find one suitable for any landscape which he wishes to print. These cloud negatives are very easy to get if a suitable position be chosen and when suitable weather occurs. It will be noticed that by far the finest cloud effects are to be seen when the weather is somewhat unsettled. On a breezy day in spring, when it appears just possible that a shower may fall at any moment, the photographer, if he can find a position which commands the whole four quarters of the heavens, may secure as many cloud negatives as will serve him for years. A word of warning must be given. It will be found that the most striking effects of clouds are always to be seen near the sun. At a distance of ten to sixty degrees from the sun's position the clouds usually have very beautiful outlines, and are lighted in a very brilliant manner. A few negatives of such clouds may be secured, but it is to be borne in mind that it is comparatively seldom that they will be brought into requisition. Landscapes are at times taken with the camera looking towards or nearly towards the sun, and some of these give very fine effects, but the vast majority of landscapes are lit from the front or side, and therefore the photographer should be careful to secure cloud negatives similarly lighted. It will be noticed that the effects produced when the sun is high in the heavens are quite different from those seen when

he is near the horizon. For this reason we should secure negatives both taken near midday and in the early morning, or late in the afternoon. The exposures for clouds at midday are somewhat shorter than those which we give in the table of exposures under the heading "Sea and Sky;" for clouds when the sun is very near the horizon they are somewhat longer.

A thing to be further borne in mind is this—the more striking a cloud negative is, the finer a result *may* be got by an artistic worker, but the more likelihood is there, if he possess not the requisite skill, that an incongruity will result. We must all begin at the beginning, and it is well to remember that the printing in of clouds is an operation requiring great judgment, and that, until we have attained sufficient confidence in ourselves, it is best to use negatives which will give only a suggestion of fleecy clouds, and not have such as show striking outlines and bold lighting.

Nothing can be conceived more ridiculous than a landscape showing clouds which were evidently lighted in a totally different manner from the terrestrial objects.

We have seen photographs of two landscapes lighted from different sides, the sun evidently in the case of each high and somewhat to the front (that is to say, rather *behind* than in front of the camera). In each of these landscapes there were shown the *same clouds*. These were unsuitable for either, being evidently lighted from nearly behind, and to make the absurdity complete were printed in *upside down!*

We hope that none of our readers will fall into such

blunders as these, but it must be borne in mind that there are many smaller errors which may be committed.

Cloud negatives may be purchased. They are generally on paper rendered transparent with wax, or on films of transparent gelatine. They have the immense advantage that they can be printed from with either side towards the albumenised paper, so that each negative presents *two* lightings.

We think it is a poor thing for the amateur when he becomes an experienced photographer to depend for his skies on negatives taken by others, but the beginner can do nothing better than purchase a few such negatives as we have described. He will find them easier to work than negatives on glass, and they will serve to give him a good idea of what he is to aim at when he commences to take sky negatives himself.

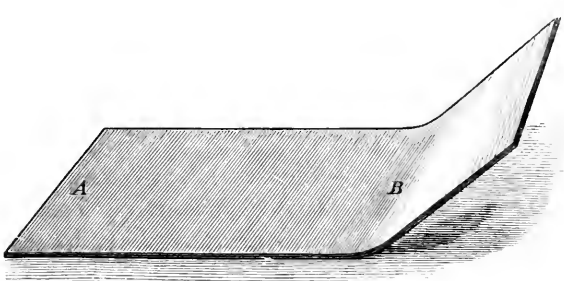
Before describing the method of printing from sky negatives we will tell how a simple graduated or shaded sky is produced. This sky has an excellent effect in the case of certain subjects. The effect produced is generally that of a *low* sky, or one such as is seen in early morning or shortly before the sun sets. It is therefore suitable for subjects taken at these times or in winter, the shadows being long. It is also suitable for subjects with comparatively straight horizons.

First as to the landscape negative. Before a sky of *any* kind is printed in, it is necessary that the place which it is to occupy should be white in the print. If the sky of the negative be so dense as to print quite white, well and good; if not, it is necessary to block the sky out. This is done in the following manner: Some ordinary water-colour vermilion is

mixed, gum-water being used instead of pure water, so that it will take readily on the varnished film, and is used with a fine camel's-hair or sable brush. The outline of the horizon is now very carefully painted along on the varnish. A line of vermilion, about a quarter of an inch wide, is thus put on. On the back of the negative we now block out the whole sky, making our blocking overlap that which has been done with great care on the film side. We may use on the back of the plate either Indian ink mixed with gum-water or Bates' black varnish. Either is applied with a somewhat large brush.

If, before blocking out, the sky printed just a very light tint it is sufficient to block out on the back of negative only, keeping the colour about a sixteenth of an inch away from the horizon line. In this case the narrow fringe of very light tint will not be noticeable.

Having got our print with a white sky we proceed as follows: We take a piece of cardboard, tin, or zinc, somewhat larger than the print, and bend it to the



shape shown in the sketch,—that is to say, we simply

bend up an inch or two of one of the edges. We now lay the print on a piece of wood or other convenient rest, the landscape portion being covered with the shade from A to B, the sky portions being under the bent-up portion of the shade. The print is taken into the light, when, as will be understood, the top portion of the sky will rapidly begin to change colour, whilst that under the shade does so more slowly, a gradation being produced. The shade is kept moving slowly backwards and forwards over the print till the desired effect is produced. The very same result can be brought about by the exercise of a little skill, the focussing cloth alone being used. In this latter case there is more necessity to keep the shade (the cloth) in constant motion than in the other, or lines be produced.

Now we come to the use of sky negatives. In the first place a suitable negative is to be selected. When one is got we place the print with white sky in contact with it and look through both, the negative being next to us. We shift the position of the one with regard to the other till it appears to us that we have got the clouds in that position which will produce the best sky. We now lay the negative with the print over it on to a printing frame with plate-glass front, the frame being considerably larger than the negative, so as to allow for the probable fact that, when the best relative position of the print and negative is obtained, the print will extend far below the negative. The former must not be folded back or the albumen will be cracked. According to the nature of the negative the next proceeding varies. If the negative has a tolerably straight horizon line

we may use the same shade as we did for the graduated sky. In this connection we must explain that if there be only dark objects, such as trees, etc., against the sky these may be disregarded and the sky may be printed right across them, as it will not be visible. In the case which we have imagined the shade is used precisely as in the case before. Even if the horizon be not straight, but if the line of it be not very crooked, it is possible to use the focussing or other cloth; a little skill and constant attention to the print is all that is necessary.

When the horizon line is very crooked, and especially when light-coloured objects project far into the sky, it is necessary to use a mask. This is a piece of some opaque substance which may be placed between the landscape and the cloud negative so as to shade the landscape, the outline of the mask precisely corresponding with the horizon line.

The best way to make a mask is to take a print as it comes from the frame untoned and unfixed, and to cut away the sky with a small pair of scissors. As it will be impossible to lay the print over the mask with absolute precision it is best to cut away a very narrow strip of the landscape matter when making the mask. If the sky overlap the landscape by a thirty-second or even a sixteenth of an inch it will be unnoticeable, but if there be the smallest white space left between the landscape and the clouds the effect will not only be noticeable but disagreeable.

When the mask is made it is applied to the sky negative which is to be used, the printed side of the mask being next the film side of the negative. The

position of the mask with relation to the sky is altered till all the sky except what is to be printed into the picture is covered up. If several prints from the same negative are to have skies printed into them it is best to fix the mask to the sky negative with a couple of wafers or drops of gum at the lower corners. The print is now placed on to the sky negative, the adjustment between the two being made by looking through them from the negative side. Some patience is necessary to get the horizon line to correspond precisely with the outline of the mask.

If it be desired to have the sky equally dark at top and bottom the frame is put out to print just as it is. It is usually best to have the sky somewhat darker at the top than at the bottom, and for this reason the shade is generally used for a part of the exposure.

When printing from paper or gelatine-film negatives a printing frame is not always necessary. The print may be laid on a board, over this the flexible negative, and above all two pieces of glass, one covering the lower part of the print, the other the upper, the line between them being an inch or so below the horizon. The shade or cloth is used over these precisely as over the frame, and when we wish to inspect the progress of printing all we have to do is to press firmly on the lower piece of glass so as to secure the print from movement, while we lift the upper glass and bend up the sky negative so as to examine the print which is below it.

As we have said, great judgment is necessary in determining how dark the sky is to be printed. The best effects are often got by skies printed very boldly, but great artistic skill is necessary in such a case. It

is best in most cases to print very lightly. In any case the highest lights of the sky should be pure white, and the general tint of the sky should be lighter than the distant portion of the landscape.

COMBINATION PRINTING.

Combination printing may be said to be the highest development of photography as a fine art. It has not been practised with any great degree of success but by a few, and we shall only dwell on it briefly here. It consists, as the name would indicate, in printing from two or more negatives. The artistic skill and knowledge necessary is vastly greater than is required for ordinary printing; still, to understand the results which *may* be obtained, one requires to have seen one of the original prints of Rylander's "Two Ways of Life," or some of the compositions of Mr. H. P. Robinson, or one of the other leading photographic artists who have given their attention to this special branch.

We shall take one of the simplest cases of combination printing, and shall describe the operation.

The case which we will suppose is that in which a figure forms the principal part of the picture, and in which a landscape forming the background is subsidiary to the figure. It may be asked, Why resort to combination printing at all in such a case? Why not place the figure where the landscape will of itself form a good background and take the whole thing on one plate? There are many reasons why this can seldom be done with a good result. In the first place, there is the difficulty of having the figure and the landscape together. It

is more than probable that where we can gain the assistance of a good model there is no suitable landscape; whilst where there is a suitable landscape one cannot get a good model. Then there is the difficulty of getting both the figure and the landscape in focus. In fact, to get the figure to fill the greater part of the plate requires it to be so near the camera that, except in the case of very small plates with short-focus lenses, it is practically impossible to get both the figure and the distance in focus. To do so would require the insertion of so small a stop that the exposure would be greatly protracted. Further, it is most unlikely that a pleasing lighting could be secured for the face of the model.

When a combination is to be made the conditions should be as favourable as possible for the landscape itself, and again for the figure itself.

First, as to the landscape. It may be almost of any nature, but as it is to be subsidiary to the figure it should not be too bold or striking. It may with advantage be what would otherwise be considered somewhat over-exposed, so as to give a delicate print.

It is to be observed that the focus of the lens used should be about the same as that which will be used for the portrait. A slight difference will be in no way noticeable.

The point which requires most attention is the position of the horizon. It is to be remembered that under no circumstances does the horizon appear as appreciably *below* the level of our eye,—it may appear much above it. The horizon line in the landscape must therefore be at least as high as that point of the figure which is on a level with the photographic eye or the

lens. As we always endeavour to have the camera level or nearly level with the face of our model, it follows that the horizon line of the landscape must be at least as high up as that on the portrait,—that is to say, it will be about one-third of the height of the plate from the top. It may be even higher. The only exception to this is when the figure is shown as on a piece of raised ground or some other high place, so that it is reasonable to suppose that the observer is looking up at it.

Our landscape should not have the sun shining, at least in the foreground, otherwise the absence of a shadow from the figure will be noticeable.

We now come to the figure. Unless a studio can be had, it is best to take the negative of this out-of-doors. The lighting in an ordinary room is far too strong,—that is to say, there is too much shadow to be suitable with the landscape. A broad enough lighting can generally be got in a studio. If the figure be taken out-of-doors it is necessary to observe the precautions already enumerated with regard to out-of-door portraits, and particularly to observe that the lighting be not such as will appear inappropriate to the landscape. Another precaution—the background must be pure white. A sheet will do well.

A print is taken from the figure negative. If the background be represented on the negative by sufficient density to show quite white in the print, this negative requires no further manipulation. If it print with a tint only more or less nearly approaching to white, then it must be blocked out as has already been described for skies.

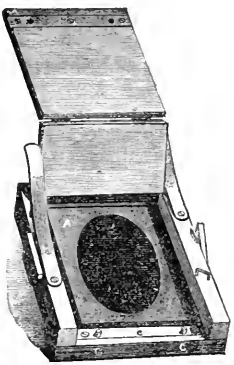
The print is now taken, and, without its being toned or fixed, the figure is very carefully cut out of it with a pair of scissors. This cut-out figure is now placed against the landscape negative with the albumenised side against the film, so as to block out that portion where the figure is to be in the finished print. The cut-out figure may be fixed with a little gum, or may be simply put in position by hand each time a print is taken. The print which we now get from the landscape negative will have the appearance of those pictures in children's picture-books, where on one page is represented a scene which would be lively but that all the figures are represented by white patches, whilst on another page there are the figures ready to be cut out and pasted over the patches. Indeed this childish amusement most closely represents combination printing.

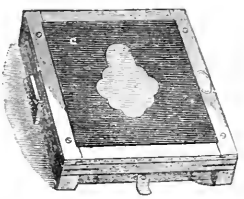
The figure negative is now taken and the landscape print is adjusted to it, so that the figure on the negative precisely corresponds with the blank space of the print. The process after this is quite simple. The printing should be so conducted that the figure stands boldly out against the landscape.

A sky may afterwards be printed into the picture. We have now made a composition from three negatives. There are photographers who have made compositions from many more than this number.

Whilst on the subject of composition printing we must not fail to mention a piece of apparatus which will be found very useful in many cases. This is Hemery's patent automatic self-registering printing frame. We illustrate it here, and shall briefly describe its use.

It will be seen that, unlike other frames, this one has the back hinged to the frame, so that it cannot be



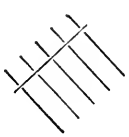


entirely removed. On the back there are two little punches, which work into corresponding holes in front of the frame. Now as to the working of the apparatus. To take an example:—It is desired to print a foreground from one negative together with a distance from another. Two similar frames are used. The negatives are temporarily fixed to the plate-glass of the frames by bits of gummed paper along the edges. A piece of sensitised paper is now placed over the negative from which the foreground is to be printed, the paper being allowed to project so far down that it will be perforated by the two punches. The second frame has two precisely similar punches, so that if the portion above the foreground of the print just mentioned be cut away and the remainder be applied over the punches of the second frame, a mask will be made, and if prints be taken from the second negative, the punches being caused to per-

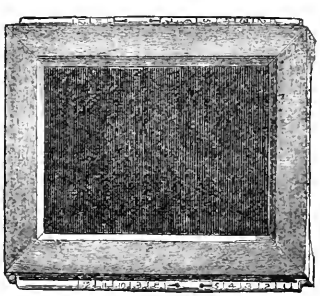
forate each piece of paper, no further adjustment will be necessary in printing the foreground than to place these prints on to the first frame so that the punches of it pass through the holes made by the punches of the second frame.

To those who wish to go deeply into the matter of composition printing we recommend a perusal of *The Art and Practice of Silver Printing*, by H. P. Robinson and Captain Abney.

Another little piece of apparatus we must not omit to mention whilst we are still on the subject of printing. This is a marker used for registering the number of prints taken from the frame. The ordinary way of keeping count of prints is to glue a piece of paper to the edge of the frame and mark each print with a stroke from a pencil or pen, the sixth (or twelfth) stroke being made to pass through the others, so as to mark a completed half-dozen or dozen, thus—



When this practice is carried on for long the frames



get covered with paper till they are almost spoiled. By using the little appliances which we here illustrate the frames are left undamaged.

A pair of these go to each frame. One is screwed on to each side. The little tubes which are to be seen on these bars can be slipped up and down, catching in each notch. The left-hand marker is moved on one notch for each single print finished, the right-hand one for each dozen.

CHAPTER XXIV.

RETOUCHING.

RETOUCHING is an art which is abused by many, and which undoubtedly is over-practised at the present day. The elaborate modelling which is frequently performed by photographers not only spoils a picture as a photograph but generally produces a result far from artistic. Still, to say that no retouching whatever should be permitted is erring in the other direction. Who, for example, can honestly say that he considers it an objectionable practice to remove those blemishes which are peculiar to the photographic process itself? Who even would say that it is wrong to touch out from the negative such spots on a face as no painter would think of putting on his canvas? Even farther than this we would go, and would ask why those lines and indications which mark age, and which are generally rendered somewhat more strongly in an untouched photograph than they appear to the eye, should not be softened by the retoucher's pencil, so long as he does not go too far? Indeed, we think that a certain amount of retouching is a necessity for the production of tolerable portraits, and we shall therefore give instructions for performing such of it as the amateur is likely to gain skill enough for.

The term "retouching" is generally applied only to such work as is done with a pencil on the film side of a negative; but we use it in a wider sense, and intend to include under it all cases where hand work is applied, either to the negative or to the print.

We take first of all, as the simplest,

Working on the Back of the Negative.

The back of a negative may be worked upon when it is desired to modify the shade of large portions of the print, and especially where it is wished to lighten them. Thus, if a negative is just barely dense enough, but is not so much wanting as to make us incline to intensify it, if a little be added to the high lights by colouring on the back of the negative brilliancy enough may be got.

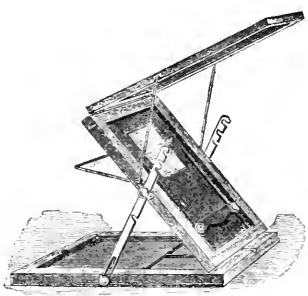
Some prefer to apply the colour direct to the glass, but we think it best to work on a piece of tissue paper, which is fixed by the edges to the back of the negative and covers the whole of it. On this tissue paper we may work lightly with pencil, or more strongly with charcoal or crayon. Effects may thus very often be much improved. By a gradual shading off towards the part of the negative which represents the distance an appearance of atmosphere may often be given, and so forth. In the case of a certain class of negative a sky may be artificially produced. When the sky in a negative is quite clear,—that is to say, without accidental spots, etc., —and when it is of such a density that it gives a light tint in the print, it is only necessary to work with the pencil or crayon over that portion of the tissue paper which covers the sky, when clouds are produced. Of

course, some taste and a little practice are necessary before good results can be got; and as, the working being on the side of the glass which is at some distance from the film, perfect sharpness cannot result, no clouds with bold forms may be attempted, but merely such fleecy things as show no very clear outline at any time.

Retouching with Pencil on the Film Side of the Negative.

For this retouching proper far more skill is required than for that which we have described. The necessary articles are, a retouching desk, a few pencils, and a small quantity of some "retouching medium."

The retouching desk is the only requisite which is at all elaborate. We illustrate it here. It will be seen



that it consists essentially of a framework or desk at which the retoucher sits, the negative being so placed that he can see through a portion of it whilst his head is shaded from the light. The negative rests with its lower edge against a slip of wood, so that it can be raised or lowered, or canted to one side or to the other. There

is a clear space about four inches square behind the negative, and behind this space, so that the retoucher looks on to it, there is a little shelf holding a piece of white paper. The angle of the shelf may be varied so as to catch the light as well as possible. A mirror may be put in the place of the piece of white paper when very dense negatives are to be retouched. A piece of bluish glass is placed between the negative and the illuminating piece of paper when it is desired to work by lamp-light. There are also adjustments for varying the angle of the frame itself to suit the operator, and to enable him to change his position when he gets tired.

The pencils are ordinary lead pencils of the best quality. Those marked H and HH will generally be found the best.

The object of the "retouching medium" is to give a bite or tooth to the pencil so that it will be possible to mark readily on the film. Of the many mediums which are made we have known none which gives better results than does Cadett's Mattline.

We will describe as accurately as we can the method in which the pencil is used, premising our remarks by saying that *practice* is in this branch of photography more all-important than in any other.

The negative must be varnished first of all. We will presume that it represents a head and shoulders portrait. The retouching will naturally come on the face only. A drop of the mattline is dropped on to the centre of it, and is quickly spread over the portion which is to be retouched, either the finger or a small pad of wash leather being used. The film is briskly rubbed in a circular manner till it appears to be quite dry again.

There will now be a tooth, on which the pencil will bite excellently.

The first experiments may be made without a retouching desk, the negative being placed against the pane of glass of a window, a piece of white tissue paper going between the negative and the glass. The position necessary for retouching in this manner will be found to be very fatiguing, and the desk will be found a necessity when even a moderate amount of retouching work is done.

A print is taken from the negative before it is retouched at all. It will probably at once be seen that certain points would bear improvement. Probably there will be observed many spots somewhat more transparent than the surrounding portions of the film. These probably are due to defects in the skin of the sitter, which are too slight to be seen by the eye, but which, being of a yellowish colour, are very visible to the photographic film. The next thing we will notice is perhaps that the oblique line which passes down from the inside corner of the eye to the cheek appears far more pronounced in the print than in the model. The cause is pretty much the same as it was in the last case. The effect given is that of an expression of care and anxiety. The exact same applies to the lines which generally fall obliquely from the lower corners of the nose, at times from the corners of the mouth. All these generally appear stronger in an untouched photograph than in nature, and, if they be left so, give a woebegone expression to the face of the sitter.

We shall first of all confine ourselves to the eradication of the evils which we have mentioned.

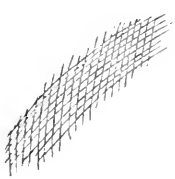
The spots are the first thing to turn our attention to. The pencil is made very sharp, and is gently worked over one of these, beginning at the centre, and working round and round to the edge. It will be found surprisingly easy to make the spot disappear entirely, or nearly so.

The lines are not quite so easy. These must not be entirely worked out, but must be lightened and shortened. We begin at the lower end of each, and, working the pencil in short strokes in the direction of the lines, make these lower ends entirely blend into the rest of the face, whilst we work over the whole line, somewhat increasing the density.

The next defect which may be noticed is a general roughness or want of evenness in the skin of the face. This will not take place if the model have a skin of perfectly peachy smoothness, but any irregularities either in texture or colour of the skin will be very strongly marked in the negative, and must be softened or entirely done away with. This is a thing rather difficult to do, as it generally involves working over almost the whole face of the negative, and it is quite likely that when one portion has been made smooth it will be found that it does not agree in density with those surrounding it—that, in fact, we have made small individual patches smooth whilst we have left a roughness on a large scale. To avoid this we must frequently look at the negative from such a distance as to get a general impression of it, and assure ourselves that we are doing correctly. The manipulation of the pencil is much the same as when spots are being filled in.

The next defect which we have to modify is that which makes itself most evident in the case of persons

having at all angular features, especially high cheek bones. The print shows all these defects exaggerated. If we look closely into the precise manner in which this defect is brought about, it will be found that it is on account of a too abrupt transition from high light to shadow, and that to correct it we have to modify this. To do so is not easy, and requires much more practice than what we have already described. The pencil has to be taken and lines have to be gently drawn around the high light where it first passes off into transparency. These are somewhat after the manner of the lines which are made in an engraving, and will, for example, take a form such as we show here.



This modelling may be carried to any desired extent, and when once the skill necessary to perform it is gained it is common for operators to go too far with it.

It should be borne in mind that we are only justified in modelling to such an extent as is necessary to obliterate the exaggeration of defect which the camera produces, giving possibly here and there the benefit of a doubt.

Now we come to the case of the lines which mark advancing age, and here a word of warning must be given. It is true that the camera generally renders these lines more strongly than they really are, but it

must be borne in mind that there are many faces of old men and women which owe their beauty almost entirely to those very lines which so many try to obliterate by retouching.

It is only when people are *beginning* to get old that any intensification of these lines is objectionable, and it is only in this case that we ought to soften them with the pencil. It is by no means difficult to do so. The point is made very sharp and is worked over the lines.

If retouching be unsatisfactory it may be removed by a drop or two of turpentine and a brisk rubbing with a cloth.

Spotting.

This term is applied to all hand working which is done on an ordinary print. Probably the name arises from the fact that by far the greater quantity of such work consists in removing white spots. Water-colours are used, several being mixed to get a shade which exactly corresponds to the colour of the print. The three most useful colours are Indian ink, sepia, and crimson lake. In fact with these three any desired shade can be got. They are mixed on a palette with a little gum-water or albumen (white of egg) and water, and are applied by means of a sable or camel's-hair brush.

CHAPTER XXV.

CUTTING UP PAPER; TRIMMING PRINTS; MOUNTING PRINTS; ROLLING AND BURNISHING PRINTS; ENAMELLING PRINTS.

When paper is being cut from the sheets, which are always of about the same size,—namely, 17 inches and 22 inches,—it is quite worth while to give some attention to the best way to do this so as to waste as little as possible. It is desirable to have about $\frac{1}{16}$ inch margin for trimming in the case of every print, but beyond this the less there is the better. We here give a set of sketches showing how paper may be cut with the best advantage for different sizes. When the sizes are small there is no great difficulty in getting a very fair degree of economy. When they are large it is far more difficult. Indeed, for some large sizes the waste is excessive, *unless smaller sizes be worked at the same time*, in which case, by getting several different sized prints from each sheet, we may have fair economy.

We take first of all the smallest size which is likely to be required—namely, carte. The smallest divisions in Fig. 1 give sufficient for trimming on all sides, and it will be found that there are forty-two of them.

Next we take cabinets, as this is the size next in popularity to the carte.

Fig. 2 shows how fifteen can be cut from a sheet. A strip 4 inches wide is first cut along one end of the sheet. This is divided into three pieces. The remainder of the sheet can then be cut up into twelve more.

$7\frac{1}{4} \times 4\frac{1}{2}$ is a popular size for landscapes. The dark lines in Fig. 1 mark out nine pieces which are a little larger than this. A strip cutting into six cartes will remain.

Whole-plate, or $8\frac{1}{2}$ inches $\times$ $6\frac{1}{2}$ inches, is as near as possible double-cabinet size. The thick lines in Fig. 2 mark out six whole-plate prints, leaving a strip cutting into three cabinets.

A sheet cut into four, as in Fig. 3, gives 10×8 prints, with some waste, but not very much.

One of these 10×8 squares will of course cut into four 5×4 squares, as shown in one of the top squares of the figure; by cutting such a square in *two* as in a lower corner two $7\frac{1}{2} \times 5$ prints are got, there being in this case, however, a considerable margin of waste.

The most troublesome size of all is the 12×10. In fact, if no size but this be required from a sheet the waste is excessive. In this case the manner of cutting shown in Fig. 4 is the only one to resort to.

The size 12×10 is, however, too nearly square for by far the majority of subjects, and a print of that size will, as a rule, be improved by cutting away from 1 to 2 inches of the width. The same refers to 10×8 prints. Fig. 5 shows one good way of cutting up a sheet when both 12×10 and 10×8 prints are required. It will be seen that there is one full size 12×10 print got. Another

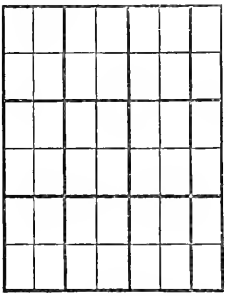


FIG 1.

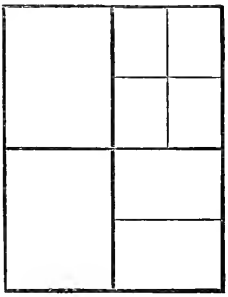


FIG 3.

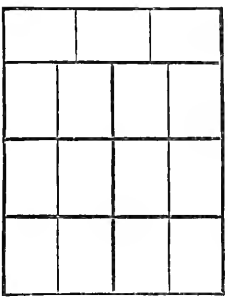


FIG 2.

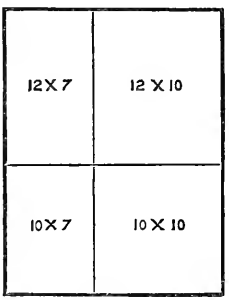


FIG 5.

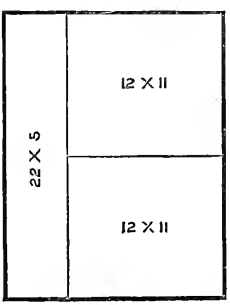


FIG 4.

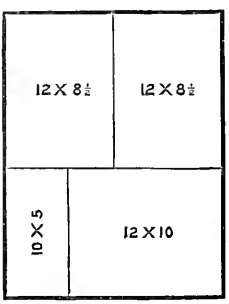


FIG 6.

is 12 inches long but only 7 inches broad. The size will be found to give a very good picture from many 12 × 10 negatives. It may be cut down to 10 × 7 and make a somewhat narrow print from a 10 × 8 negative. There is another which without any further cutting is 10 × 7, whilst there is one 10 inches square which will serve for a full-sized 10 × 8 print.

Where 12 × 10 negatives are being printed from, but no 10 × 8 ones, the method of division shown in Fig. 6 will be found very useful.

There is one full-sized 12 × 10 print given; two which are of the preferable size, 12 × 8½; and there is left a piece of paper which may be used for a 7½ × 5 and a carte, or for a 7¼ × 4½ and a carte, or for a cabinet and two cartes.

TRIMMING PRINTS.

It will be readily seen that these sizes are only approximate, and that there must be after printing a trimming performed so as to get the precise size.

In the case of cartes, cabinets, and the other popular portrait sizes it is necessary to adhere exactly to the usual dimensions; but in the case of other sizes, which are generally used for landscapes, the prints being either pasted into a book or mounted on large mounts with a very considerable margin, it is by no means essential to adhere precisely to any particular sizes, and indeed there is great advantage in not doing so. As a rule the photographer feels unwilling to curtail the size of his photograph by trimming a considerable portion off it, but in not doing so he often acts unwisely. Very frequently a photograph may be vastly improved by cutting an inch

or two off either the length or the breadth of it. This especially applies to the prints from negatives of the sizes which somewhat approach a square, as, for example, the 12 × 10 and 10 × 8. In the case of these it is seldom that an improvement cannot be made by cutting an inch or two, or at times even more, from the breadth, the foreground being as a rule the part which is best removed.

The implements used in trimming prints are the following :—

Cutting shapes.
Scissors.
Cutting knives.
A trimming table.
A small drawing-board, and a
T-Square.

The cutting shapes are pieces of thick plate-glass with edges ground accurately to the sizes which the prints are desired to be. The edges are sometimes bevelled away. For the reason given above it is desirable to have glass shapes only for the popular portrait sizes, marking out as appears best in the case of each print those which are from large landscape negatives.

In cutting with shapes either a pair of scissors or a trimming knife is used. Probably the amateur will find the scissors the most convenient. The length of the blades must be such that the print is cut with a single snip along the longer edge of the largest shape used. The print is taken up in the left hand and is adjusted under the cutting shape, and is thus snipped round with the scissors.

In cutting with the trimming knife the trimming

table is used. This has a revolving top. The print is laid on it, the glass shape being placed above, the left hand bearing on it, so that the print is nipped between the table top and the shape. The knife is now run along first one edge then another, the table being turned a quarter revolution after each is cut.

In trimming landscape pictures by whatever method it is necessary to observe one or two points. A vertical line, such as the corner of a house, must always be parallel to the ends or sides of the print. If the sea is introduced, no land being seen beyond it, the horizon line must be parallel to the top or bottom of the print.

When prints of the larger sizes are to be trimmed it is best to mark each one out with a pencil, using the small drawing-board and T-square. In doing this it is necessary to observe what we have just said with regard to vertical lines and the horizon, and also what we said a little time ago about occasional trimming away of a portion of the photograph.

After the prints are marked they may be trimmed by the scissors, but it is best to use the trimming table and a ruler of plate-glass longer than the longer edge of the largest print to be trimmed, and two or three inches wide. This is used to clip the print down to the table and as a guide for the knife.

Prints may be trimmed either before or after they are toned. It is easier to do them before, as they lie flat, and, moreover, the clippings are valuable as they contain silver. If they are trimmed *after* toning, fixing, etc., it is necessary to flatten them out first with a paper cutter, as we described already when writing on the preparing of paper sensitised as required.

MOUNTING PRINTS.

Prints may be mounted either on cards or in scrap-books.

When the photographs are portraits it is usual to have mounts which show only a narrow margin. In the case of smaller sizes the mounted prints are put into the well-known albums; in the larger ones the mounts themselves are commonly made with gilt sides, so that when placed, for example, on a mantleshelf leaning against the wall, the mounted print has a finished appearance.

Landscapes, and at times large portraits, are mounted on cardboard mounts with wide margins, the length and breadth of the mount being commonly nearly double the length and breadth of the print. Gilt bevel-edged mounts have been recently introduced, and when these are used the photographs are mounted close up to the edges. The effect is very good.

Scrap-books are very suitable for receiving photographic prints of all kinds, but especially landscape prints. Indeed, it is a very desirable thing for amateurs to make a rule of fixing a print from *every* negative taken into such a book. This does not prevent them from mounting in a more ornamental way such prints as they consider their best. Amateurs are to be warned against making the negative the *end* instead of the *means*. It may seem strange that it should be so; but after some time the photographer gets to look with so great satisfaction at the negative that he is perfectly pleased if it is perfect, and is liable to place it on one side without even taking a print from it! It is for this

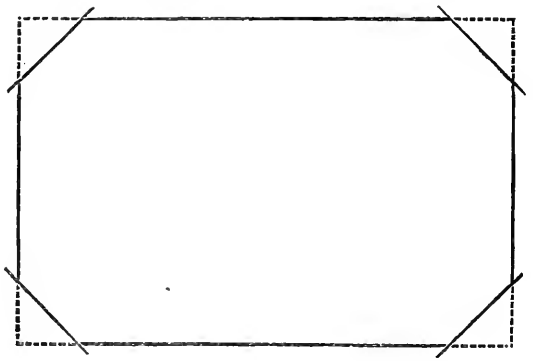
reason that we urge that at least one print be taken from every negative and be pasted into the special book which is made for the purpose, and to which the name of "The Amateur's Scrap-Book or Register of Work" has been given.

On whatever the print is to be mounted the process of mounting is the same. Various solutions are used for the purpose. Starch and glue are the most common, but both these have the drawback that they cockle or bend the mount. This is objectionable in any case, but not so much so when mounts are used as when the prints are pasted into a scrap-book. In the former case the cockling may be removed by the after process of burnishing or rolling, which will be described, but in the latter it cannot. "Marion and Co.'s mounting solution for photographs" does not cockle the mount, and is therefore preferable to either of the other mountants mentioned.

The method of using it is as follows:—The prints are first of all flattened, as has been already described. The solution is warmed till it is quite liquid. The prints are taken one by one and solution is applied with a hard brush. Each one is then brought into contact with the mount, a clean cloth being used to press it down. It is best not to apply the print the moment that the solution has been brushed on, but to let it remain for a moment or two till it becomes somewhat sticky.

If a scrap-book made of thick paper instead of cardboard be used, photographs may be inserted without any mountant at all. A slit is made for each corner of the print, as we show, and the corners are inserted. It

will be seen that by this method prints can only be fixed on one side of each leaf.



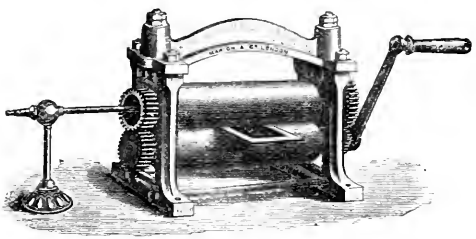
ROLLING PRINTS.

After prints have been mounted it is necessary to perform some process to give a finish or gloss to them. There are two methods of doing this, which are in common use. One is burnishing, and is usually applied to small prints on mounts with narrow margins; the other is rolling, and is generally applied to large prints.

In the first of these the print is drawn across a hot steel burnisher by means of a roller, which bears on the back. In the other it is simply pressed between steel rollers very much as clothes are mangled. The first process gives the finest gloss, but unless the burnisher is very carefully used the prints are liable to be torn to pieces.

In Marion and Co.'s self-adjusting rolling-press and burnisher, which we here illustrate, a compromise is made

between the two processes. It will be seen that the two rollers are geared into each other. The one is caused to travel a little more quickly than the other, and the result is that, whereas a finer polish is produced



than even with the burnisher, there is no danger of tearing the print.

Before either burnishing prints or rolling them with the special press a solution of one grain of Castille soap in one ounce of methylated spirit should be rubbed over the surface, which is then ready for burnishing whenever it is dry.

MOUNTING PRINTS IN OPTICAL CONTACT WITH GLASS.

This is a method of mounting prints which gives a particularly pleasing effect. A piece of glass free from all air-bubbles or other blemishes is selected. A porcelain dish which will hold the plate is taken. A solution of gelatine is made up in the following manner: Over 300 grains of hard gelatine is poured a half pint of cold water. When the gelatine becomes soft the cold water is poured off and hot is added till the total amount is ten ounces. If the heat is not sufficient to

entirely melt the gelatine, the vessel containing it is placed in a basin of hot water or near the fire. The temperature of the solution should be about 120° Fahr. The dish and glass plate are warmed by pouring hot water into the former. This water is poured off, and the gelatine solution is poured over the plate. There must be enough solution to cover it to a depth of at least a quarter of an inch. The quantity which we mention is merely taken so as to give the proportion of gelatine to water. The print which is to be mounted on the glass is soaked in warm water till it is quite soft, when it is placed face downwards into the gelatine solution. It is brought into contact with the plate. The plate, with print on it, is now removed from the solution, and a *squeegee* is applied to the back of the print to press out the superfluous solution. A squeegee is a strip of pliable india-rubber mounted on a piece of wood. For small prints it may be dispensed with, the gelatine solution being pressed out with the ball of the thumb.

Prints mounted on glass show a beautiful depth and transparency of shadow. They may be framed in oak frames, the glass taking the place of the glass of the frame. A second glass may on no account be placed in front of the one supporting the print.

ENAMELLING.

If the plate of glass used in the process just described be coated with plain collodion and be allowed to dry before it is placed in the gelatine solution, the print may be stripped from the glass after it is dry, and will have a very highly-polished surface. Such prints must be

mounted before they leave the glass,—that is to say, the mount must be applied to the back of the print, and then fixed with mounting solution before it is stripped from the glass, which may not be done till the mounting solution is completely dry.

A special plain collodion is made for enamelling prints.

CHAPTER XXVI.

THE FERRO-PRUSSIATE PROCESS; ENLARGING; LANTERN SLIDES.

THE FERRO-PRUSSIATE PROCESS.

This is perhaps the simplest of all printing processes, there being no toning or fixing to perform. The print which is got is of a bright blue colour. The chief use of the process is for copying plans and drawings such as are used by engineers and architects, the lines coming out white on a background of blue. Very pleasing effects can, however, be got from negatives of certain subjects, notably of sea-pieces.

The paper is manufactured and sold by Marion and Co., and is ready sensitised. It is placed in a frame like albumenised paper, and the process of printing is watched in precisely the same way. Several changes of colour take place. The print becomes first yellow, then greenish, afterwards greenish-blue, deep bluish-gray, and lastly, an olive tinge with a metallic tint is acquired. The deepest shadows should reach this colour. The time taken is about four or five times as long as for albumenised paper. When the printing has gone far enough the piece of paper is placed in a dish and clean water is poured on to

it. The water becomes yellowish, and the print almost instantly becomes of a bright blue colour. The washing is continued as long as the water comes off of a yellow colour, which is only a few minutes. It should not be allowed to go farther, otherwise the depth of the blue may be somewhat reduced. The print is next pressed between sheets of blotting-paper to remove surface moisture, and is hung up to dry when it is finished.

When drawings are to be copied, they are best traced first on transparent tracing-cloth or paper. It is, however, possible to take prints even from drawings on thick drawing-paper.

The following is the course pursued in a large drawing office attached to a mechanical engineering work: The drawings are pencilled in as usual on drawing-paper, but, instead of inking them in, a tracing on very transparent tracing-cloth is made. The thing most necessary to observe is that the ink be quite opaque. The best way to secure very white lines in the prints is to mix a little vermilion colour with the Indian ink used for the tracing. This will not notably alter the appearance of the tracing, whilst it will stop all chemical rays. The sectioning, instead of being done in colour, is done in lines. The tracing is now kept in the office as a finished drawing, the pencil drawing being destroyed. When copies are wanted for the workshop or to send out they are taken on the ferro-prussiate paper. As it is difficult to turn over the very large frames which are generally used for drawings, it is best to leave a narrow margin of ferro-prussiate paper beyond the tracing-cloth, so that the change of colour may be watched. Another plan is to put a very small drawing in an ordinary quarter or half-

plate printing frame beside the large one, and look at the progress of it from time to time.

Corrections or additions may be made on the blue paper by writing or drawing with a solution of a few grains of caustic potash to each ounce of water. The correction is made, and as soon afterwards as possible the part is sponged with clean water to remove superfluous potash, which would otherwise cause the line to spread.

If it be desired to have blue lines on a white ground, a double process has to be gone through. A special paper is made for taking prints with white lines on a blue ground, which, being transparent, may be printed from. In this case the exposure must be continued for several times as long as if white lines on a blue ground only are required. This print, taken on the transparent paper, is now used precisely as the tracing was, and there results a print with blue lines on a white ground.

It is almost needless to remark that the paper must be kept from any bright light except during exposure, just as sensitive albumenised paper is.

ENLARGING.

It may be said that, *other things being equal*, the larger a photograph is the finer it is, at any rate within limits. The apparatus for taking very large pictures is, however, exceedingly cumbersome, and the plates necessary are very expensive. Moreover, certain optical difficulties are met with. It is exceedingly difficult, indeed impossible, to make a large lens equal to a small one even in its properties of definition and flatness of field. But it is in a want of depth of focus that large lenses show them-

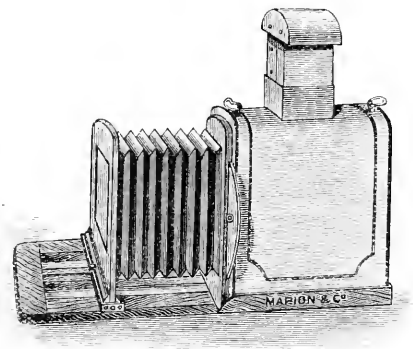
selves most defective. When we get beyond such lengths as fourteen and twenty inches we find that, to get the foreground and distance both anything like in focus, we have to use excessively small stops, so that the exposures are prolonged and certain effects become impossible to attain. For example, instantaneous views are most difficult to do with a lens of beyond about 20-inch focal length.

For all this the photographer need not despair of getting prints as large as he likes of any subject which may be taken on even the smallest plate. He may have recourse to the process of *enlarging*. Recently this process has been made much more easy by the introduction of gelatine bromide paper, which is simply paper coated with a gelatine emulsion specially prepared for the purpose.

First, as to the negatives to be used for enlarging. These require, of course, to be very sharp. For this reason focussing must be performed with great accuracy, a focussing magnifier being used in every case. A negative which will give a perfect silver print will always give a good enlargement. The thing to be specially avoided is hardness. We must therefore neither under-expose nor over-develop. A negative which will give a silver print somewhat too soft will generally give an excellent enlargement, especially if the shadows be very clear.

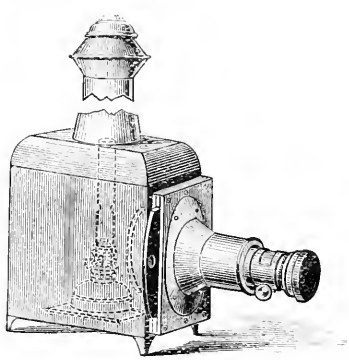
Various designs of apparatus have been made for enlarging, the most convenient of which is "Marion and Co.'s Enlarging Apparatus," which we illustrate here. We believe that we shall most readily make the object of this clear by saying that it is simply an improved

magic lantern, and that indeed it may be used as such. When it is used for enlarging, the negative takes the place of the magic lantern slide, and the enlarged image is thrown on to the sensitive film. No lens is shown



in the engraving, but any photographic lens of suitable focus will do well. A portrait lens, or one of the rapid type of about six or seven inches equivalent focus, will be found the best.

We illustrate also a cheaper form of apparatus designed



specially for amateurs. It is not quite so convenient or perfect as the more elaborate appliance, but will be found to give excellent results in use.

An easel is made to go with the apparatus. This has an adjusting screw, so that its distance from the camera may be varied. The sensitive paper is fixed to this.

We shall now describe the precise method of using the apparatus. It may be used in any room which can be darkened, or rather in which there is only non-actinic light.

The lamp of the apparatus is lighted. Opposite the lantern, and so that the disc of light shines full upon it, is placed the easel at a distance of a few feet, care being taken to ensure its being at right angles to the axis of the lens. A piece of white drawing-paper is fixed to it with drawing-pins. If the disc of light appears evenly illuminated we may proceed. If not, the lamp is moved farther from or nearer to the condenser (the large lens which will be found between the lamp and the groove for the negative) until an even illumination is got. The negative is now placed in its groove. We must determine of what size the enlargement is to be. We adjust the distance between the negative and the lens till the image is fairly sharp on the drawing-paper which is pinned to the easel. We now measure the image to see if it is the right size. If it is too large we move the easel towards the apparatus; if it is too small we move it away. We focus roughly once more, and measure again. When we have got the size we want we make a final very accurate adjustment by means of the screw of the easel till we get the image quite sharp. We may say that it is seldom that gelatine negatives will stand enlarging to

more than six or eight diameters, as beyond that the texture of the emulsion itself becomes very evident. As, however, such a degree of enlargement will give even from a quarter-plate negative a print thirty-four inches by twenty-six inches, it will be seen that it is ample. An enlargement of four or five diameters is generally sufficient.

When the focussing is accurately performed the cap is placed on the lens, the drawing-paper is removed, and its place is taken by a piece of gelatino-bromide paper, when the exposure is made. As the exposure may vary according to the lens used, and the distance between the lens and the sensitive paper, from a few seconds to many minutes, it is best to make a trial exposure first, using only a small piece of paper, which is at once developed.

When the exposure is over the enlarged print may be developed. This is done in almost precisely the same way as a plate is developed, ferrous oxalate being used. The directions which are issued with the paper should be implicitly followed. If the enlargement be of moderate size, say not more than fifteen inches by twelve, it may be developed in a dish; if it is larger it is usual to construct a dish out of the paper itself, which is laid on a board or piece of plate-glass, and the edges are carefully turned up.

After development is complete the print is washed. Then it is treated with the precise same alum solution which is recommended for negatives, is washed again, and is fixed with the negative-fixing solution. It is once more thoroughly washed, and when dried is finished.

The remarks which we made with regard to the use

of opal glass for positives when treating on the alpha paper and plates (see p. 180) hold equally good in the case of enlargements. The Britannia argentic bromide opal plates are made specially for the production of enlargements, and very beautiful results can be got with them.

It will be seen that for enlarging in this manner a separate operation with the enlarging apparatus has to be gone through for each negative which is required. This is very troublesome if many enlarged prints are wanted. Moreover, the colour of the gelatino-bromide print, which is of an engraving black, although it is liked by many, is by some thought not so good as that of a print on albumenised paper. If an enlargement on this latter is required, it is necessary to take an enlarged negative, usually on glass; and if many enlargements of the same subject are required, it is best to do the same.

There are two ways in which an enlarged negative may be got. Before describing them we must mention that a transparency is a picture on glass like a negative, but with the shades correct instead of reversed. Such may be got by simply placing a sensitive plate in contact with a negative, and allowing the light from a gas-burner or lamp at a distance of a couple of feet or so to shine through the negative for a few seconds. Development is performed as usual.

If a glass plate take the place of the sensitive paper mentioned already, an *enlarged* transparency will result. To get an enlarged negative we may either take a transparency by contact from the small negative, and place this transparency in the enlarging apparatus, and thence

get an enlarged negative, or we may place the small negative in the apparatus, and get from it an enlarged transparency, from which an enlarged negative may be got by contact.

The former plan has the advantage of economy,—one large and one small plate being used, whereas in the latter two large plates are used. There are, however, advantages in the latter case which more than counterbalance the slight additional expense. In the first place it is likely that the final negative will be sharper, but, besides this, there is offered an excellent opportunity for retouching which would not otherwise be afforded. If our chapter on retouching be considered, it will be seen that the only defects which can be eradicated are those which appear too transparent in the negative and too dark in the print. Such as appear too dense in the negative and too light in the print can be corrected only by manipulating each separate print. When, however, we have an enlarged transparency as well as an enlarged print we can eradicate defects of both natures. It might be supposed that the small transparency would serve as well for retouching on as the large one; but it must be borne in mind that the marks of the pencil on the small transparency, when magnified in the enlarged negative, would appear excessively coarse.

Taking all this into consideration, we describe the process for getting an enlarged negative by means of an enlarged transparency.

The plates used are the same as those employed for landscape work. The best thing to focus on is a piece of glass whitened by rubbing a piece of putty on it. This is fixed to the easel by drawing-pins, the edges of

the pin-heads being made to clip the glass plate. The plate is of the same size as the enlarged transparency and negative are to be, and its thickness will allow for the thickness of the former of these after focussing. The small negative is placed in the lantern, and focussing is performed exactly as for the paper.

The whitened glass is removed, and a sensitive plate takes its place. The sensitiveness of this will be found to be much greater than that of the paper, probably five or six times as great. On the other hand, the time allowed must be such as to give (allowing for difference of sensitiveness) a far more complete exposure. Where a positive is desired the highest lights must remain pure white. When a transparency is wanted it is necessary to get printing density in all the details of the highest lights. To make sure of this we must give such an exposure that no part will remain quite white. The exposure will therefore, allowing for the difference of sensitiveness, most likely be about one-half that required for a positive on paper. The development is performed exactly as for a landscape negative. If ferrous oxalate developer be used the transparency itself will be very pleasing in appearance, and may be kept to hang up against a window, so as to be looked through.

After it is dry, and any retouching which is required is done, a negative is taken from it by contact. It is best to place the transparency and the negative both in a printing frame so as to ensure there being no motion between the two. The exposure required will average about ten or fifteen seconds at a distance of four feet from an ordinary 15-candle gas-burner or good paraffin lamp. The development is conducted precisely as for a land-

scape negative, and the negative should not be different in appearance from one taken direct, except on very close examination. It is treated precisely as an ordinary negative.

MAGIC LANTERN SLIDES.

There is no way of exhibiting photographs which shows them to half so great advantage as the magic lantern, and as the photographer who possesses Marion's enlarging apparatus has in it a most excellent "optical lantern"—as the magic lantern is now generally denominated—it is a pity he should not know how he may produce slides to use with it. It is often the case that a photographer, seeing for the first time the projection on the screen from a slide taken from one of his negatives, is astonished at the amount which there is in it. Details which were entirely overlooked in an ordinary print are now clearly visible, and the whole appears to stand out in bold relief.

The usual size of magic lantern slides is about three and a quarter inches square. Quarter-plates are therefore very suitable for their production. If the negative be on the same sized plate the transparency which forms the slide may be taken by contact. If the negative be of any size from quarter to half-plate it is best to use the enlarging apparatus, the focussing screen being brought very near the lens so as to get the image very small.

If the negative be very large it is necessary to have recourse to another plan. A room must be used in which it is possible to fix the negative in an aperture made for it in a shutter, and from which all actinic light except such as comes through the negative is excluded.

The camera is now placed opposite the negative, and the distance is so adjusted that the size of the image on the ground glass is three and a quarter inches long. There is fixed outside the window, at an angle of 45° with a horizontal line, either a mirror or a board of wood with a piece of white paper on it, so as to reflect light from the sky on to the negative.

In developing the slides the utmost care is necessary to have the high lights *absolutely clear*. At the same time any approach to hardness must be avoided. Indeed, the density must be considerably less than what would be required to make a transparency which would look well when held up against the sky. To ensure getting these qualities an ample exposure must be given and a ferrous oxalate developer must be used, which is both weak and considerably restrained, the development being stopped before the highest lights discolour in the least.

We may add one ounce of the solution of protosulphate of iron to five of the oxalate of potash, and, having diluted this with an equal quantity of water, may add to the whole four to six grains of bromide of ammonium or potassium. The development with this will be very slow, taking possibly ten minutes or quarter of an hour; but if the exposure have been correct, perfectly clear high lights will result.

Whilst we are writing the above we have just heard of Mr. Cowan's gelatino-chloride plates, and we are inclined to believe they give the best results for all kinds of transparencies, and at the same time are very quick in printing, and very easy to develop. We do not think it necessary to give directions here, for Marion and Co., who have the sole sale of these plates, send

out printed instructions in each box. They likewise prepare the solutions ready for use. Therefore all difficulties are smoothed away for the photographer.

Since the last paragraph was written for our first edition Mr. Cowan's plates have come into very general use amongst photographers, and it is now generally admitted that, except perhaps where enormous quantities of similar slides or transparencies are required, they give better results than can be got by any other process.

The special quality which gelatino-chloride plates possess, and which distinguish them from all others, is their power of giving an extraordinary range of tone in transparencies. By mere variations of exposure and development any colour, from a rich engraving black to a crimson red, can be obtained.

CHAPTER XXVII.

CONCLUDING REMARKS.

We have now finished our work of instruction. Our endeavour throughout has been to give directions of a nature so practical and so far devoid of technicalities that any one quite unacquainted with photography might take up our book and, beginning at the beginning of it, might, without any further assistance, acquire a knowledge of the beautiful and fascinating art which forms the subject of it. If we have succeeded in this we are satisfied, and have but a word or two further to say to our reader.

In every photographic operation care and deliberation are above all things necessary. The beginner should confine himself to one branch at a time, and, until he has learned by experience what deviations can be made from them with safety, should adhere absolutely to the instructions given. As he advances he is sure—and it ought to be so—to deviate in small matters from any written instructions which can be given him; but he will always find that careful and cleanly working is a necessity if good results are required.

Above all, let him endeavour to avoid making the mere technicalities of his photographic work an object,

instead of letting them be but a means to an end. Let him try at all times to produce pictures which will be a credit not only to himself but to the art by which they are produced, bearing in mind that if photography is not ranked by all as one of the fine arts, it is rather because it is practised by so many who have not any artistic feeling, or will not take the trouble to acquire any artistic knowledge, than because it is incapable of producing true works of art.

THE END.

Printed by R. & R. Clark, *Edinburgh.*

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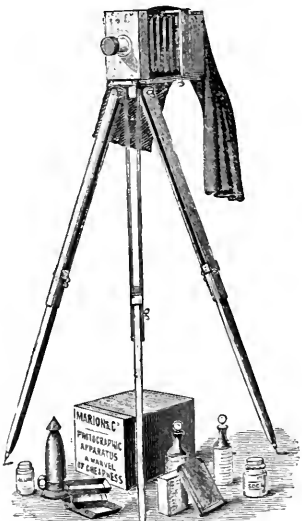

The above Set is complete with all the Apparatus and Material requisite for the production of a really good class Negative. Our aim has been to produce a useful Working Set at the minimum of cost. The Directions issued with each Set are written expressly for the Amateur who knows nothing whatever of Photography, and will, if carefully followed, enable such to produce a fairly good negative even at the first trial. We have every confidence in recommending this to BEGINNERS.

Printing Set for above . . . . £1 : 5s.

If packed for the Country, 2s. extra is charged.

Prices of Extras and Materials.—Portrait Lens (double combination), 15s.; Leather Case to take Camera, Slides, Lenses, and Focussing-Cloth, 10s. 6d.; Extra Double Slide, 7s. 6d.; Britannia Dry Plates, per dozen, 2s. 3d.; Solutions, Nos. 1 and 2, 1s. 6d.; Alum, per bottle, 3d.; Hyposulphite of Soda, in jar, 4d.; Ruby Lamp, 1s. 10d.; Ruby Chimney, 1s.; Trays, each, 1s. 9d.

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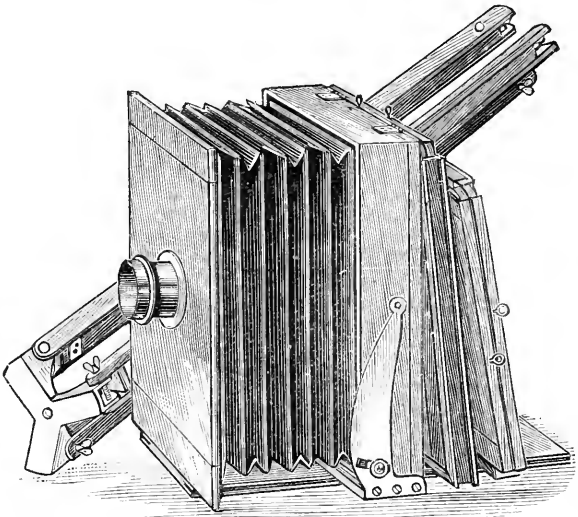
THE "OXFORD" PHOTOGRAPHIC APPARATUS.

To make Negatives $6\frac{1}{2} \times 4\frac{3}{4}$ *(Cabinet Size),*

Complete, with Lens, Camera, Dry Plates,



Chemicals, Lamp, Trays, etc. . **Price £5.**

THE above Set is complete for working the popular Cabinet size, suitable either for Portraits or Views. The Camera is well made, with leather bellows, and has two double dark slides; thus four dry plates can be worked with it. Printed instructions are given with each Set sufficiently clear and precise for a Beginner. It must be noted, however, that the plates are fitted into the backs slightly different from the method given in the directions. The metal plate in the backs or slides is a fixture, consequently each of the gelatine dry plates is fitted in **coated side upwards.** The folding-board of the Oxford Camera is made rigid by turning the brass bars at its side round into the side of the Camera base.

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Superior Lens for taking single Portraits	£3 5 0
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Extra Double Slide	0 10 6
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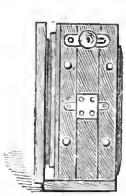
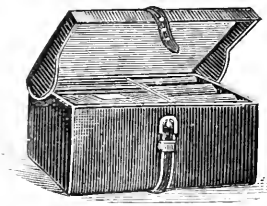
A light but strong Camera, Leather Bellows, Rack and Pinion, and with 3 Double Backs, 1 of Marion's quick-acting Rectilinear Lenses, Focussing-Cloth, and Waterproof Case to hold the above.

Measurements of Case—
Length, 8 in.; width, 6 in.; depth, 8 in.





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Also Tripod Stand in Waterproof Case.

This might well be called The LADIES' Amateur Photographic Set, so light and so easy to work.

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SPECIALLY prepared for the use of Engineers, Builders, &c., who require records and copies of their works. The set is quite complete, comprising everything requisite for the making of negatives (a good strong Camera, an effective Lens), and it will take negatives up to 12 × 10 in. *Full particulars on application.*

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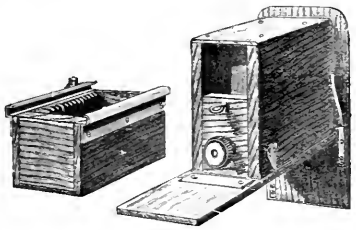
THE ACADEMY CAMERA.



THIS small Camera, known as the **ACADEMY CAMERA**, is invaluable to the Artist, Military Man, and others who require a handy instrument that will operate without a stand or the cumbersome backs. The Tray underneath contains 12 Plates, which can be exposed in rotation, and (a still further advantage) the Tray with exposed Plates may be removed and replaced by another filled with unexposed Plates, and this change may be safely made out-of-doors without danger of spoiling the Plates. The Cameras are made in four sizes. For particulars as to size and price, see next page. The following are the

DIRECTIONS FOR WORKING.

The under tray is filled with 12 plates, film side towards the front of Camera; of course this must be done in a photographer's dark room, or in fact in any room from which the light is excluded, using our Candle-lamp with its ruby chimney. The, tray is now slipped on to the under part of the Camera, and moved by the rack-work close up to the front. The plates are thus protected from daylight, and the Camera may be taken anywhere.

In photographing, the Camera is generally held in the hand like a pistol when aim is taken, or rested on any convenient place. Touch the little knob which is behind the Camera front on the left; this releases the ebonite revolving disc, which must be turned toward the right by means of the brass projecting head until it catches in a spring. It will be observed, as the ebonite plate turns, the slot in it reveals the under lens. (This is the acting lens, its fellow above merely serving to focus with.) When the ebonite disc is pushed home, adjust the tray by the rack-work so that the brass finger on the other side of the Camera covers the first notch of the brass plate. Now turn the Camera upside down, lay hold of the brass-milled head at the back of the Camera and pull it outwards,—this leaves free passage for the plate to fall from the grooved tray through an opening at the bottom of the Camera. When the plate is heard to fall into the Camera, let go the milled head; the spring released closes the apertures of the Camera and retains the plate in its proper position. The Camera is now turned over to its normal position, and the object to be photographed is focussed, the Camera being held a little distance from the eyes; the focus is obtained in No. 1 (Academy Camera) by pulling outwards or pushing inwards the brass wire projecting beneath the

ground glass, until the object is sharp and distinct on the ground glass. Nos. 2, 3, and 4 have a rack and pinion on the top of the instrument for focussing. Now touch with the forefinger the brass knob on the right hand behind the Camera front. The ebonite disc is released, revolves, and exposes the plate, passes on, and is caught in the catch. The picture is now taken, and the plate is released by pulling outwards the brass-milled head at the back of the Camera—the plate falling through into its groove in the tray beneath. When the click of its fall is heard, release the spring.

P.S.—When the plate has been dropped into the Camera from the tray the tray must not be moved until the plate has been exposed and allowed to drop back again into its place in the tray.

For another exposure repeat the operation, of course moving forward the tray by the rack-work till the brass finger points to the next notch. There is no difficulty in working—one point only requires care and judgment—viz. time of exposure. This difficulty can only be overcome by experience. The revolving ebonite disc moves at a greater speed, as the steel spring beneath the button on face of shutter is turned from left to right and fixed in the bags. In dull weather it may be necessary even to hold it open by the hand. This is done by holding the brass head between the finger and thumb.

The negatives, though small, have perfect definition, and give excellent sharp prints, and make good enlargements.

N.B.—On the shutter of Camera is engraved an arrow. This signifies, when extra speed is required, the direction in which the wire spring must be turned and fixed into the toothed wheel. The red star on disc is in centre when the shutter is ready for release.

THE PRICES BELOW INCLUDE THE LENSES.

No. 1. **ACADEMY CAMERA**, for Plates 1¼ in. square, including a pair of Lenses, and Tray with 12 Plates. Size of Camera, 4 × 3 in. . . . . each £2 10 0
(Extra Trays for ditto, 4s. each.
1¼ in. square Britannia Dry Plates, 1s. per dozen.)

No. 2. **ACADEMY CAMERA**, for Plates 2 in. square, including a pair of Lenses, and Tray with 12 Plates. Size of Camera, 9 × 7 × 4¾ in. . . . . each 3 15 0
(Extra Trays for ditto, 5s. each.
2 in. square Britannia Dry Plates, 1s. 3d. per dozen.)

No. 2A. Superior Workmanship.—ACADEMY CAMERA, best mahogany, with a pair of MARION & Co.'s Rectilinear Lenses, Tray, Porcelain Slab for Memoranda . . each 7 7 0
(Extra Trays, with Ivory Number Tablet, 6s. each.)

No. 3. **ACADEMY CAMERA**, for Plates 3¼ in. square, including a pair of Lenses, and Tray with 12 Plates. Size of Camera, 10½ × 6⅝ × 10¾ in. . . . each 5 0 0
(Extra Trays for ditto, 10s. each.
3¼ in. square Britannia Plates, 1s. 6d. per dozen.)

No. 3A. Superior Workmanship.—ACADEMY CAMERA, best mahogany, with a pair of MARION & Co.'s Rectilinear Lenses, Tray, and Porcelain Slab for memoranda . . each £10 10 0
(Extra Trays for ditto, with Ivory Number Tablet, 11s. each.)

No. 4. ACADEMY CAMERA, for Plates $4\frac{1}{4}$ in. × $3\frac{1}{4}$ in., including a pair of Lenses and Tray with 12 Plates. Size of Camera, $11\frac{1}{4} \times 6\frac{3}{8} \times 10\frac{3}{4}$ in. . . . each 6 10 0
(Extra Trays for ditto, 12s. each.
$4\frac{1}{4} \times 3\frac{1}{4}$ in. Britannia Dry Plates, 1s. 6d. per doz.)

No. 4A. Superior Workmanship.—ACADEMY CAMERA, in best mahogany, with a pair of MARION & Co.'s Rectilinear Lenses, Tray, and Porcelain Slab for memoranda . each 12 12 0
(Extra Trays for ditto, with Ivory Number Tablet, 13s. each.)

CAPT. PLUCKER'S PATENT TELESCOPE STAND, with Metal Attachment for the ACADEMY CAMERA, for No. 2 size, 42s. each; for No. 3 and No. 4, 60s. each.

For those who are not already supplied with chemicals and dishes, we have prepared a set of the materials and apparatus for making and developing the negative taken by the Academy Camera, likewise everything requisite for Photographic Printing—all neatly arranged in a mahogany box, including the Camera, which in addition has a leather case for carrying it on expeditions. Thus the Camera with one or more trays can be taken on distant excursions in a very small compass, and the development can be made after the return; but it will be desirable to practise with the instrument first, so that there may be a complete mastery of it before starting. (See advertisement end of book.)

ACADEMY CAMERA SETS, complete with everything requisite for Photographic Negatives and Photographic Printing, fitted in mahogany box, comprising Camera and Lenses, Leather Case, Twelve Dozen Plates, Chemicals, Trays, Lamp, Measure, etc. Also material for Printing and Mounting.

No. 1 SET	£6	10 0
2 ,, ...	8	5 0
3 ,, ...	10	15 0
4 ,, ...	12	15 0

Ditto, ditto, with superior workmanship, Camera and MARION'S Rectilinear Lenses.

No. 2A SET . . .	£11	17 0
3A ,, ...	16	5 0
4A ,, ...	18	17 0

N.B.—PACKING EXTRA.

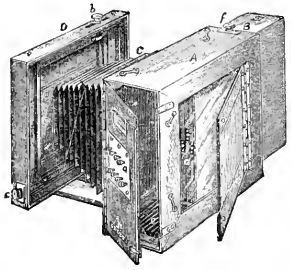
MARION & CO., 22 & 23 Soho Square, London, W.

New Patent

CAMERA AND CHANGING BOX IN ONE,

CALLED AFTER THE INVENTOR,

The "ENJALBERT."



SINCE the introduction of Dry Plates a want has been felt for a Camera that should combine in itself an arrangement for holding several plates, permitting of their exposure being made in rotation, thus avoiding the cumbersomeness and inconvenience of several extra dark slides or backs, and which shall be also of light weight, yet strong and rigid.

These requirements will be found fully met in the Enjalbert. The simple way in which the difficulty is overcome of changing successive plates will, we are sure, be much appreciated, and will be admitted as superior to any other method employed.

The total weight of half-plate Camera, with its drawer complete, is under 4 lbs.

Extra Drawers are supplied, and being made to a gauge, are interchangeable in the Camera. Each drawer contains 8 Holders, and being light and compact, a large number of Plates may be carried at a minimum of weight and bulk.

The Camera is adapted for use either upright or oblong way.

It is easily set up.

Its power of expansion or contraction allows the use of any Lens.

Its front shifts in all ways.

Focussing is easy, being adjusted by rack-work and fixed by a screw.

The Camera is well balanced.

The focussing-glass is in a supplementary groove in the body of the Camera.

The sliding bottom board has a scale, so that any of the plates may be used after once focussing.

SIZES AND PRICES.

The Drawer with 8 Slides and the Ground-Glass Screen included.

$6\frac{1}{2} \times 4\frac{3}{4}$, 200s. | $8\frac{1}{2} \times 6\frac{1}{2}$, 270s. | 10×8, 310s.

Made in Best Mahogany.

ACCESSORIES.

Telescopic Camera Stand, extra strong	45/	Inner Carriers	$8\frac{1}{2} \times 6\frac{1}{2}$ 3/
Extra Drawers containing 8 slides or Holders . . .	$6\frac{1}{2} \times 4\frac{3}{4}$ 40/	Strong Leather Case for Camera	$6\frac{1}{2} \times 4\frac{3}{4}$ 30/
Do. do.	$8\frac{1}{2} \times 6\frac{1}{2}$ 50/	Do. do.	$8\frac{1}{2} \times 6\frac{3}{4}$ 35/
Do. do.	10×8 55/	Do. do.	10×8 40/
Inner Carriers	$6\frac{1}{2} \times 4\frac{3}{4}$ 2/6	Strong Waterproof Case for Telescope Stand	10/6

THE ENJALBERT SETS.

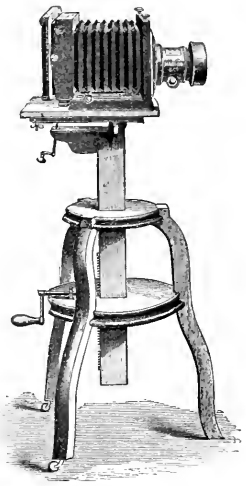
(*N.B.—Equal to a Camera with 8 Double Backs.*)

Comprising Camera, MARION & Co.'s View Lens, Stand, 1 extra Drawer, 4 Inner Carriers, Leather Cases, 1 gross Britannia Dry Plates, Chemicals Trays, Measure, Washing Apparatus, Lamp, Strong Box with partitions.

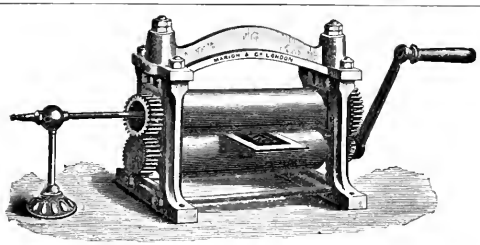
No. 1. For Plates $6\frac{1}{2} \times 4\frac{3}{4}$ . . . £25. | No. 2. For Plates $8\frac{1}{2} \times 6\frac{1}{2}$ . . £30.
No. 3. For Plates 10×8 (with only 4 Carriers), £39.

MARION & CO., 22 & 23 Soho Square, London, W.

STUDIO SETS.



To those Amateurs who desire to make a complete study of Portrait Photography, MARION & CO. can give an estimate for erecting "Studio" and fitting it up complete with Apparatus and Accessories, etc.



MARION & CO.'S

Self-Adjusting Rolling Press & Burnisher

For C.D.V.'s and CABINETS, Plain Nickle Rollers . . **47s. 6d.**
For C.D.V.'s and CABINETS, fitted with Hot Roller for Burnishing, **£5.**
For BOUDOIRS, IMPERIALS, PANELS, etc. (9 in. Roller) . . **£9.**
To roll PHOTOGRAPHS 12 in. wide (12 in. Roller) . . . . **£15.**

The pressure adjusts itself according to the thickness of the Mount. There are no screws or levers; the pressure is entirely self-acting. The Rollers are of hardened polished steel, and the top one hollowed out to receive a Burner, by which the Roller is heated. The glaze or burnish given by these Rollers is more glossy, and the photo is less scraped and pulled to pieces than with the ordinary Burnisher.

MARION & CO., 22 & 23 Soho Square, London, W.

SHUTTERS.

CADETT'S

Patent Pneumatic Photographic Shutter.

Made to fit inside or outside the Camera. Price 42s. each.

It has often been remarked by eminent Photographers that any arrangement which would enable persons to be photographed without their being aware of it would be a most useful one. All that has been done in this direction necessitated the operator being by the Camera; here we have an instrument which permits him to be at any part of the Studio that he pleases.

When using with very rapid Plates, we recommend the operator to put a collar of velvet round the hood of the lens; thus the velvet flap lies against it, and is perfectly light-tight. The Shutter, we feel certain, with this precaution, may be used for instantaneous view work.

Cadett's Patent Instantaneous View Shutter.

The great use of Dry Plates for landscape work has necessitated the employment of a Shutter capable of working with the utmost rapidity, at the same time offering the means of readjustment for medium or slow exposures. All these requirements are fully met by this Shutter.

The Shutter is fitted to the hood of the lens, therefore it is necessary to state, when ordering, what Lens the Shutter is to be used with.

No. 1.	For Lens of a diameter $1\frac{1}{8}$ in.	. . .	50s.
,, 2.	,, ,, $2\frac{3}{8}$,,	. . .	50s.
,, 3.	,, ,, $3\frac{1}{16}$,,	. . .	60s.

If the Shutters are required between the above sizes, Leather Collars are supplied at a small extra charge.

Just Introduced.

Cadett's Patent Pneumatic Drop Shutter

for the Studio.

Price 24s.

All the London Photographers are buying it. It will fit the largest size Dallmeyer's Lens, but the hood of the Lens must be unscrewed.

In ordering, state for what Lens it is to be used with.

MARION & CO., 22 & 23 Soho Square, London, W.

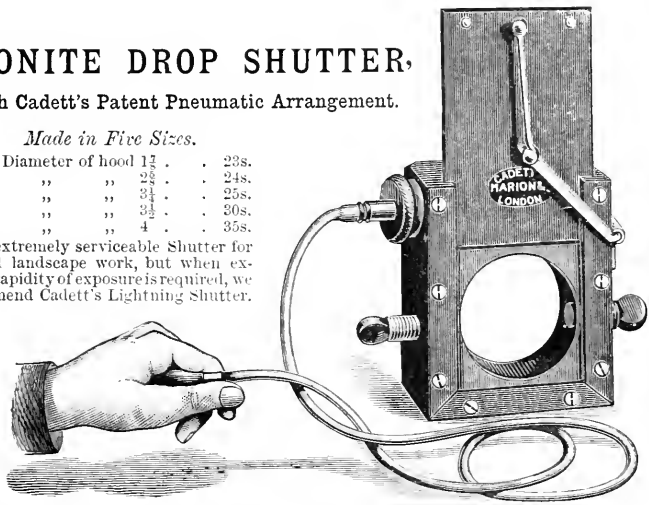
EBONITE DROP SHUTTER,

with Cadett's Patent Pneumatic Arrangement.

Made in Five Sizes.

No. 1.	Diameter of hood	$1\frac{7}{8}$	23s.
No. 2.	,, ,,	$2\frac{5}{8}$	24s.
No. 3.	,, ,,	$3\frac{1}{4}$	25s.
No. 4.	,, ,,	$3\frac{1}{2}$	30s.
No. 5.	,, ,,	4	35s.

An extremely serviceable Shutter for general landscape work, but when extreme rapidity of exposure is required, we recommend Cadett's Lightning Shutter.

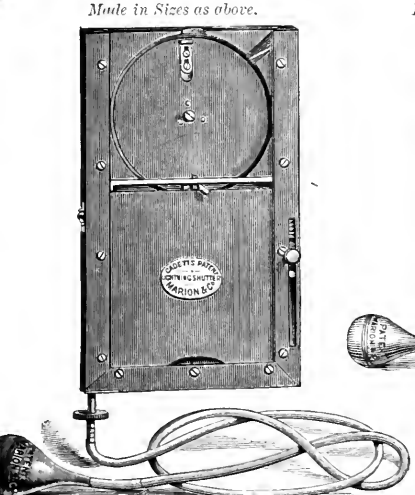


FOR THE FIELD.

DETT'S LIGHTNING EBONITE SHUTTER,

h Cadett's Patent Pneumatic Arrangement.

Made in Sizes as above.

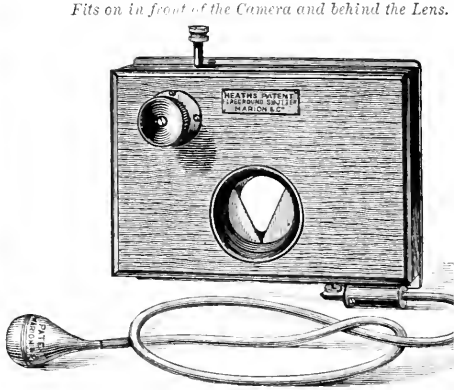


Shutter being now in course of manufacture, the are not yet established; they will be somewhat higher the above list. By a simple and an ingenious arrange- the exposures can be changed from a moderate one the most extreme rapidity; there is also an arrange- for focussing.

HEATH'S PATENT FOREGROUND SHUTTER,

with Cadett's Patent Pneumatic Attachment.

Fits on in front of the Camera and behind the Lens.



It is so constructed as to give greater exposure the foreground than to the sky. The range of posure in this Shutter is very great, from a slow to a flash exposure. The mechanism is boxed and working in a very shallow space. The appe ance of the Shutter is very like an ordinary cam front, only a little deeper. It being now only course of manufacture, the prices are not yet fix but they will be moderate.

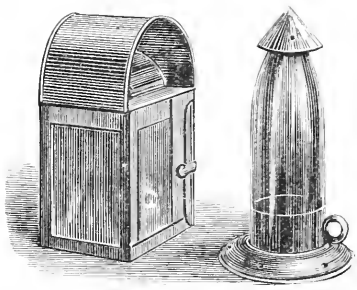
In ordering please state size of Lens.

The Reflector DEVELOPING LAMP.

Price 23s. 9d. each;

Smaller Size 9s. each.

This new lamp, glazed with new orange glass, permitting a clear light to work by, yet perfectly safe for the most sensitive dry plate, has a shade reflector which throws the light down on the developing tray, but stops the rays from ascending; consequently the eye of the operator is well protected from the orange light, and yet the plate is much bettter illuminated than by the ordinary lamp.



DEVELOPING LAMPS.

The Candle Lamp, as used in our Student's or Beginner's Set.

1s. 10d. each.

RUBY LANTERNS

With Oil Lamp.*

5s. each.

* If desired, this lantern can be supplied so as to fit over a gas burner. Price the same.

BRITANNIA SOLUTION.

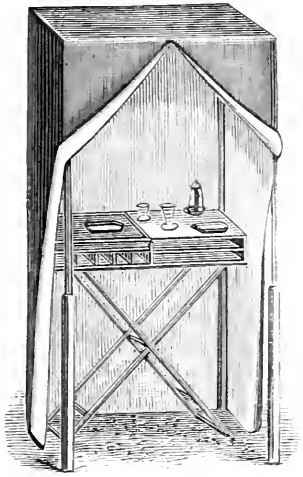
A concentrated and convenient Solution for developing Britannia Dry Plates.

On the same day of using, pour out one ounce of this Solution into nineteen ounces of water; this forms Solution No. 3 of our developing formula. It is mixed in equal proportions with Solution No. 2. This latter is so easily made up by every Photographer that we do not offer it in a separate bottle. It consists of 3 drachms of strongest liquid ammonia to one pint of water. The quantity of Solution that should be mixed together of No. 2 and No. 3 must depend on the size and number of plates to be developed, but always in equal parts of one to equal parts of the other.

N.B.—If the plate is found to be over-exposed, at once remove it from the dish, and pour over it once or twice some solution of No. 3, allowing that which runs off the plate to mix with the solution in the dish. Upon returning the plate to the dish it will be found in most cases to develop as if correctly exposed.

In cases of under-exposure the development may be hastened by adding more of Solution No. 2.

MARION & CO., 22 & 23 Soho Square, London, W.

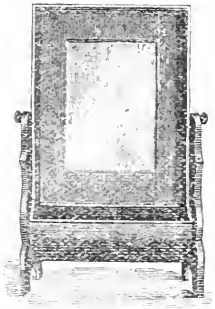


MARION'S
NEW PORTABLE
DEVELOPING TENT
AND
TABLE.

PRICE £4 : 5s.

Our Tent is so devised that it may be fitted up indoors or out-of-doors. Stands 6 feet high, and is 3 feet square. Folds up in a compact form for travelling. The Table is fitted with developing sink and partition for chemicals.

THE TRANSPARENT AND ROCKING
DEVELOPING TRAY.



Two advantages, sure to be appreciated by all dry-plate workers, are found in this Tray. Pivoted on a stand, the rocking motion flows the developing solution in a smooth even wave over the negative. Being made of papier-maché, with a glass bottom, when tilted up the light from ruby lamp shines right through the glass bottom, and thus the development may be watched without touching the plate.

PRICES—For ¼ plate, 9s.; ½ plate, 11s. 4d.: ¼ plate, 12s. 3d.; 10 × 8, 13s. 3d.; 12 × 10, 15s. 3d.; 15 × 12, 17s.

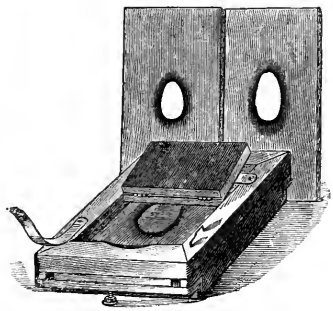
MARION'S READY SENSITISED PAPER,

Thick, in White or various Tints, will be found a great boon to all Photographers. It saves an immensity of trouble, is always ready for use, and with ordinary care it will keep without losing quality over six months.

Price 11s. 6d., and the best Superfine 14s., per Quire.

MARION & CO., 22 & 23 Soho Square, London, W.

NEW
VIGNETTING FRAME.

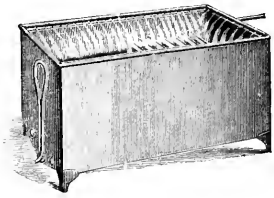


These Frames have each three thick slabs of wood with bevelled oval opening each a different size. These Slabs are placed in front of the Printing Frames, and are held in their place by two screws, but their positions may be shifted; the oval holes, being some distance from the negative, permit the rays of light to slant, thus effecting a soft pleasing vignette.

NONE CHEAPER! NONE BETTER!

PRICES—$\frac{1}{4}$ plate, 2s. 6d.; $\frac{1}{2}$ plate, 4s.; $\frac{1}{1}$ plate, 5s. 2d.

JOHN EDWARD'S WASHING APPARATUS.



This Apparatus offers all the desiderata for a complete and thorough wash to the Plates. The water falls in a gentle shower; when nearly full the overflow syphon begins to work, so there will be a constant inflow and outflow. When the water is turned off the syphon sucks out the last drop, thus there is no fear of Hypo deposit remaining.

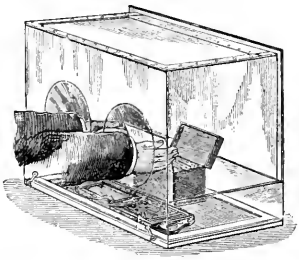
Size of Plate.	s.	d.	Size of Plate.	s.	d.
50 grooves, $\frac{1}{4}$ . . .	17	6	36 grooves, 7×5 or $7\frac{1}{2} \times 5$.	20	0
50 ,, 5×4 . . .	20	0	36 ,, 9×7 . . .	21	0
50 ,, $\frac{1}{2}$ . . .	20	0	24 ,, 10×8 . . .	20	0
50 ,, $\frac{1}{2}$ or $\frac{1}{1}$ . . .	22	0	24 ,, 12×10 . . .	25	0

COWAN'S DRY-PLATE CHANGING BOX.

Price 40s. each.

The box is large enough to change plates up to 12×10.

Mr. Cowan has designed this box on the principle that it is much easier to change plates by the touch only than to do so whilst looking through an obscure medium. The apparatus is not only a box in which plates may be safely changed in the open air, but it also forms a portable travelling case, in which camera, dark slide, and plates may be packed—a notable convenience when work must be done away from the studio.



MARION & CO., 22 & 23 Soho Square, London, W.

WARNERKE'S

STANDARD SENSITOMETER.

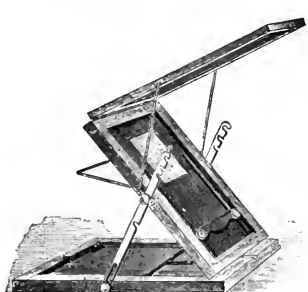
Price 15s.

Approved by a Committee comprising several of the leading Members of the Photographic Society of Great Britain.

This Instrument has been invented by Mr. Warnerke to serve as a standard measure of sensitiveness to all the Photographers of the world. Thus when Gelatine Dry Plates are said to be 16 by the Standard Sensitometer, all shall know at once what degree of sensitiveness and what exposure is necessary for the Plates. All the Standard Sensitometers register alike, and never vary. Thus, if four Dry Plates made by four different makers register (when developed alike) in four different Sensitometers the figures 16, it can be depended on, as a matter of fact, that they will all require the same exposure. In practice, the actual exposure-signified by a given number will soon become a recognised and familiar fact. In order to find without trouble the exposure necessary for any given number of the Sensitometer, Mr. Warnerke has worked out a table giving the relative exposure of each number.

Instructions for using will be sent with each Sensitometer.

COLES'S RETOUCHING DESK. Price 50s.



There are some new features in this instrument which make it an improvement on other kinds in use. The platform on which the white paper or reflector is placed can be adjusted at any angle. There is a slit at the top of the instrument to allow the negative to slide through when it is desired to retouch parts of the negative awkward to get at without this provision. The bar across front on which the negative rests can be shifted at different angles to facilitate working. The supports of front, as will be seen by the woodcut, can be screwed firmly at any desired elevation. The desk also forms a convenient easel, on which finishing of enlargements may be done. It can be used for negatives from ¼-plate to 12 × 10.

MARION & CO., 22 & 23 Soho Square, London, W.

MARION & CO.'S
BRITANNIA DRY PLATES

From their Cheapness and Excellence are in Universal Use.

IMPORTANT NOTICE.

Although the unprecedented sale of the BRITANNIA PLATES may be said to be a sufficient guarantee and acknowledgment of their superiority over all other Plates before the public, the Proprietors are convinced that there are still many Professional and Amateur Photographers who have not given due consideration to the advantages obtainable by the use of Britannia Plates, and they beg to submit the annexed Prices and Testimonials for their careful attention, the Plates being now of much superior quality to those of earlier manufacture.

CHARACTERISTICS OF THE PLATES.

Vigour of Image. Evenness of Film. Great Sensitiveness. Fineness of Texture. Freedom from Fog and Frilling. Clearness of Shadows and Edges. Cleanness and Simplicity of Development. Durability, Uniformity, and Cheapness.

Sizes.	Per Gross. s.	d.	Sizes.	Per Gross. s.	d.
$1\frac{1}{4}$ in. square	12	0	$8\frac{1}{2} \times 4\frac{1}{4}$	54	0
2 ,,	15	0	$7\frac{1}{2} \times 5$	60	0
$3\frac{1}{4}$,,	18	0	$8\frac{1}{2} \times 6\frac{1}{2}$	72	0
$4\frac{1}{4} \times 3\frac{1}{4}$	18	0		Per Doz.	
5×4	27	0	9×7	7	6
$6\frac{1}{4} \times 3\frac{1}{4}$	38	0	$8\frac{1}{2} \times 8\frac{1}{2}$	8	6
$6\frac{1}{2} \times 4\frac{1}{4}$	40	0	10×8	10	6
$6\frac{1}{2} \times 4\frac{3}{4}$	42	0	12×10	15	0
$7\frac{1}{4} \times 4\frac{1}{2}$	51	0	13×8	15	0
			15×12	26	6

EXTRA LARGE SIZES.

Sizes.	Per Doz. s.	d.	Sizes.	Per Doz. s.	d.
17×11	32	0	20×16	43	0
17×14	38	0	23×15	47	0
18×14	40	0	24×18	65	0
18×16	41	0			

TESTIMONIALS.

Being a few out of many hundreds received from all parts of the Country.

From Messrs. VALENTINE & SONS, Perth Road, Dundee.—"January 14, 1884. We are very much pleased with the quick Plates you sent the other day. They are the finest quality of really quick Plates we ever used."

From Mr. J. HAWKE, of Plymouth.—"January 18, 1884. I am very pleased with the Extra Rapid Plates, and shall be glad if you will forward three gross of half-plates per return."

From Mr. F. W. BROADHEAD, of Leicester.—"January 16, 1884. I received a sample of your new make of Plates, and they are the best I have yet used. They are in appearance more like the best wet plates, and quite free from green fog."

From Mr. J. Smale, of Dartmouth. "January 19, 1884. I have this day thoroughly tested your new Rapid Britannia Plates, and cannot but say that they are the most rapid and uniform Plates I have ever used."

MARION & CO., 22 & 23 Soho Square, London, W.

COWAN'S

Gelatino-Chloride Plates.

MARION & CO., Sole Proprietors.

The attention of Photographers and Amateurs is respectfully solicited to these plates. In our opinion their use is likely to be very extensive, and a source of considerable profit to the profession.

Gelatino-Chloride Plates are printing plates for positives; a good print can be obtained in 1 to 5 seconds in diffused daylight, and with gaslight in a proportionately longer time.

No Transparencies have ever been produced finer in tone or richer in detail than those by Cowan's Chloride Plates.

WHAT DO THE PLATES SERVE FOR?

1. Portraiture and landscapes; most lovely effects visible by transmitted light.
2. Lantern-slides and stereoscopic transparencies; with more detail, and better tone than by any other process.
3. Transparencies for enlargements; full of detail, soft, vigorous, and equal in all respects to the finest carbon positives, with this advantage, that they can be produced in any light.
4. For reproduction of negatives; they are invaluable.

PER DOZEN.

	s.	d.		s.	d.
$3\frac{1}{4} \times 3\frac{1}{4}$ . . .	2	0	$8\frac{1}{2} \times 6\frac{1}{2}$ . . .	10	0
$4\frac{1}{4} \times 3\frac{1}{4}$ . . .	2	6	9×7 . . .	12	0
5×4 . . .	4	0	10×8 . . .	14	6
$6\frac{1}{2} \times 4\frac{3}{4}$ . . .	5	6	12×10 . . .	22	0
$7\frac{1}{2} \times 5$ . . .	7	6	13×8 . . .	22	0
$8\frac{1}{2} \times 4\frac{1}{4}$ . . .	8	0			

Any other Sizes to Order charged in same proportion.

Samples of the Transparencies supplied—

C.D.V., 1s.; CABINET, 2s.; and WHOLE-PLATE, 3s. each.

DEVELOPING SOLUTIONS.

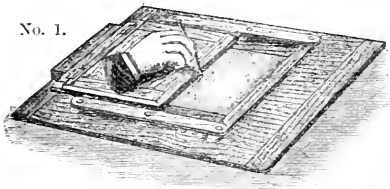
Nos. 1, 2, and 3, 10 oz. bottles, 1s. 9d.; 20 oz. bottles, 3s. each.
Iron Solution ,, ,, 9d.; ,, ,, 1s. 3d. each.

N.B.—In preparation a series of cheap Metal Gilt Rims specially adapted for Transparencies. They will be made in all sizes, and be low in price.

MARION & CO., 22 & 23 Soho Square, London, W.

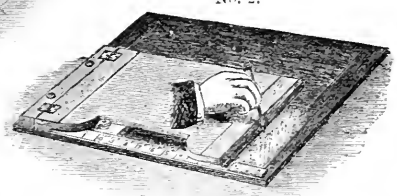
Cowan's Patent Cutting Boards, 16s. each.

No. 1.



No. 1. For centring and cutting glass. Any piece put on the Board can be immediately cut exactly into half. For Dry-Plate work it is a great economiser of time.

No. 2.



No. 2. For cutting glass photographic sizes from ¼-plate up to 10 × 8. A rule, a movable stop, and a firm straight edge for the diamond to work on, form the simple means of this time and labour-saving instrument.

MARION & CO.'S

MOUNTING SOLUTION FOR PHOTOGRAPHS.

1s. per Bottle.

This Solution has been in use during the last five years in a large Photographic Establishment, and will be found to possess the following qualities:—

It has no disagreeable Smell;
It does not cockle the thinnest Mounts;
It does not discolour the Photograph;
It does not perish; and it is easily used.

DIRECTIONS FOR USE.—Place the bottle in warm water, or on a stove, till the Solution is melted. Apply it with a stiff brush (which must be perfectly dry) to the back of the Photograph. Let the Photograph thus coated remain for a few seconds and then place it on the Mount and press it well down.

THE AMATEUR'S SCRAP-BOOK, OR REGISTER OF WORK DONE.

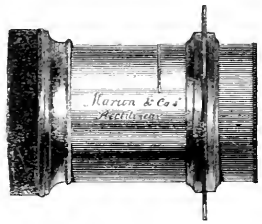
If a print from every negative that an Amateur may have taken be mounted into a book, it will be surprising how interesting the collection will grow. Such a collection would show the advance in quality of work, and would also be a memento of time and places. Without some such method the Amateur has no security against forgetting or losing his negatives.

No.	Size.			s.	d.
R.M. 10.	12 × 9½	French Morocco,	half-bound, Cardboard Leaves	6	6
,, 12.	15 × 11	Do.	do. do.	10	0
,, 18.	12 × 9½	Morocco, Gilt Back	do. do.	12	0
,, 20.	15 × 11	Do.	do. do.	16	0
,, 64.	12 × 9½	Anglo-Russia,	full-bound do.	15	0
,, 66.	15 × 11	Do.	do. do.	23	0
,, 72.	12 × 9½	Morocco, Gilt Edges	do. do.	22	0
,, 74.	15 × 11	Do.	do. do.	30	0

MARION & CO., 22 & 23 Soho Square, London, W.

MARION & CO.'S

LENSES.



QUICK-ACTING RECTILINEAR,

Metal Mounts Nickled.

We guarantee each Lens perfect.

No.	Size of Plates.	Diam. of Lens.	Back Focus.	s.	d.
1.	$4\frac{1}{4} \times 3\frac{1}{4}$ and 5×4	$1\frac{1}{16}$	6	42	0
2.	$6\frac{1}{2} \times 4\frac{3}{4}$ and $7\frac{1}{2} \times 5$	$1\frac{3}{8}$	8	61	0
3.	$8\frac{1}{2} \times 6\frac{1}{2}$ and 8×5	$1\frac{1}{16}$	$10\frac{1}{4}$	71	0
4.	10×8	2	12	95	0
5.	12×10	$2\frac{3}{8}$	$13\frac{3}{4}$	142	0
6.	15×12	$2\frac{1}{16}$	...	200	0

WIDE ANGLE RECTILINEAR LENSES.

We guarantee each Lens perfect.

No.	Size of Plates.	Diam. of Lens.	Back Focus.	s.	d.
6.	$4\frac{1}{4} \times 3\frac{1}{4}$	$\frac{3}{4}$	$1\frac{3}{4}$	45	0
7.	$6\frac{1}{2} \times 4\frac{3}{4}$	$1\frac{1}{16}$	$2\frac{3}{8}$	60	0
8.	$8\frac{1}{2} \times 6\frac{1}{2}$	$1\frac{5}{16}$	5	80	0
9.	10×8	$1\frac{11}{16}$	8	100	0
10.	12×10	$2\frac{5}{16}$	12	140	0
11.	15×12	$3\frac{3}{16}$	$15\frac{3}{4}$	200	0

PORTRAIT LENSES.

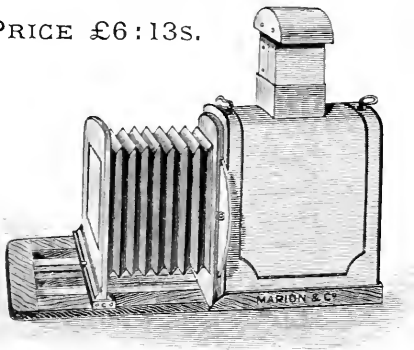
No.		£	s.	d.
100.	SERVICEABLE PORTRAIT LENS for C.D.V., $1\frac{9}{16}$ diam., 4 focus	£1	8	0
101.	Do. do. for CABINETS, $3\frac{9}{16}$,, $6\frac{1}{4}$,,	2	5	0
102.	EXCELSIOR C.D.V. and CABINET LENS, $2\frac{7}{16}$,,	3	5	0
103.	For PROMENADE and CABINET, will cover a whole plate, Nickel Mounts; quality guaranteed	13	0	0
104.	EXTRA RAPID C.D.V. PORTRAIT LENS, Nickeled Mounts .	3	10	0
105.	EXTRA RAPID CABINET do. do. .	9	0	0
106.	EXTRA RAPID PROMENADE and CABINET PORTRAIT LENS .	10	0	0
107.	PORTRAIT LENS for 10×8 Plates, diam. 4, focus 17, Nickel Mounts	20	0	0
109.	PANEL LENS for Plates 13×8 or 12×10, diam. 5, Nickel Mounts; this is a long focus lens and requires a long studio; we guarantee the quality . . .	28	0	0
110.	GRAND PANEL LENS for Plates 24×18; diam. of lens, 6; long focus, Mounts Nickeled; we guarantee the quality.	50	0	0
	FOCUSSING GLASSES	5s. or	10	6

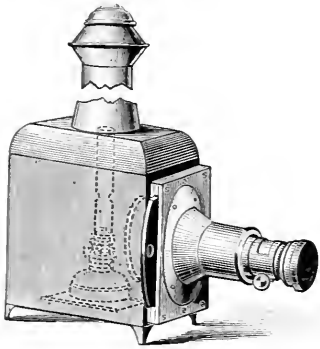
MARION & CO., 22 & 23 Soho Square, London, W.

MARION'S ENLARGING APPARATUS

Can be strongly recommended as most efficient. It also serves as an effective Magic Lantern. We supply a special spirit for the lamp which gives a brighter and whiter light than any mineral oil. The Apparatus may be used in any room, provided all actinic light be excluded; a hood, as shown in the woodcut, covers the lamp, to prevent any light escaping. Every part is movable, therefore the adjustment is easy. We append directions for use, and we may add that the operations are much simpler than they seem as described in the directions.

PRICE £6 : 13s.





MARION'S MAGIC LANTERN AND ENLARGING APPARATUS COMBINED.

Price £2 : 16s.

Fitted with Portrait Lens, £4 : 4s.

Upright Easel Stand for ditto, 21s.

The above Apparatus is made on the same principle as our £6 : 13s. Enlarging Apparatus, which has given such general satisfaction. The same spirit and the same lamp are used, thus the illuminating power is equal. It is fitted to take up to a quarter-plate negative. Combining, as it does, the lantern and the enlarging, this Apparatus will be found both to the Amateur and Professional one of the most useful and one of the cheapest instruments ever offered.

DIRECTIONS FOR USE.

The apparatus must be used in a darkened room from which all actinic light is excluded. It will, however, of itself give sufficient light to work by. Place it on a table or bench; a flat board should rest on an upright easel—this latter to have wheels so that it might be moved backwards or forwards. Remove the hood or metal box which covers the lamp, and light the lamp in the ordinary manner. Now take out the slide from the wood upright, and into this slide fix the negative, and then replace into its former position.

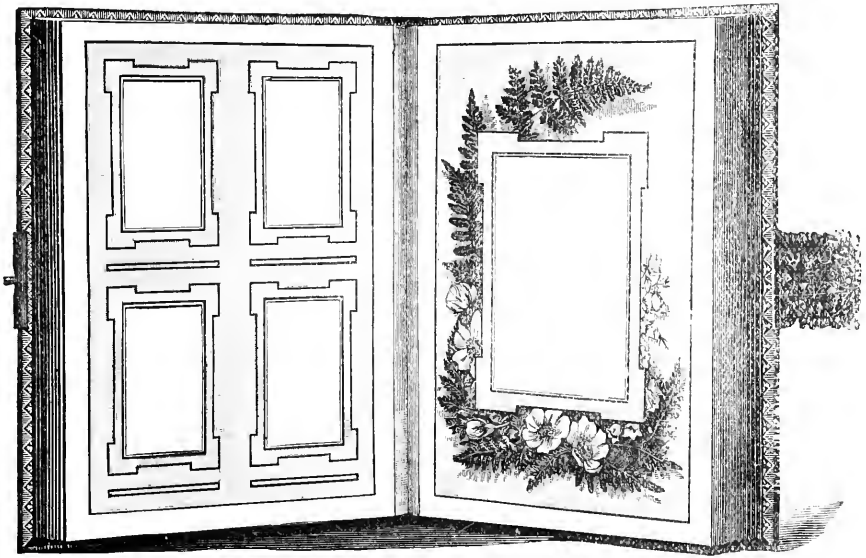
To the front of the Enlarging Apparatus must be fixed a lens (generally a ½ or ½ plate portrait). Now adjust the bellows until an image of the size desired is thrown on the screen or board which rests on the easel (a sheet of white paper is attached to the board during this operation), and the exact focus is obtained by moving the easel stand backwards or forwards. To get the fullest power of illumination, the glass condensers as well as the lamp are made movable. There is one particular point which will be found to give the greatest light—this can only be discovered by adjustment. Now the correct size of image, the sharpest focus, and the greatest illumination being obtained, replace the hood in its position; this will shut out all light except that which comes from the lens. The white sheet of paper is removed from the board, and sensitive paper placed there instead. Care must be taken not to disturb the position of the easel, otherwise the focus will be lost. The exposure takes place, and will depend on the nature and sensitiveness of the paper used.

A few words with respect to the lamp. Great care must be taken that the wick is always kept clean; after using, no camphine should be allowed to remain in the lamp, and the wick should be thoroughly trimmed. It is a safeguard to wash it in methylated spirit.

MARION & CO., 22 & 23 Soho Square, London, W.

THE "FERN" ALBUM.

From £2 to £5 : 5s., according to description of Binding.



Appropriate Monograms in pierced and engraved metal, from 12s. each. Price according to size and number of letters. Design furnished and not charged when Monogram is ordered.

OPINIONS OF THE PRESS.

"An elegant Photographic Album."—*Morning Post.*
"A handsome volume—solidly bound."—*Daily Telegraph.*
"Ingenuity and taste have been largely exercised in the production of this volume."—*Illustrated London News.*
"A very good notion—well carried out."—*St. James's Gazette.*
"One of the handsomest presents for Christmas-time."—*Scotsman.*
"The choicest Album we have ever seen."—*Western Morning News.*
"Most handsome and artistic."—*European Mail.*

MARION & CO.'S
BEST FRENCH MOUNTS.

(Made at Marion's Factory, Courbevoie, near Paris.)

No.

800. **Best Ivory Carte de Visite Mount** of a slight cream tint, 1s. for 50, and 1s. 6d. for 100.

801. **Best Ivory Carte de Visite Mounts,** in white, 1s. for 50, and 1s. 6d. for 100.

802. **Best Enamelled Carte de Visite Mounts,** in white, cream, and salmon tints, 1s. 3d. for 50, and 1s. 9d. for 100.

803. **Best Enamelled Carte de Visite Mounts,** cream tint, with gold design on back and line on front, round corners, and gilt edges, 2s. 6d. for 50, and 3s. 9d. for 100.

804. **Best Enamelled Carte de Visite Mounts,** cream tint, with carmine rands and round corners, 2s. for 50, and 3s. for 100.

805. **Real Gold Bevelled Carte de Visite Mounts,** medium thickness, in cream, rose, blue, black, olive, and chocolate tints, 3s. 6d. for 50, and 6s. for 100.

806. Do. do. as above, but extra thick, in same tints as above, 4s. for 50, and 7s. 6d. for 100.

900. **Best Ivory Cabinet Mounts** of a slight cream tint, 2s. 9d. for 50, and 5s. for 100.

901. **Best Ivory Cabinet Mounts,** in white, 2s. 9d. for 50, and 5s. for 100.

902. **Best Enamelled Cabinet Mounts,** in white, cream, and salmon tints, 3s. 6d. for 50, and 6s. for 100.

903. **Best Enamelled Cabinet Mounts,** cream tint, with gold design on back, 4s. for 50, and 7s. for 100.

904. **Best Enamelled Cabinet Mounts,** with carmine rands and round corners, 4s. 6d. for 50, and 8s. for 100.

905. **Real Gold Bevelled Cabinet Mounts,** medium thickness, in cream, rose, blue, black, olive, and chocolate tints, 5s. for 50, and 9s. 6d. for 100.

906. **Real Gold Bevelled Cabinet Mounts,** extra thick, in same tints as above, 6s. for 50, and 11s. 6d. for 100.

1000. **Landscape Mounts,** cream tint, 8 × 6, 10d.; $9\frac{1}{8} \times 7\frac{1}{8}$, 1s. 2d.; $12\frac{3}{8} \times 9\frac{1}{4}$, 2s.; $13\frac{1}{2} \times 10\frac{1}{2}$, 3s.; 16 × 13, 4s. 4d.; 19 × 14, 5s. per doz.

1001. **Landscape Mounts,** cream tint, and with line, 8 × 6, 1s. 6d.; $9\frac{1}{8} \times 7\frac{1}{2}$, 2s.; $12\frac{3}{8} \times 9\frac{1}{4}$, 3s.; $13\frac{1}{2} \times 10\frac{1}{2}$, 4s.; 16 × 13, 5s. 6d.; 19 × 14, 6s. 3d. per doz.

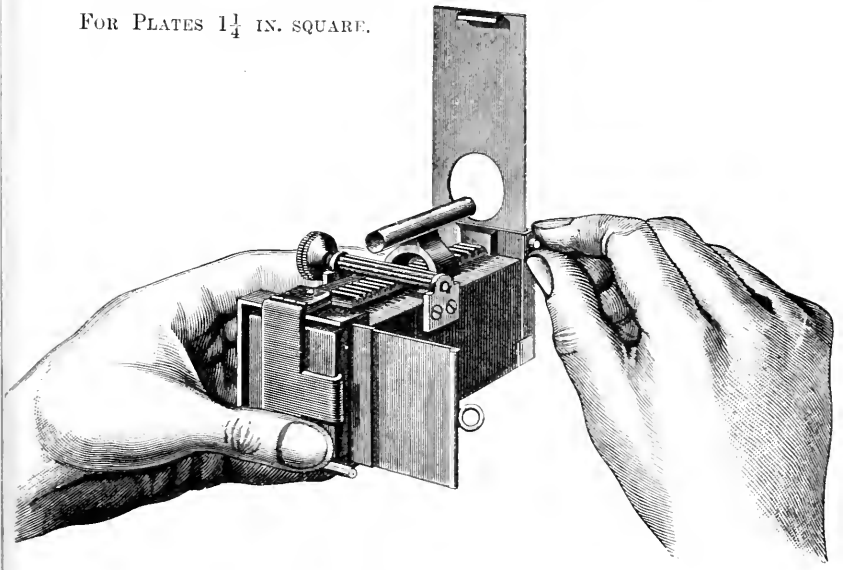
1002. **Landscape Mounts,** with tint on cream ground, with line, 8 × 6, 2s. 6d.; $9\frac{1}{8} \times 7\frac{1}{2}$, 3s.; $12\frac{3}{8} \times 9\frac{1}{4}$, 3s. 9d.; $13\frac{1}{2} \times 10\frac{1}{2}$, 4s. 6d.; 16 × 13, 6s.; 19 × 14, 7s.

1003. **Finest Quality Mounts,** with real gold bevels for views. Photos on the above are mounted close up to the bevel in cream and olive tints. For $5\frac{1}{2} \times 3\frac{3}{4}$, 1s.; $6\frac{1}{8} \times 4$, 1s. 4d.; $7\frac{1}{2} \times 5$, 2s. 4d.; $8\frac{1}{2} \times 6\frac{1}{2}$, 3s.; 10 × 8, 4s. 8d.; $11\frac{1}{2} \times 9\frac{1}{2}$, 7s. 6d. per doz.

MARION & CO., 22 & 23 Soho Square, London, W.

MARION'S MINIATURE CAMERA.

FOR PLATES $1\frac{1}{4}$ IN. SQUARE.



PRICE . . 25s.	
A Box of 12 Slides for do. . .	12s.
Extra Slides	1s. each.
Britannia Plates, $1\frac{1}{4}$ in. square .	1s. Doz.
Do. Extra Rapid Series	1s. 6d. Doz.

The above illustration represents the Miniature Camera in half size; it can therefore readily be seen that such an instrument, with 12 dark slides, may easily be carried in the pocket. It is made of metal, is well finished and light tight; a good lens is used, and there is a finder on the top of the instrument to centre the object. A separate focussing-glass in a square shade is supplied, but is scarcely necessary, as the change of position of lens for distant or near views is so very trifling that the correct position can be marked on the Camera, and thus the focus is established for ever. The weight of one slide is two-thirds of an ounce.

MARION & CO., 22 & 23 Soho Square, London, W.

FOLDING CHANGING BAGS.

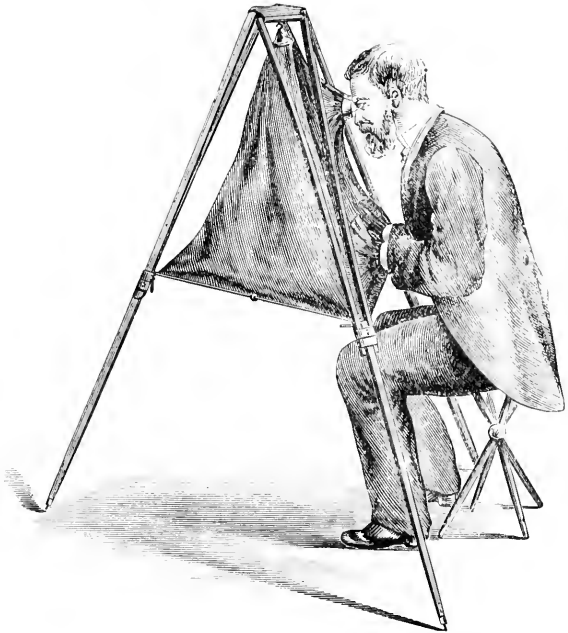
Light, Cheap, and Effective.

No. A.—With cord to fasten round the neck, so that the bag is suspended in front of the operator in such a manner that he may easily look through the eye-pieces. There are two sleeves, through which the arms are passed, and there is not the slightest difficulty in changing the plates. The Bag is of a square shape when extended, and when not in use collapses, and can be folded up into a very small compass, so as to go into the pocket.

PRICE . . 12s.

No. B.—This Bag is larger, and instead of being suspended in front of the operator, it is attached to a light tripod stand. This stand may at the same time be used as the stand for the Camera. There are a pair of eye-pieces and sleeves just as in the Bag described above. It is very easy to use, and when not required folds up into a very small compass.

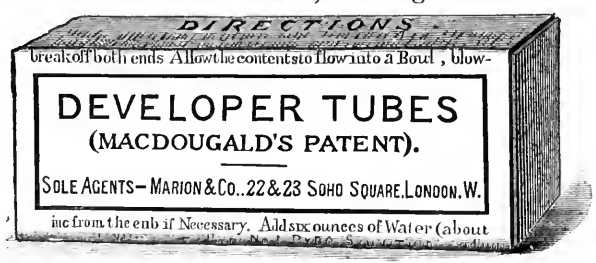
Complete with Stand . . . 27s.
If without Stand . . . . 12s.

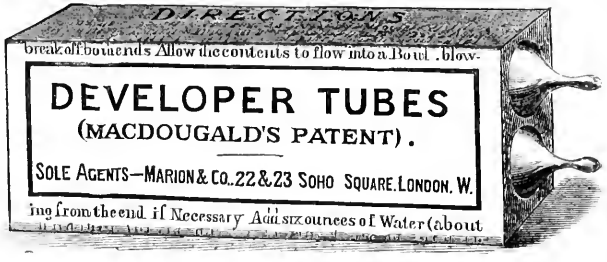


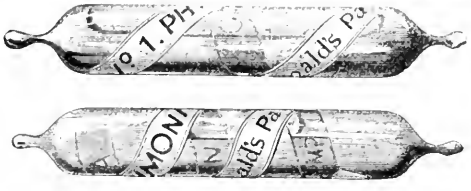
MARION & CO., 22 & 23 SOHO SQUARE, LONDON, W.

DEVELOPER TUBES—MACDOUGALD'S PATENT.

MARION & CO., Sole Agents.







These are two Glass Tubes with closed ends—one containing Pyro, the other Ammonia—and fitted into a solid block of wood so that they can be carried in the pocket or sent per post. When required for use the ends are broken off and the solution mixed with its proper quantity of water. Thus it is of very great convenience to be able to carry the Developer in its concentrated form, and mixing it with water only at the spot where development is required. *To the Amateur* this little Invention will specially recommend itself.

Solutions to make 12 ounces . 1s. | Solutions to make 24 ounces . 2s.

MARION'S SPOTTING MEDIUM.

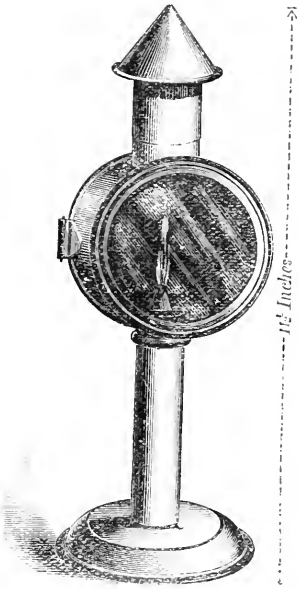
This Medium is invaluable for remedying defects in Negatives and for Spotting Prints. It is particularly useful for Enamelled Prints, as, being perfectly insoluble, it will not run or wash off in the Gelatine Bath. Should the Medium harden on palette, it can easily be thinned by adding a little Methylated Spirit.

PRICE 1s. 6d.

MARION & CO.'S READY SENSITISED PAPERS.

Cut to C.D.V. and Cabinet sizes, and put up in boxes.

C.D.V., No. 1, size $3\frac{1}{2} + 2\frac{1}{4}$ in.	1 Quire C.D.V.,	1008	Sheets,	Thick Rives,	13/6	per box	...	Best Superfine 15/	per box.
	$\frac{1}{2}$,, ,,	504	,,	,,	7/3	,,	...	,, 8/	,,
C.D.V., No. 2, size $3\frac{5}{8} + 2\frac{1}{4}$ in.	$\frac{1}{4}$,, ,,	252	,,	,,	3/10	,,	...	,, 4/3	,,
CABINET ... size $5\frac{1}{4} + 4$ in.	1 Quire CABINET,	360	,,	,,	13/6	,,	...	,, 15/	,,
	$\frac{1}{2}$,, ,,	180	,,	,,	7/3	,,	...	,, 8/	,,
	$\frac{1}{4}$,, ,,	90	,,	,,	3/10	,,	...	,, 4/3	,,



MARION'S

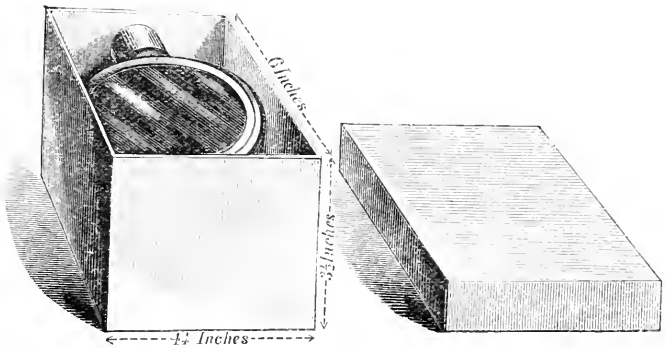
COMPACT

CANDLE LAMP

FOR

DEVELOPING DRY PLATES.

Price 7s. 6d. each.



The above illustration shows exactly the size and shape. It is easily put together, and packs, as will be seen, in a very small compass; thus it is the best Lamp for travelling about with.

SOLE AGENTS:

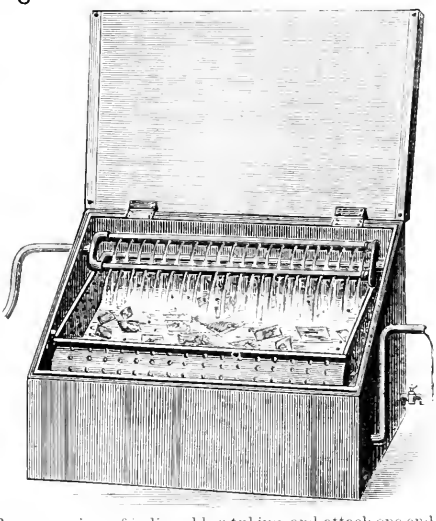
MARION & CO., 22 & 23 Soho Square, London, W.

MARION & CO.'S Registered WASHING APPARATUS.

THE great feature of this Apparatus consists in the rotary movement of the prints, caused by the system of inflow and outflow of the water.

The prints are in constant motion with the water; they circulate continuously in the trough from top to bottom, and never curl together. An hour and a half is sufficient to thoroughly wash them. This has been certified to by the public Analyst of Brighton, who tested a batch of prints washed in this time, and found not the slightest trace of hypo.

We have great confidence in recommending this Apparatus.



DIRECTIONS FOR USE.—Procure a piece of india-rubber tubing, and attach one end to the water-tap, the other to the tube of apparatus, and turn on the water from the tap; when the trough is nearly full, the overflow pipe will commence to run off the water, and the prints should then be put in. The inflow of water is generally arranged so that the outflow carries off about the same quantity. It must be understood that the overflow pipe is not a syphon; therefore, when it is desired to run off all the water, the tap at the bottom of the apparatus must be turned on and, of course, the inflow stopped. The two tubes, which are pierced, and through which the water falls in a shower into the trough, are pivoted so that they may be turned to the right position for the water to fall at a proper angle, to cause a swift rotary movement. It will be observed that this movement is not in full force till the overflow commences. Very little water is required after once the trough is filled, and it need only be run off for the purpose of cleaning out about once every ten days.

Nos.	1.	2.	3.	4.
Sizes { Length,	15 inches.	21 inches.	30 inches.	38 inches.
Sizes { Width,	18 ,,	18 ,,	19½ ,,	21 ,,
Sizes { Depth,	19½ ,,	19½ ,,	20½ ,,	21½ ,,
Prices	40s.	50s.	60s.	70s.

N.B.—It should be noticed that we offer the above also with enamelled Trough; we ourselves do not think this necessary, but as some writers in the Photographic journals have expressed a suspicion of the effects of plain zinc, we have arranged for the inside of the Trough to be enamelled for all those who would prefer it so.

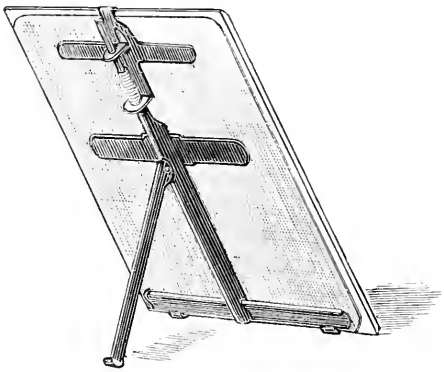
With Trough Enamelled, extra 2s. 3d. .. 3s .. 3s. 6d. .. 4s. 3d.

Self-Acting SYPHON TANK for WASHING NEGATIVES (Registered).

The advantage offered by this Tank is a continuous change of water without personal supervision. When the water arrives near the top, the Syphon commences to operate and swiftly empties the tank. The water from the tap running in all the time, soon begins to refill it, and thus the operation goes on continuously and the plates get repeated fresh baths of water, a moderate supply of which answers the purpose well.

For 24 plates—¼ plate, 7s. 6d.; ½-plate, 9s.; Whole-plate, 10s. 6d.; 10×8, 12s. each.
No. 1 P. Combination, for ¼, ½, and 1/1 plate hys. . . . . 12s. 6d.
,, 2 P. ,, ,, 1/1, 10×8, and 12×10 hys. . . . . 18s.

MARION & CO., 22 & 23 Soho Square, London, W.



NEW GLASS FRAMES

With Metal Spring Backs,

FOR PHOTOGRAPHS.

No. M2.—Bevelled-Edged Glass with Narrow Gilt Border.

Carte-de-Visite . .	9d. each	Boudoir . . .	2/0 each
Cabinet	1/6 ,,	Imperial . . .	3/0 ,,
Promenade . . .	2/0 ,,	Panel	4/6 ,,

NEW GLASS FRAMES

With Metal Spring Backs,

FOR OBLONG PICTURES.

GROUPS OR VIEWS.

No. M2 Oblong.—Bevelled-Edged Glass with Narrow Gilt Border.

Cabinet	1/6 each	10 × 8	3/4 each
$7\frac{1}{2} \times 5$	2/0 ,,	$11\frac{1}{2} \times 7\frac{1}{2}$ . . .	3/6 ,,
$8\frac{1}{2} \times 6\frac{1}{2}$	2/3 ,,	$11\frac{1}{2} \times 9\frac{1}{2}$ . . .	5/0 ,,

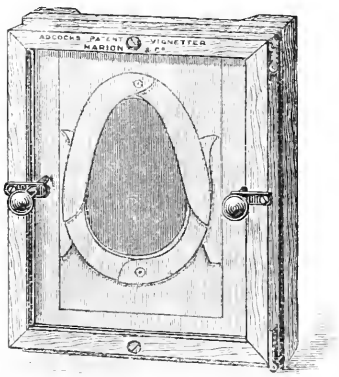
MARION & CO., 22 & 23 Soho Square, London, W.

CLOUD NEGATIVES

Of Wax-paper for Printing-in Skies.

1s. 6d.	2s.	3s.	4s.	5s. each.
For $6\frac{1}{2} \times 4\frac{3}{4}$	$8\frac{1}{2} \times 6\frac{1}{2}$	10×8	12×10	15×12.

Adcock's Patent Vignetting Frame.



A very useful and ingenious Vignette, to be screwed on to the front of Printing Frame.

For Carte-de-Visite size,
3s. each.

For Cabinet size,
4s. 6d. each.

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MARION & CO.'S

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