searching each other's heads and eating the prey there found.

Carver particularly describes the lakes and streams west of Lake Superior. Lake Winnipeg he spells Winnepeek, and the Missouri River he speaks of as the Messorie. He relates that it is said that in the country of the Pawnees and Mandrakes are found a species of root resembling human beings of both sexes! He also states that a little to the northwest of the head of the Messorie (Missouri) and St. Pierre (St. Peters) the Indians told him that there was a nation smaller and whiter than the neighboring tribes, who cultivated the ground.

He speaks of the Shining Mountains far West, probably the Rocky Mountains, and the natives there have plenty of gold. Further on he speaks prophetically of these mountains, of which time has proved much, and says: "These mountains are more than three thousand miles long. Probably in future ages they may be found to contain more riches in their bowels than those of Indus, Malabar, or are produced from the golden coast of Guinea, nor will I except even the Peruvian mines. West of these mountains future generations may find an asylum, whether driven from their country by the ravages of lawless tyrants, or by religious persecutions, or reluctantly leaving to remedy the inconveniences arising from a superabundant increase of inhabitants."

Carver mentions a remarkable phenomenon connected with the straits of Michillimackinack. "In seven and a half years they rise three feet, and the next seven and a half years they decrease three feet." He had no opportunity to prove it, but something was taking place.

The book contains additional information concerning the origin, customs, etc., of the Indians of the Northwest; also botanical and geological information, all interesting.—G. C. B., in *Kansas City Review*.

RECENT PROGRESS IN PHOTOGRAPHY.

"ANOTHER revolutionary power in photography," is the heading of an advertisement which appears in some of our weekly technical journals, and it is this revolutionary power to which we propose to refer, in the first place premising that the exclusive right of its exercise does not appertain to the individual who thus attracts the attention of that portion of the public who are interested in photography. As a matter of history, it may be as well to mention that several years ago Dr. Maddox obtained sensitive photographic plates by emulsifying bromide of silver in liquid gelatine, coating glass plates with the product, and then drying the film. He was subsequently followed by Mr. Burgess; but not till Mr. Kennett's process was published was anything practicable for the use of the general public made known. But, notwithstanding Mr. Kennett's fostering care, the gelatino-bromide process—as it was incorrectly called—did not make much way, since it appeared to possess but few advantages and several disadvantages when compared with the old collodion processes with the nitrate of silver bath, or the newer ones in which bromide of silver was suspended in collodion.

Some two years ago the whole photographic world was startled by the announcement that Mr. C. Bennett could obtain pictures in the camera in but a fraction of the time necessary with any process extant up to that time, and he demonstrated the fact to the satisfaction of every one. The process he used was founded on that of Dr. Maddox, and consisted of bromide of silver in a state of minute subdivision held in suspension in a viscous solution of gelatine. The rapidity was gained by keeping the gelatine containing the suspended matter in a liquid condition for several days, the molecular state of the sensitive compound being altered by the prolonged liquefaction. Some idea of the exquisite sensibility of bromide of silver can be gathered from the fact that M. Stas, the great Belgian chemist, while making his classical researches on the atomic weight of bromide, found one particular form of this compound which was speedily blackened by the feeblest yellow light—a light which, as a rule, is totally inoperative to cause the slightest change in bromide of silver. To revert, however, to Mr. Bennett's process. It was, indeed, a new power placed in the hands of photographers, and it need scarcely be said that portraitists were not long in adapting it to the requirements of the studio, or, perhaps, to speak more correctly, to adapt the studio to the requirements of the process. Many of our readers must remember the often painfully lengthy pose—perhaps a minute—required from them in the dull days of winter in order to produce a passable likeness. Such a sitting was by the new power reduced to one-sixth of the length. Eminent experimentalists on the science side at once grappled with the subject, and by their researches the time of preparation is reduced from days to hours, and increased rapidity is attained; indeed, to such a degree that in some cases a photograph can be taken in from one-thirtieth to one-sixtieth of the time of the old collodion wet process. To these newer plates, then, it is no misnomer to couple the term revolutionary power, and there is no doubt that a revolution in some branches of photography has taken place. Photography has known, however, greater revolutions than this—revolutions, indeed, which involved a complete change in the manipulations. Thus calotype, or the waxed paper process, with its development by means of silver, superseded the daguerreotype, in which the image was developed by mercury vapor; and, again, calotype, in which the foundation was paper, was ousted from its position by Archer's collodion process, in which the paper picture gave way to transparent glass and a substratum of collodion. The daguerreotype, it will be recollected, was a picture which was impressed on a metallic silvered plate, and which admitted of no reproduction in the commercial sense of the word, though it was and is still a glorious work of art, so delicate and rich in detail that nothing can surpass it for beauty.

It was not then surprising that any process was hailed which enabled prints to be made from what is technically called a negative picture, and calotype fulfilled this condition. When Archer introduced the collodion process, however, its superiority in rapidity and in the beauty of the prints produced from its negatives, at once gave it a place which it held till two years ago. The latter have none of the grain of the paper, which in small pictures marred the fidelity of detail, and, though not so exquisitely delicate as the daguerreotype, yet it was a wonderful stride toward perfection. In fact, the collodion processes by the wet or dry methods rendered photography capable of holding the place among our national industries which it now holds. It has now a co-partner, but not a rival, in the gelatine emulsion process.

In the recent photographic exhibition in Pall Mall we saw examples of the rapidity of which the gelatine process is capable. A train going 60 miles an hour was fairly expressed on the photographic plate, there being a sharpness of image which was truly marvelous. The 1-150th part of a second is a short interval of time, yet in such a time the

picture was taken. Again, one of the pictorial series of interest of the year was a series of views on the river Thames by Mr. Mayland. The silent highway is sparkling with motion, shipping and steamers at full speed being rendered sharply and clearly—in fact, the idea of motion is conveyed by the foaming tracks and curling waves which they make in their passage.

Drawing-room photography by amateurs now becomes a possibility and a practicability which before it was not, and in one remarkable picture of the year we have a dark interior of a room, and the portrait of a charming model secured on one plate in 25 seconds of time. In the old days such a combination would have been impossible, except by printing from two or more negatives. Mr. H. P. Robinson, whose artistic work is so well known and so greatly admired, has thus scored a success in adapting the process to his peculiar style of pictures. In science, however, the rapid plates have proved of more than yeoman service.

One of the most marvelous feats, however, of photography is the portrayal of the motion of trotting, cantering, and galloping horses by Mr. Muybridge, in America, in which he shows changes in the position of every limb during minute fractions of a second, and this settles certain points which have long exercised the minds of certain eminent physiologists.

If we quit the more rapid process and come once more back to the old collodion process, we find that it has also done good service in scientific research. In the Bakerian Lecture of the Royal Society for the past year, Captain Abney has shown how the sensitive compound bromide of silver can be so modified as to cause radiations of very low wave-length to impress themselves on the photographic plate, and in a map he gives the Fraunhofer lines which exist in the solar spectrum far down below the visible red rays of the spectrum. In the prints as usually supplied, the images, which are built up of minute particles of silver, gradually fade and become worthless.

The simplification of the Woodburytype process, and of printing in printing ink from gelatine surfaces, is still making progress, as evinced by the number of specimens of each which we see in books of travels, or of transactions of antiquarian and learned societies.—*London Times*.

ENLARGING BY THE GELATINE PROCESS.

By H. J. PALMER.*

AT this time of the year the photographic opportunities of most of us—as amateurs—are of necessity very limited in their character; but the production of enlarged copies of smaller negatives taken during the past season is an employment for a winter's evening full of interest and conducive to results of a very pleasant kind.

The gelatine process enables us to practice the art of enlarging without the expenditure of an undue amount of time or of means. For, with a sciopicon—or, indeed, with any of the numerous modern lanterns provided with a duplex or triplex paraffine lamp—an enlargement on a gelatine plate of the largest size, and composed of a slow-but-sure emulsion, may be made in from five to ten minutes. And then, with regard to cost, a plate 20 by 15 may be sensitized with a gelatine emulsion for an expenditure of three pence or thereabouts; and the mode of procedure is simplicity itself.

I will give a brief account of the preparation of a plate. I used an emulsion consisting of 20 grains of gelatine, 13 grains of silver, and 8 grains of bromide of ammonia to the ounce. This was prepared in the evening, in a concentrated form, *i. e.*, with half the necessary amount of water, and placed on the bottom or warmest shelf of the drying cupboard, in close proximity to the opening at the apex of an iron cone, with a small gas burner below. Having been left all night to cook, in the evening it was poured out into a porcelain dish, placed under a dripping tap of cold water till business hours were over in the evening, and then, after draining and warming, it was poured through glass wool into the porcelain cup of a child's food warmer, and the whole brought up to its full quantity by addition of alcohol and water in equal proportions.

A plate was now made comfortably hot at the fire, and placed on the open palm of the left hand. Three ounces of emulsion, which had been measured out in a warm measuring glass, were poured on to the center of the plate in a pool of circular shape, and even distribution over the surface was effected by means of the fingers of the right hand. No glass rod or contrivance of any kind that I have met with can compare with the fingers and hand as distributors of emulsion over the surface of a large plate; but I do not recommend their employment for this purpose if they have been recently in contact with the hyposulphite, or, indeed, with anything save soap, water, and towel. A large surface of gelatine sets very speedily, and therefore as little delay as possible was employed before the plate was deposited on the leveled shelf. I have noticed that there is a considerable difference between the rapidity of setting of gelatine of various makes. Nelson's photographic gelatine sets more quickly than the opaque, and the French Coignet is the slowest of all. I recommend this last, then, as the preferable kind for sensitizing plates of large size.

The crux of the gelatine process for amateur makers of plates lies in the drying. A small plate can easily receive an alcohol bath, and so be speedily ready for exposure; but that is not so practicable with a film of large dimensions. The difficulty in the way of the use of alcohol lies in the fact that it removes all varnish from the wooden trays in which it is applied to plates of large size, and porcelain trays are not usually to be found of sufficient capacity in our laboratories.

The great secret of success in coating plates of considerable size rests with the amount of emulsion poured, in the first instance, upon the surface to be covered. If this quantity be insufficient, it will be impossible to flow the gelatine over the whole of the plate, and the result will be misery and mess. I mentioned three ounces just now as the quantity necessary for a 15 by 20 plate; but it will be found far better to have courage to pour much more than this upon the warm surface first, and, after flowing it nicely around the edges and corners in succession, to return the surplus to the vessel. This, I think, is the secret of successful coating of plates of all sizes—to have the courage to pour a plentiful pool of emulsion at the first. I recommend the palm of the hand as the best plate holder; for I have never yet met with an artificial contrivance which could be depended upon to keep a firm grasp upon its plate until coating was completed.

There is no need of apparatus of any kind beyond an ordinary lantern, and a transparency for the production of a gelatine enlargement. I usually employ a plate box accu-

rately placed in a parallel position to the plane of the lens of the lantern, and against this I rest a sheet of cardboard for focusing, and the sensitive plate afterward. The time of exposure depends, in the first place, upon the sensitiveness of the emulsion employed; and, in the second place, upon the size of the enlargement. It is not likely ever to exceed ten minutes, though it may be modified also by the density or thinness of the transparency employed. It should be borne in mind, in connection with this subject of enlarging by the gelatine process, that small negatives which are worthless for printing, from over exposure, are often capable of producing very fine positives with the lantern. And nothing can exceed the beauty of an enlarged positive on an opal plate when rightly exposed and developed with ferrous oxalate.

ON THE PREPARATION OF GELATINE EMULSION.*

AT the suggestion of the Hon. Secretary of the Manchester Photographic Society to explain the working of my injector for emulsions, which I did at the October meeting, and having made some observations relative to the preparation of emulsions, I have been asked to put together, if possible, the remarks I made at that time. I now make the attempt, and I hope what I may say will help a little. The injector exhibited was a ten-ounce one, consisting of a small bottle, an intermediate stopper, and a larger bottle. I will now give my process of making emulsion, using the parts of the injector to illustrate my mode of working.

Into the smaller bottle I put 150 grains of nitrate of silver dissolved in six drachms of water. I then add by degrees liquid ammonia (880) until the oxide of silver formed is redissolved and the solution bright. In the larger bottle I place 30 grains of gelatine, 100 grains bromide of ammonium, and 5 ounces of water. After standing for a short time I apply heat to dissolve, heating the stopper bottles and their contents to a moderate temperature. The concave end of the stopper must now be placed upon the smaller bottle, then inverted into the larger bottle. The combined bottles are now grasped by the right hand, with the thumb pressed firmly upon the upper bottle, and in that position is agitated by percussion either upon the palm of the other hand or otherwise on a pad formed out of a handkerchief rolled up, ball shaped, until the silver solution is injected. A little more water may now be added to rinse out the remaining silver; then inject as before. It is important that the rubber rings are kept round the stopper to prevent jamming of stopper and bottles.

Place the emulsion in a cool place to set; when in that condition break up the mass into small particles by means of a thin glass rod, filling the bottle with water at the same time. When it has settled pour the excess of water off; repeat the operation three or four times, and finally tie a piece of fine muslin over the neck. Then invert the bottle to drain upon a thick pad of blotting-paper (which latter, after drying, may be used over and over again).

The emulsion must now be heated up to boiling point to remove the excess of ammonia; the olfactory nerve must determine that. Water is now added to make the quantity up to 10 ounces, and then add the remainder of the gelatine, 170 grains. After standing for a time the emulsion must be heated until the gelatine is perfectly dissolved. The emulsion may now be filtered through wash leather or a funnel plugged with wool; it is then ready for use.

Why I use so small a quantity of gelatine is that I consider the sensitive germ of emulsion is as fully secured in the small quantity as in using the full quantity; and, also, if the perfect removal of the soluble salt from the emulsified gelatine assists in conferring greater sensitiveness, you are more likely to secure that end by dealing with as little gelatine as possible in the first instance. There is no doubt the sensitiveness of a gelatine film depends upon the formation of a species of gelatinate of silver, so to speak, just in the same way that Fothergill plates are prepared. By pouring albumen upon a partially washed collodion plate you get superior sensitiveness, which is considered to be due to the formation of albuminate of silver.

My arrangement for warming the emulsion is by the usual decapitated, bottomless hock bottle with benzoline lamp, which I make serve two purposes—a light to work by, and the waste heat I utilize by placing at the top a hemispherical dish of copper, which I find most convenient for warming the emulsion dish and contents.

The next matter is measuring the emulsion for each size of plate. The spoon or ladle system of measuring I consider defective. As the emulsion requires to be stirred occasionally, it is impossible to do so without bringing about the "bubble" reputation, which is not very desirable, nor can it be avoided altogether; moreover they cannot well be seen owing to the opalescence of the emulsion. I find the use of a graduated glass syringe about the best for the purpose. There are two kinds of syringe known to the trade as "male" and "female." The latter is the preferable one. It has a rounded end with a number of perforations in it; is a most useful appliance; it may be used as a stirrer; takes up the requisite quantity for each plate without any bubbles whatever, if taken from the lower stratum of emulsion; it is also a useful distributor, and quite as effective as a glass rod.

ROBERT KNOTT.

GELATINE BROMIDE TISSUE.

WE have read several accounts of trials to make flexible gelatine pellicles in the style of Warnerke's emulsion films. It would be indeed very important to have such a tissue, which would make the practice of photography much less burdensome to travelers. We have obtained good results with Warnerke's collodio-emulsion films, but, for some reason, this ingenious product has not come into general use. Although the preparation of the collodio-bromide tissue is probably a difficult matter, it is our opinion that the preparation of gelatine bromide paper should be much easier. Everybody knows how carbon paper is prepared, a sheet of paper being drawn over the surface of a warm gelatine solution containing pigment; exactly in the same manner a band of paper could be coated with a gelatine solution containing bromide of silver. Warnerke gave his paper preliminary coatings of India-rubber and plain collodion, and perhaps a similar preparation would be necessary for the gelatine bromide tissue. Warnerke removes the film from the paper after development, and mounts it on glass; but it might be more convenient to let it dry on the paper, and then to render it transparent by means of wax or a suitable varnish. Perhaps such tissue would become of very high importance for making positive prints on a large scale by means of artificial light. We mention here that on one occasion we

* Abstract of a paper read before the Liverpool Amateur Association.

* A communication to the Manchester Photographic Society.