

for half an hour, and, to my surprise, their density had greatly increased, and I obtained two soft, clear negatives.

This experiment leads me to the conclusion that, in developing with two solutions, it is better to soak the negatives for two or three minutes in a very strong pyro solution—as much as twelve grains to the ounce—than a weaker one.

But in case sufficient density is not obtained after the alkali has acted in bringing out the image, we have the satisfaction of knowing that it can be produced, without in the least fogging the plate, by simply soaking the latter for a long time afterwards in the pyro solution.

We thus have a means, perfectly under control, of improving the negative and rectifying any errors which might have been made during the first part of the development.

In conclusion, let me say that the development of the negative is to me, as I know it must be to every sincere amateur, the most fascinating part of our work. Under, or too short, development is usually the difficulty beginners have to contend with. My advice to them is, commence with a weak alkali solution, increase it as is necessary, and take plenty of time to bring out the picture; you will then, allowing that the exposures have been within bounds, undoubtedly succeed.

PHOTOGRAPHIC APPARATUS AT THE ENGLISH PATENT OFFICE.

BY CHAPMAN JONES.*

BATHS IN GENERAL AND WASHING TROUGHS.

THERE are a few matters worthy of notice, in addition to the details given in the preceding section.

Baths have been constructed of a variety of materials. Daguerre and Niepce (see M. Berry, August 14th, 1839) used tinned copper trays in the preparation of Daguerreotypes. Wooden baths, but with glass bottoms, are described by J. P. Bourquin (January 18th, 1884), and P. A. le Comte de Fontainemoreau (April 7th, 1854) talks of an apparatus "of pans with edges perfectly flush, resting on a plate of glass," for treating paper with liquids "by absence of any intervening atmosphere, light, dust, &c." Gutta-percha was used at an early date, and J. Knight (April 6th, 1861) uses thin gutta-percha covered with paper, fabric, or other material, and so gains in economy and durability.

The use of yellow or orange glass, in connection with baths, is referred to by many inventors, the coloured glass being as eye-pieces, a sliding-cover, bottom as well as top, &c., to enable development to be performed in daylight. J. Purnell (April 9th, 1857) appears to be the first who registered this idea, though a box, looked into through yellow glass windows, had been used before then.

L. J. M. Daguerre and J. I. Niepce (M. Berry, August 14th, 1839) uses a hook of tinned copper to raise the plate out of the bath. J. P. Bourquin (January 18th, 1854,) stands his baths on levelling-screws; and P. I. A. Gaudin (July 13th, 1855) has an outer case or jacket to contain warm or cold water, to keep the bath at the most favourable temperature.

A bath rocked by machinery, in one or other of the usual methods, is described by H. L. D. Marsden (December 4th, 1868), and gradually leads us to consider washing-troughs; that is, apparatuses for washing negatives or prints, that are not mere vessels or baths.

J. Garnett (April 11th, 1862) has a box with a perforated top and bottom, and divisions for different sized prints. This is submerged in a vessel of water, and worked up and down therein by a handle or otherwise. Various forms of centrifugal apparatuses are described by J. E. Grisdale (August 23rd, 1864). The prints are secured round the surface of a drum in piles, the individuals being separated by layers of wire gauze or pieces of fabric, and the whole is alternately wetted, and dried centrifugally. The drum revolves in a trough. A disc may be used instead of a drum. T. Reissig, for W. Reissig (March 10th,

1865), also drives out the washing water centrifugally, but uses a folding frame or cage, "covered with lattice work," within which the prints are confined. J. Beckett (September 16th, 1872) tones, fixes, and washes prints by securing them with elastic bands on to a cylinder that revolves in a trough containing the required liquid or solution. Thus the prints alternately dip into and out of the liquid.

ENLARGING CAMERAS.

Just as a reduction of a picture is obtained in the ordinary way, as understood by the expression "photographing it," so an enlargement may be obtained if the thing photographed is brought near to the camera, and the sensitive surface moved sufficiently far from the lens. This, the simplest method, is still in use, and was referred to more than four years before the "solar camera" of Woodwad was described. J. Brett (July 8th, 1853) very curtly describes such an apparatus for producing positive pictures on sensitive surfaces. P. C. Stortz (October 23rd, 1858) mounts the negative or positive transparency in the open back of a camera in daylight, and points the lens into the dark room. The magnified image is received on a suitable surface, supported on an easel, but this surface is not sensitive; the image is gone over with indian-ink, chalk, or pigment. E. Edwards (March 23rd, 1867) uses two cameras, front to front, and supports the negative in the open back of one of them. The back of the other camera is for the sensitive surface. J. Simpson (May 25th, 1867) has an ordinary dark-slide at the wide end of a telescopic conical tube for the sensitive surface, otherwise his arrangement is like the previous one. J. Petrzywalski (June 7th, 1867) uses a box adjustable like a sliding-body camera. The negative and sensitive surface occupy opposite ends, and the lens between is supported on a sliding platform. Three lamps, with reflectors, illuminate the negative. W. Morgan-Brown for J. H. Hermagis (March 13th, 1875) describes the use of a folding, wooden-bodied, portable camera, for enlarging, by fixing the negative in the ground-glass slide, and supporting the sensitive surface on a separate screen.

The disadvantage of the methods just detailed is the difficulty of getting the negative evenly lighted, the consequent need of an illuminated surface, and the uselessness of direct sunlight or any other powerful light for the operation. By such methods it is therefore practically impossible to print enlargements on ordinary albumenized paper. The use of a condenser between the light and the negative overcomes this difficulty, and enables one to use the sun or an electric light by causing convergence of their diverging rays. A. V. Newton, for D. A. Woodward (September 22nd, 1857), describes an apparatus consisting of a reflector, which directs the sun's rays through a hole in a darkened room on to a condenser, and thence through the negative, which gives an enlarged image by means of an ordinary photographic objective. The objective and the negative are adjustable by racks and pinions. P. A. le Comte de Fontainemoreau, for A. Liébert and J. Lafon-Saint-Cyr (February 11th, 1864), gives a similar arrangement, but without the reflector; and the various parts are all enclosed within a taper case, which is mounted, so that the condenser can easily be kept always pointing to the sun. The condenser is an achromatic combination with separated components, and will be included in the section on Lenses. A heliostat may be used with the apparatus. H. A. Bonneville, for D. C. E. van Monckhoven (April 21st, 1864), describes an enlarging camera of the sort under consideration, but the novelty lies in the lenses used. F. H. Warlich and J. W. T. Cadett (November 21st, 1877) use an apparatus like a magic lantern, with an electric light, and if necessary the transparency may be cooled by water circulating around it. The condensers also are kept cool by water. F. H. Warlich (May 21st, 1880) has three enlarging apparatuses round one electric light. The moveable parts are worked to and fro on travelling tables by racks and pinions.

* Continued from page 772.