

Far. Malcolm.

I

HOW THE CAMERA WAS USED

By J. C. Burrow

ADVANCEMENT in any particular branch of science is often slow and laborious, and, if examined in detail, the progress is not very apparent. When, however, the distant Past is contrasted with the Present, it is evident that great strides have been made and important revolutions effected. This applies as much to the photographic as to any other branch of applied science; for, although the results of daily researches and experiments may not be very striking in themselves, yet, were our fathers in photography, of forty or fifty years ago, to revisit the scenes of their labours, they would be more than astonished at the present high standard of pictorial work. One is apt to be satisfied with the attainment of any special object, regarding it as the *acme* of human effort. But there is no standing still, and what seems perfect to-day will be superseded to-morrow.

To the scientist, the engineer, and the explorer, the camera has become an absolute necessity. It has been used in all kinds of places, on the surface, under the sea, in the air, and even under the earth's surface. The greater the difficulties encountered, the stronger the determination has been to accomplish successful results. Usually the indispensable light comes direct from the Sun, but that is of course unable to penetrate the rocky crust of mother earth. Hence the first difficulty in underground photography is to satisfactorily illuminate the workings by artificial means. The objects of the following sketch are to describe how this illumination may be effected, and to illustrate the advantages which the artist may take of the illumination.

After preliminary trials with cameras varying in size from 10 × 8 to half-plate, it was finally determined to use the latter because of its lightness, portability and moderate size, the latter being

pecially important in confined situations. The light bellows Kinnear form of camera was most suitable. Double dark slides were used carrying fourteen plates, but such were the difficulties experienced that often five or six plates only could be exposed on the same day. When changing plates underground there was no danger of their being damaged by the light, for when the candles were extinguished there was absolute darkness. But, since it was impossible to keep one's hands clean underground, it was found better to take the plates well protected in dark slides. Lenses of all descriptions were tried, with more or less success. The rapid symmetrical did very well for certain subjects, and a half-plate portrait combination was fairly good when used in an open place where the subject did not require great depth of focus. Care was, of course, taken to prevent the flare spot. The ordinary wide angle was much too slow. A lens having all the advantages of each of these was required, one that would embrace a wide angle, give depth of focus, and speed. This was found in the Zeiss' Anastigmat, Series III., made by Messrs. Ross & Co. It proved to be a perfect gem, and with it splendid results have been obtained, both underground and at surface. A sliding tripod stand was most convenient. Sometimes the camera had to be tilted at an angle of 60° , and the front leg tied to a rock to prevent overbalancing. At other times it was strapped to a ladder, or a bar, looking down an inclined shaft, or fixed on the ends of a couple of stout planks over a yawning "gunnies". The sliding form of tripod allowed the greatest freedom in such situations.

The best apparatus manufactured is of no practical value without good plates. On this subject, so important to the photographer, pages might be filled with the experiences of a twelve-month underground. The plates of several makers were tried, slow plates, rapid plates and isochromatic plates. But none equalled the Cadett lightning plate. At first all the candles were extinguished, as the halo round each spoiled the effect of the picture, but, with the lightning plate, every miner was taken in his working position, with his light in its usual place. So sensitive

were these plates that the camera had to be well covered to prevent any stray pencil of light being admitted other than through the lens. This requires careful attention when working in daylight. The diaphragm slit in the lens, even, should be covered, say, by means of a wide indiarubber band.

It is needless to detail the incidents attending the transport of apparatus from surface to the bottom of an inclined shaft half-a-mile below. Some were unpleasant, many were amusing. Occasionally the band of willing helpers was recruited from certain classes of individuals totally unaccustomed to mining and mines. Readers intending to attempt underground photography must not be discouraged when a too eager assistant, staggering through the semi-darkness with a hydrogen cylinder of 20 feet capacity under his arm, and a pair of lime-light burners in one hand, stumbles headlong into a pool of water by the side of the level. Nor must they lose their self-control when, after carefully selecting the driest spot available to open the magnesium powder tin for re-charging the lamps, a "flood" of water from some unknown source falls into the tin as soon as the cover is off, instantly "dropping the curtain" most effectually upon the remainder of the day's programme. The temptation to place on record many incidents, annoying at the time of occurrence, but extremely interesting as reminiscences, becomes strong. On one occasion, just as arrangements for a first shot of the camera were completed, a strong voice, some ten fathoms overhead, shouted, "Hallo, down there. Fire.*" "*Don't* fire yet," was the reply. "*We have* fired. Go back under the stull." Too late to postpone matters, the only thing left to do was to ask, "How many?" "Three. Look out." In a few moments, bang, bang, bang went three holes, the roar of falling stuff followed, and a few loose stones rattled down the foot-wall to the place where the camera had been fixed. This meant waiting for a long time for the atmosphere to regain a sufficient degree of clearness, and, of course, refixing the whole of the apparatus.

*When a hole is charged ready for blasting it is customary for the miners who are responsible to give a warning to all in the immediate vicinity by shouting "Fire".

The preparations required were more extensive than one imagines. Each helper undertook a particular duty. One adjusted the lime-light burners, another attended to the oxygen and hydrogen cylinders and trappings, another prepared the magnesium lamps, and so on. The writer, after repeated unsatisfactory experiments with different flash-lamps, designed a pair of triple-flash lamps, which have proved exceedingly useful and have given most satisfactory results. The high temperatures of the deep mines caused camera and lens to be covered with condensed vapour for some time after the scene of operations was reached, a source of much bother.

A state of readiness having been arrived at, the word to "light up" produced a powerful flash from the lamps and ribbons simultaneously. The lime-lights were previously at their maximum intensity. An exposure of from two to four seconds generally gave the best results. If everything appeared favourable in the strong light, another subject was sought; for a second exposure, in the same place on the same day, rarely gave good results, owing to the "fog" caused by the products of the combustion of the magnesium. For close subjects two triple-flash magnesium lamps were generally used, so placed as to destroy shadow as much as possible, but in large areas, such as that shown in Dolcoath Man Engine Shaft (No. 2), more lamps were brought into requisition. In such places the air was generally cooler and clearer, and sometimes two exposures in succession gave fair results under such circumstances. The bottom of the shaft in Cook's Kitchen Mine (No. 18) was a difficult subject. The temperature there was 100°F. The miners work nearly naked. The camera was attached to the ladder and tilted at an angle of 45°. Water dropped everywhere and came from the foot-wall in a steady stream. Heat, water, and vapour, combined with the peculiar setting of the camera, made the work tedious and difficult.

In the foregoing the writer has attempted to sketch an outline which may guide one desirous of commencing experiments in this new channel for photographic enterprise. Very little has been

done in this direction so far. The Freiberg and Clausthal mines have each produced a series of plates of close subjects, and Mr. H. W. Hughes, of Dudley, has obtained some excellent results in the coal and limestone districts of South Staffordshire. Apart from these and the productions of Mr. Arthur Sopwith, also in coal mines, attempts at underground photography have not generally been successful. So many difficulties have presented themselves at the outset that the work has invariably been abandoned after brief trial.

II

A DESCRIPTION OF THE SUBJECTS PHOTOGRAPHED

By W. Thomas, Assoc.M.Inst.C.E., F.G.S.

BOOK illustrations of underground operations and appliances are like some drawings intended to represent adventures in books of travel, apt to be highly coloured, and a few sensational pictures of miners in impossible, but, to the uninitiated "fetching", positions have undoubtedly often helped to promote a transaction in which both book and buyer have been "sold". It is not, however, so easy to agreeably misrepresent the real in honest photographs. This fact has long been appreciated, not only by the artist, who finds it essential to elaborately "touch up" his productions in order to meet the harmless desire of the public to have their good looks exaggerated, or at least emphasised, but by the artist's patrons, whose gallant struggles to make

"The worse appear the better"

frequently have tragic ends. The writer's friend, Mr. Burrow, has succeeded in obtaining an excellent series of representative photographs in Cornish mines, at surface and underground, and has been persuaded to re-produce a portion of these in book form. The writer has, with much pleasure, attempted to briefly describe the plates selected for reproduction, although it seems unnecessary, in the majority of instances, to explain that which has been rendered sufficiently clear by the quality of the picture, from an artist's point of view, and the judicious selection of the subject, from a mining standpoint.