the operations are very different. The coating with emulsion is by far the more difficult operation of the two, but, on the other hand, the knack once acquired, it may be performed with far greater expedition. In the case of collodion, the plate is held level; a comparatively small pool of the fluid is poured on to it. The plate is now slowly tipped slightly to one corner, and afterwards gradually to each of the other three, the collodion flowing steadily in the desired direction. Then the plate is tipped slowly up, almost to the vertical position, and rocked, whilst the greater portion of the excess of collodion is allowed to leave it, taking its own time. With gelatine emulsion the operation is very different. The plate is held level, as for collodion. A larger pool, however, is poured on to it; in fact, more than half the area ought to be covered.

Quickly the plate is now coated over to one corner to a much less extent than with collodion. In fact, the appearance to the uninitiated when he sees a clever coater working, is that the emulsion is jerked to each of the four corners of the plate, so quickly is it done. The plate, when it is flowed, is stopped up for one instant, and again it seems as if the excess were almost jerked off. A little rocking of the plate in a nearly horizontal position, to remove any inequality caused by the tipping up, completes the operation.

The fact is, that the object to be attained is quite different in the two cases. What is desired with collodion is to make such a quantity as will adhere evenly to the glass in a vertical position; in fact, to evenly wet the plate with collodion. What is needed with emulsion is to cause a certain quantity, much more than that required to wet the plate, to spread itself evenly over the plate.

In hand-coating with emulsion it is necessary to pour the excess either into the same vessel as that from which it is poured on to the plate, or with a different one. In the former case, something of the form of a teapot is always used, so that air-bubbles may be avoided. Some manipulators perform the whole operation over a large flat dish, such as is used for sensitizing albumenized paper in. This receives both excess of emulsion and accidental spillings.

To one not accustomed to the sight of practised plate-coaters at work, the expedition with which the operation is performed appears marvellous.

The plates lie in a pile generally on the right hand side. One is picked up with a pneumatic holder from the top of the pile. The emulsion is almost dashed into it, and, with what appears but a single turn of the wrist, the whole operation is finished, and the plate is placed on the levelling slab.

We shall in a future article tell what we know of mechanical coating, and shall describe the operations as we have seen them at one of the principal dry plate manufactories

INVESTIGATIONS ON CELLULOSE, AND ON AN OXIDATION PRODUCT DERIVED FROM IT.

IN the current number of the *Journal of the Chemical Society* we find an account of highly important investigations on cellulose by Messrs. Cross and Bevan; and these investigations have especial interest for the photographer, as cellulose in one form or another is still the sample material upon which the photographic image is formed.

It is well known that the prolonged action of nitric acid on cellulose or any of its strict analogues leads to the production of oxalic acid, and this product is also to be found among the products resulting from the spontaneous oxidation of the various kinds of pyroxyline.

Messrs. Cross and Bevan find that when the action of nitric acid is arrested at a certain point, and the undissolved residue is washed with hot water, a gelatinous mass is obtained, and this is the crude form of a new oxidation product, which they have named oxycellulose.

Messrs. Cross and Bevan say: "In this state it is entirely soluble in dilute alkalis, and is precipitated from such solutions unchanged and in a form resembling pectic acid, on the addition of acids, as also of alcohol, saline solutions, or even strong solutions of the caustic alkalis. Observations of the composition of these precipitates showed that oxycellulose does not form compounds with bases, or at least only of a very weak order, the substance thrown down by alcohol or saline solutions retaining only traces of inorganic matter. Specimens of oxycellulose obtained from various sources and purified in different ways were analysed, after drying at 110°, with the following results:—

"(*a.*) Prepared from cotton, dissolved in NaOH, precipitated with $BaCl_2$, and washed.

"(*b.*) Prepared from jute, dissolved in NaOH, precipitated by HCl, and washed.

"(*c.*) Prepared from jute, dissolved in NaOH, precipitated by HCl, and washed.

"(*d.*) Prepared from pith of Aralia papyrifera, analysed directly after washing.

	a.	*b.*	*c.*	*d.*	Calc. for $C_{18}H_{26}O_{16}$.
C	43·16	43·52	43·32	43·23	43·40
*H	5·20	5·36	5 50	5 51	5·22
O	51·64	51·12	51·18	51·26	51·38

"Oxycellulose dissolves in concentrated sulphuric acid with a pink colour; the dissolved body, when isolated, is found to be dextrorotatory, and otherwise similar in properties to ordinary dextrin. The freshly-prepared oxycellulose is not coloured by iodine or by Schulze's solution, but the horny mass to which it dries is coloured deep blue by the latter. These facts establish the cellulosic character of oxycellulose."

A tri-nitro-derivative of oxycellulose was obtained, a circumstance of extreme interest, as indicating that the main nucleus of the original body is not altered by partial oxidation, and although the description of the new body is brief in the extreme, we hope that full particulars as to its properties may shortly be published. The following are all the details given:—

"The 'nitro'-body was prepared in the following way:—The gelatinous oxycellulose was washed with strong nitric acid until free from water, and was then diffused through a mixture of equal volumes of strong sulphuric and nitric acids, in which it quickly dissolved. The solution, after standing for about an hour, was poured in a fine stream into a large volume of water, by which the 'nitro'-body was precipitated as a white flocculent mass. The product, after drying at 110°, was analysed according to Eder's method (*Ber.*, 13, 169), with the following result:†—

0·2342 gram gave 25·20 c.c. NO at 770 mm. and 19·4° C.

Percentage of N.	Calc. for $C_{18}H_{23}O_{16}3(NO_2)$
6·48	6·63

Either Messrs. Cross and Bevan do not thoroughly appreciate the industrial value and technological importance of their work, or they prefer not to discuss its bearing on manufacturing process; but they refer in the following terms to their intention of carrying out further investigations.

"We have commenced the study of the oxidation of cellulose, in presence of alkali, by means of permanganate; and in addition to products of low molecular weight, we have obtained a body exhibiting the characteristic properties of metapectic acid, a result which is in confirmation of the above hypothesis."‡

The various forms of pyroxyline have a very considerable importance, and passing over the use of gun-cotton for war-like purposes, we find that most industries in which pyroxyline is largely used are subject to uncertainties and difficulties which crop up at extremely inconve-

* Allowing for ash.

† We think it worthy of record that in a second determination by this method, with a larger quantity of substance (0·801 gram), when about 80 per cent. of the total NO had been expelled, the flask containing the boiling ferrous sulphate solution was shattered, with a violent explosion.

‡ Comp. H. Muller, "Pflanzenfaser," p. 15.