fully distilled, with or without steam. A small quantity of the lightest product, or eupion, which comes first from the condensing worm, is usually discoloured, and may therefore be transferred to the succeeding charge.

The last distillation should be made slowly and with care, avoiding all fluctuations produced by an unsteady heat. If desired, the eupion may be taken off at the commencement of the distillation. It should be at proof 60°, or specific gravity, 0·733, or it may be allowed to run in with the lamp-oil. When the distillate has reached proof 40°, or specific gravity 0·819, the remainder is to be transferred to the next charge, or the heavy oil, as being too dense for illuminating purposes. The mixed oils intended for lamps have their disagreeable odour chiefly removed by allowing them to remain in flat open cisterns over weak solutions of the alkalies during a period of some days. Exposure to light also improves their colour. The alkalies employed in the foregoing treatment may be restored and used in subsequent purifications. The oils of the second or heavy part of the first distillate are purified by the same means as described for the lighter oils, except that they require the application of more acid and stronger alkalies. All the oils distilled from them at proof 40° are added to the lamp-oils. At the close of each distillation, and as the oils acquire greater density, the colour grows dark and changeable; finally, they are partially charred, and especially when they have been distilled without steam. These dark-coloured oils may always be renovated by the use of acids and alkalies, the permanganates of potash and soda, and, finally, by distillation. The colour of the lamp-oils should not exceed a tinge of greenish yellow, when viewed in a clear glass flask six inches in diameter. If by accident, carelessness, or negligence, the oils treated by the fore-going method should be impure, they must be submitted to washing and re-distillation.—*Philadelphia Coal Oil Circular.*

PURIFICATION OF WATER FOR PHOTOGRAPHIC AND OTHER PURPOSES.

An interesting and valuable pamphlet has recently been published by Mr. Condy, in which the removing from water of a variety of impurities is described. For this purpose the well-known action of alkaline permanganates is made available.

"By the peculiar chemical properties of the permanganic acid it is capable, when employed in appropriate combination, of not only destroying every trace of organic matter in a water, but it also removes many of the mineral constituents which are sometimes almost as objectionable. An experiment of Mr. Condy's shows this in a striking manner. He made a saturated solution of oxide of lead, by shaking common whitelead in distilled water, and filtering; this, on being tested with hydrosulphuric acid, gave a black precipitate. Four ounces of this liquid were then taken, and to it were added two drops of a weak solution of permanganate of lime. Upon standing for half an hour, the pink colour had disappeared; and when filtered off from the precipitated peroxide of lead and binoxide of manganese, there was only a brown tint communicated to it on testing with hydrosulphuric acid. Another similar experiment was tried, in which a little more permanganate of lime was added, and the liquid allowed to stand for some hours, when, upon filtering again, not a trace of lead was found in solution. Lead is a most difficult impurity to remove from water, whilst it is the most poisonous of ordinary metallic contaminations, but is thus easily removed, as well as all metals capable of assuming the form of peroxides. Water containing iron in solution can also be purified in the same manner, so as to render it fit for use in dyeing and other industrial purposes."

The presence of organic impurities is, however, most detrimental to the photographer; and Condy's fluid is preëminently valuable in removing these. On this point the author says, "Filtration through charcoal or bone-black has no doubt considerable effect in absorbing certain gases, which are products of the decomposition of organic matter; but it acts only very partially on such matter when not in a decomposing state. Hence water which has been more or less deodorized by charcoal will often be found, on being allowed to stand to become again offensive from the further decomposition of organic matter, which the charcoal had been inadequate to remove. The presence of such organic impurities in water which has been treated with charcoal can always be readily detected by permanganates. Nothing proves so distinctly the superiority of those substances for purifying water as the certain and delicate way in which they discover the imperfections of all other methods of purification, whereas no substance that I am acquainted with is capable of revealing the presence of organic matter after their use as purifiers. The permanganates, then, not only afford a ready and efficacious means of doing what charcoal is supposed, in a tedious and imperfect manner, to perform, but likewise of producing changes similar to those effected by most of the other modes of purification which are usually recommended or occasionally practised. Thus they do all that alum, caustic alkalies, alkaline carbonates, and caustic lime are capable of accomplishing; while they even surpass ebullition and distillation in their power of removing organic matter, at the same time that, by the formation and precipitation of oxide of manganese which take place at all points of the water during their contact with substances of an organic origin, they have the effect of mechanically drawing down impurities held in suspension. Add to this, that water purified by the permanganates is, in most instances, pure enough for every ordinary purpose, and so charged with oxygen as to be highly agreeable to the palate, and beneficial to digestion. When absolutely pure water is required for some special scientific object, it can be readily procured with one distillation, by the use of an alkaline permanganate."

The advantages of this system, so far as simplicity and efficiency are concerned, cannot very well be over-estimated, whilst its economy is beyond impeachment. "The quantity of permanganate necessary to purify 10,000 gallons of water would be contained in one gallon of Condy's Fluid, the price of which is only 10*s.*; at this rate 200 gallons, or one ton, of water could be purified at an outlay of 2½*d.*" A series of interesting experiments and instructions as to the method of proceeding are given in the pamphlet, one or two of which we shall quote. In order to test water for organic impurities, proceed as follows:—