merse in a little of the test solution for about three minutes. Well-washed films, including those for record purposes, should show very little or no discoloration.

The spot test for prints can also be used with dry films or plates, but should not be used on wet negatives because of the risk of spreading the solution.

(6) RAPID DRYING

Rapid Drying of Prints.—Prints on 'airmail' or 'document' papers may be dried rapidly by soaking them for one or two minutes in spirit, blotting off the excess and drying in the normal way. Prints on normal 'single-weight' or heavier papers may be immersed for at least twenty seconds in undiluted spirit, pinned to a stick, and the spirit lighted at the bottom edge of the print. The stick should be waved to minimise any tendency for charring the edges of the prints to occur.

Formalin Method for Negatives.—Rinse from the hypo-bath, place in 1 : 50 formalin for ten minutes, wash by pouring nearly boiling water six times over the negative and dry by heat. To get rid of the relief which is produced by this process, the negative is rubbed with a piece of wash-leather moistened with alcohol.

Chrome Alum Method.—A method of rapid drying that is often useful with glass negatives consists of treating the negative, after washing, for three minutes in a 1 per cent chrome alum solution, to which sufficient ammonia has been added to form a slight permanent precipitate. Give a brief rinse, blot off surface moisture, and dry over a Bunsen flame or in front of an electric fire. Drying under these conditions should take less than five minutes, but care must be taken not to crack the glass.

Drying Negatives by Alcohol.—Plates and films, also, may be dried after washing, much more rapidly after immersion in alcohol. 'Industrial' or 'Surgical' spirit may be used, or any grade of denatured alcohol which does not show pronounced milkiness on dilution with water. Milkiness, if it does tend to occur, can be prevented by adding 1 per cent of salicylic acid to the spirit. For use, the spirit should be diluted with three parts water to seven of spirit, and the plate or film immersed for not more than two minutes at not more than 70°F. Drying temperatures above 70°F tend to cause milkiness. For economy of spirit, the water should be well drained from the material before immersion, and the spirit should not be left in open dishes for longer than can be helped; the two-bath method also helps—a first bath being used to remove most of the water, with a fresh bath to finish.

Diacetone Alcohol Method.—I. Davies and A. K. Soper of Kodak Research Laboratories have devised an elegant method of rapid drying by immersion in a mixture of a hydrophilic alcohol with a water-immiscible solvent. A mixture is made of 75 per cent petroleum ether and 25 per cent diacetone alcohol. The plate or film is immersed in this, whereupon the alcohol removes water from the surface of the swollen gelatin layer as fast as it diffuses from the interior, and the diacetone alcohol-water mixture, being immiscible with the petrol ether, streams away from the gelatin surface to form a separate heavier layer at the bottom of the vessel. This lower layer may be removed, say by siphoning, and the diacetone alcohol regenerated. Regeneration is thus carried out on relatively small quantities of diacetone alcohol-water, and the main bulk of the fluid remains essentially water-free.

On immersion of the well-drained negative in the mixture, 'liquid tears' immediately form over the negative and drip to the bottom of the container. Gentle agitation of the negative aids the detachment of the droplets. After one minute at room temperature, or when no further water appears to be exuded, the negative is removed and wiped with a soft cloth, after which it is, to all intents and purposes, dry.

The solvent mixture has a very slight softening action on film base, so that film material should not remain in the mixture for longer than is necessary to remove the water from the gelatin layer. Petroleum ether is, of course, highly inflammable, and this drying technique is therefore of practical value only when precautions appropriate to the use of such solvents can be fully observed.

Other solvent mixtures may behave in a similar manner, but those above have been found most effective. If carbon tetrachloride be substituted for petroleum ether, the aqueous layer floats to the surface and tends to rewet the gelatin on withdrawal. On the other hand, the substitution of ethyl alcohol for diacetone alcohol gives a mixture very intolerant to moisture which promotes a rapid separation into two phases.

The chemicals are readily available from any of the appropriate chemical supply houses.

(7) INTENSIFIERS

The use of Intensifiers has decreased with the use of small formats, but there are occasions on which they may be found useful or essential to retrieve a negative or treat a positive material.

The following notes apply in principle to all types of emulsions but the behaviour of the formulae which follow may operate differently with the modern thin emulsion films. Some of the older types of rapid films employing double-coated emulsions required an excessive time to bleach before redevelopment or blackening. Modern thin emulsion films, however, in which the silver halide layer has little protection from a heavy layer of gelatin, may be more rapidly attacked, hence some care should be exercised in

using the various solutions. A test using a negative on the same type of film should always precede the actual process of intensification.

The whole purpose of intensification is to increase contrast or gamma, and in this sense is limited to certain well defined errors in exposure and development. Under-exposure, if accompanied by over-development, is an instance where intensification will exaggerate the faults of a 'thin' negative resulting from these causes.

Softness, either through under-development or lack of contrast in the subject, is satisfactorily dealt with by the chromium or mercury intensifiers. Mercury has the advantage that with alkaline development it may be applied several times in succession if necessary, and a weak image strengthened to any desired extent.

If the plate is over-exposed, veiled and flat, giving a print of insufficient contrast, it should be reduced first with hypo and ferricyanide, and then, after washing, intensified as suggested in the preceding paragraph. When a negative is successively treated by any of these methods it is desirable, whenever practicable, to dry it after each operation.

Copper intensification, when followed by silver nitrate blackening, suits line subjects in which great density, and clarity of line, are required. Bichromate intensification is the recommended general purpose negative intensifier. It may also be used for prints giving a slight warmth of tone.

Uranium is perhaps the only intensifier which *may* improve a slightly under-exposed negative, since fine shadow detail is built up to a greater extent than the strong densities. This depends on partial intensification, which, however, is difficult to judge on account of the reddish-brown image. For 'ghost' negatives, uranium is admirable.

All negatives for intensification should be properly fixed in fresh hypo and thoroughly washed. Staining, however, is more liable to arise from imperfect fixing rather than from insufficient washing. Blistering and frilling of the gelatin may occur during treatment in acid intensifiers, and it is recommended that negatives should be hardened before beginning operations.

Mercuric Chloride

Mercuric chloride	120 gr	(27·5 gm)
Water, to	10 oz	(1000 cc)

Dissolve the above in very hot water and use when cool. The new or used solution will keep indefinitely.

The negative should be bleached thoroughly until evenly white back and front, and afterwards washed for a few minutes, followed by two or three immersions in the following bath with rinsing between each.

Hydrochloric acid	30 minims	(5 cc)
Water, to	12 oz	(1000 cc)

The acid bath prevents undesirable combination between the mercury and the gelatin, and aids the removal of the mercury residue. Blackening may be carried out by any of the following methods:

A. A dilute solution of ammonia, not exceeding 5 per cent. Negatives so blackened are not permanent, although the degree of intensification is high.

B. Any non-staining developer, such as metol-hydroquinone, amidol, etc., which gives a moderate degree of intensification sufficient for all ordinary purposes. The process can be repeated as many times as desired, valuable in the case of difficult subjects when sufficient strength cannot be obtained by other means. For photo-mechanical papers, however, redevelopment sometimes causes stain and scum, and the following is recommended:

C. Sodium sulphite (crystals) 10 per cent solution. This gives a good degree of intensification and is probably the safest method for both plates and films, and photo-mechanical (negative) papers. Repetition of the process, however, gives no increase in contrast, but a negative bleached in mercuric chloride and sulphite-blackened can be rebleached and redeveloped with an increase of density equal to that given by mercury and redevelopment.

Chromium Intensifier

The following simple one-solution formula is easily prepared and this intensifier will give the maximum increase of contrast on most grades of plates and films. It can be repeated two or three times to secure maximum contrast.

Potassium dichromate	90 gr	(10 gm)
Hydrochloric acid (pure conc.)	50 minims	(5 cc)
Water, to make	20 oz	(1000 cc)

Use without dilution, and proceed as follows: (1) Immerse the negative in the solution rocking the dish all the time until bleaching is complete (1½ to 3 minutes) as indicated by the changed character of the image which should have the same appearance on both sides of the negative. (2) Wash in running water for five to ten minutes to reduce the stain. (3) Redevelop in any non-staining developer under white light, either artificial or diffused daylight. (4) Rinse redeveloped negative. (5) Refix in acid bath, wash and dry.

Any print or universal developer can be used at normal (1 : 3) dilution. Redevelopment should be continued until no further contrast can be obtained. The degree of intensification is controlled by the hydrochloric acid, a decrease of which will increase contrast. The acid concentration in the above formula, however, is the lowest that will ensure complete bleaching in a reasonable time.

N.B.—All negatives should be hardened before bleaching, particularly roll-films, some makes of which reticulate otherwise.

Uranium Intensifier

A	Uranium nitrate	100 gr	(23 gm)
	Water, to make	10 oz	(1000 cc)
B	Potassium ferricyanide	100 gr	(23 gm)
	Water, to make	10 oz	(1000 cc)

For use, take A, four parts; B, four parts; acetic acid,

one part. After intensification, wash in several changes of *still* water until the yellow stain is gone. A 2 per cent solution of ammonium thiocyanate will remove any yellow stain; weak ammonia or sodium carbonate removes the intensification and restores the negative to its original condition. If to be reintensified first bathe in weak acetic acid.

Copper Intensifier

Gives greater intensification and is best suited for line subjects.

A	Copper sulphate	100 gr	(23 gm)
	Water, to make	1 oz	(100 cc)
B	Potassium bromide ..	100 gr	(23 gm)
	Water, to make	1 oz	(100 cc)

A and B are separately made up with hot water, mixed, and allowed to cool. The negative is bleached in the mixture, and washed for a minute or two. It is then blackened in:

Silver nitrate	45 gr	(10 gm)
Water (distilled), to make ..	1 oz	(100 cc)

For still greater density the negative is well washed from silver and an ordinary developer applied.

If too dense, after the silver, it can be placed in weak hypo solution (2 per cent) or weak potassium cyanide (½ per cent).

Wellington's Silver Intensifier

The best negative intensifier provided instructions are strictly carried out. It is proportional, and if the fore-bath is used correctly the original gradations are not materially altered. It also has the advantage that intensification may be stopped at any time during the process. As in the case of any process not familiar to the worker, it is advised that several tests be made with unimportant negatives so that the general effect and behaviour of the intensifier can be examined.

It is important that the negative should be fixed in a *fresh* hypo bath, well washed and hardened in Formalin, one part; water, ten parts, for five minutes. Thoroughly rinse the negative again and place it for *exactly one minute* in:

Potassium ferricyanide ..	10 gr	(2·3 gm)
Potassium bromide	10 gr	(2·3 gm)
Water, to make	10 oz	(1000 cc)

The fore-bath plays no part in actual intensification, and is to prevent staining in the silver bath. It is, however, essential to success and must always be used. The stipulated time of immersion is also important, since any increase will start reduction and the final result will be a negative of altered gradation.

Wash well in running water and intensify as follows:

Stock Solution

A	Silver nitrate	400 gr	(91·5 gm)
	Water (distilled), to make	10 oz	(1000 cc)
B	Ammonium thiocyanate	700 gr	(160 gm)
	Hypo	700 gr	(160 gm)
	Water, to make	10 oz	(1000 cc)

Take A, 1 oz. (100 cc) and add slowly to 1 oz of B (100 cc), *stirring vigorously* with a glass rod. The mixture should then be clear. To this add 2 drachms (25 cc) of 10 per cent pyro solution preserved with sodium sulphite. That is to say, the pyro must be dissolved in a 5 or 10 per cent solution of sulphite. Then add 4 drachms (50 cc) of 10 per cent ammonia solution.

Place the negative in a chemically clean dish, preferably of glass or porcelain, which has been cleaned out with hydrochloric acid and well washed, and pour the silver solution over it. Silver begins to deposit in a minute or two. When intensification has gone far enough, refix in an acid bath and wash well.

Over-exposed flat negatives are best over-intensified and then reduced in Farmer's reducer which will give greater contrast.

(8) REDUCERS

Before using the following reducers, see the note preceding the introduction to 'Intensifiers' with modern films.

It should be recognised that all reducing processes, excepting the rehalogenisation method, are progressive, i.e. the operation can be stopped at any stage by judgment of the effect produced. At any future time reduction can be resumed, continuing exactly as if taken to a later stage at first.

Very dense negatives may be reduced to give shorter printing time. Also, such reduction may be accompanied by an improvement in the gradation of the negatives according to the type of reducer employed.

Hard negatives, resulting usually from under-exposure and over-development, require a super-proportional or a proportional reducer of the persulphate or persulphate-permanganate class. The choice, of course, depends on the negative contrast and the extent to which it is required to 'soften' it without affecting shadow detail.

Dense negatives resulting from very great over-exposure are usually flat and without sufficient contrast. Consequently, their treatment should be such as will increase contrast during the process of reduction. For this purpose Farmer's or Modified Belitski's reducer should be used, but with very great care, since subtractive or 'cutting' reducers attack delicate shadow detail first.

For consistent and trouble-free results it is advisable to adopt the sound general plan to make sure that all negatives and prints are entirely free from hypo, and have been sufficiently hardened to withstand the effect of decidedly acid baths.

Even when density is not excessive, flat negatives often benefit by slight reduction in Farmer's prior to intensification. This method is particularly useful as a means of