

# FORMULARY

Issued by the  
RESEARCH LABORATORIES  
KODAK LIMITED  
WEALDSTONE  
HARROW



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### NOTES ON SOME CHEMICALS MENTIONED IN THE FORMULARY

"Dolmi" is a pure form of diaminophenol hydrochloride, also known under the trade name of "Amidol."

"Elon" is a specially purified form of monomethyl paraminophenol sulphate and is also known under other trade names, such as "Metol," "Genol," etc.

"Kodalk" is a new alkali, introduced by Kodak Ltd., intermediate in activity between sodium carbonate and borax. Films developed in a developer in which "Kodalk" is used as an accelerator will not blister when placed in an acid fixing bath, even at high temperatures.

"Kodurol" is parahydroxyphenyl glycine and is also commonly known as glycin.

Pyro is 1 : 2 : 3 trihydroxybenzene, also known as pyrogallol or pyrogalllic acid.

## KODAK TESTED CHEMICALS

Most chemicals of use for photographic work are supplied by Kodak Limited in a tested quality of guaranteed purity. In addition, a number of the developer formulae given in this booklet are available as "Kodak" Packed Developer Powders or in solution form. These are indicated on the formulae concerned. The following preparations are also supplied in packed form :—

### DEVELOPER POWDERS

"Kodak" X-ray Ultra-rapid Developer Powder. Designed for the development of radiographs in 15 to 30 seconds, during surgical operations.

"Kodak" Time Standard Developer Chemicals and Replenisher. Designed to give the same degree of development at a given time and temperature throughout its life when large numbers of routine negatives have to be developed.

### CONCENTRATED DEVELOPER SOLUTIONS

"Kodak" Press Contrast Developer. A rapid-working developer for general work, requiring dilution with up to 9 parts of water.

"Kodinol." A highly concentrated developer solution which requires only dilution with 16 to 40 parts to make a clean-working developer for general work: the concentrated solution has a long life.

### FIXING SALTS

"Kodak" Acid Fixing Salts with Hardener. For preparing a standard hardening fixing bath for general work.

"Kodak" Rapid Fixer. For preparing a non-hardening acid fixing bath.

"Kodak" X-ray Fixing Salt with Hardener. For general X-ray work.

"Kodak" X-ray Rapid Fixer. Packed to enable either a non-hardening or a hardening acid bath to be prepared.

"Kodak" X-ray Ultra-rapid Fixing Salts. For use in conjunction with "Kodak" X-ray Ultra-rapid Developer Powder.

### HARDENERS

"Kodak" Liquid Hardener. For addition to acid fixing baths.

"Kodak" Hardening Powder.

"Kodak" Tropical Hardener.

### FILM CEMENTS

"Kodak" Industrial Film Cement. For use with safety-base film.

"Kodak" Film Cement (Nitrate).

"Kodascope" Film Cement. For use with safety-base film.

### MISCELLANEOUS COMPOUNDS

K.A.F. "Kodak" Antifog Tablets. For addition to developers when unfavourable circumstances tend to promote chemical fog, as when development has to be prolonged or carried out at high temperatures or when materials have deteriorated through age or incorrect storage conditions. Development of printing papers may thus be forced, for instance, to enable under-exposed prints to be saved without fogging or staining. The amount used should be determined by



experience but about one or two tablets of K.A.F. to each 20 ounces of developer (2 to 4 tablets per litre) are usually used.

"Calgon." For addition to developing solutions to prevent the precipitation of calcium salts when using hard water.

"Kodaflat" Solution. For holding films and papers on temporary supports during exposure.

"Kodak" Lens Cleaner. For cleaning lenses and optical equipment.

"Kodak" Cine Film Cleaning Fluid.

"Kodak" Varnish. For the cold application of a protective layer to plates and miniature, cut-sheet and roll films.

"Kodak" Special Retouching Medium.

"Kodak" Opaque and Spotting Medium.

"Kodak" Mounting Paste.

"Kodak" White Ink. Specially prepared to flow smoothly on to negatives, prints and paper.

"Kodak" Fungicide. For protecting negatives and prints from the attacks of fungi and insects.

### "KODAK" WETTING AGENT

Recommended as an addition to most liquids used in processing photographic materials. It ensures uniform wetting of the material when placed in the liquid, and uniform draining away of the liquid when the material is removed. This promotes even development, reduces any tendency to the formation of air bells prevents drying marks or "tear marks" and, because the fluid drains away much more completely from the surface, greatly curtails the drying time needed.

"Kodak" Wetting Agent is chemically inert towards photographic solutions and may be added with advantage to all kinds of photographic solutions without interference with their normal chemical operation. For example, it may be used with fixing, toning, reducing, intensifying, colouring, opaquing, spotting and retouching (dye or chemical) solutions as well as developers. Acid and neutral solutions generally require greater additions than alkaline solutions to produce the optimum wetting effect. With very alkaline developers, however, the addition of any wetting agent increases appreciably the tendency to froth.

### Instructions for Use

For general purposes where only a small quantity of solution is required add to all solutions 1 to 2 drops of "Kodak" Wetting Agent to each 8 oz. of bath employed. For larger quantities it will be found more convenient to make up a 10 per cent. solution. This should be added to the various processing baths in accordance with the following recommendations:—

*Developing Solutions.* 5-10 cc. of "Kodak" Wetting Agent (10 per cent. solution) per litre of solution (1 drachm per 25 fluid ounces). Use the smaller amount for the more alkaline developers, such as the special high-contrast formulae.

*Fixing, Reducing and Intensifying Solutions.* 20 cc. of "Kodak" Wetting Agent (10 per cent. solution) per litre of bath (1 drachm per 6 fluid ounces).

*The Final Rinse Bath to be Used after Washing.* 20 cc. of "Kodak" Wetting agent (10 per cent. solution) per litre (1 drachm per 6 fluid ounces). For hard water use a smaller amount of wetting agent. Where the water is very hard and tends to deposit a scum on drying, give the final rinse in distilled water containing this addition of wetting agent.

## DEVELOPER FORMULÆ

### D.1 THREE-SOLUTION PYRO DEVELOPER

Stock Solution A		Avoirdupois		CHARACTERISTICS AND PURPOSE
Metric				
9.8 grams	Sodium bisulphite	345 grains		
60 grams	Pyro	4 ounces 350 grains		
1.1 grams	Potassium bromide	40 grains		
(11 c.c.)	(or 10% solution)	(420 minims)		
1000 c.c.	Water to make	80 ounces		
Stock Solution B		Avoirdupois		
210 grams	Sodium sulphite, crystals	16 ounces 350 grains		
(105 grams)	(or anhydrous)	(8 ounces 175 grains)		
1000 c.c.	Water to make	80 ounces		
Stock Solution C		Avoirdupois		
200 grams	Sodium carbonate, crystals	16 ounces		
(75 grams)	(or anhydrous)	(6 ounces)		
1000 c.c.	Water to make	80 ounces		

Dissolve the chemicals in the order given.

**FOR DISH DEVELOPMENT**—Take 1 part A, 1 part B, 1 part C and 7 parts of water. Develop for 5 to 7 minutes 65° F. (18° C.).

**FOR TANK DEVELOPMENT**—Take one part A, 1 part B, 1 part C and 11 parts of water. Develop for about 12 minutes at 65° F. (18° C.).

### \* D.8 HYDROQUINONE-CAUSTIC DEVELOPER, SINGLE-SOLUTION

Stock Solution		Avoirdupois		CHARACTERISTICS AND PURPOSE
Metric				
180.0 grams	Sodium sulphite (cryst.)	14 ounces 175 grains		
(90.0 grams)	(or anhydrous)	(7 ounces 90 grains)		
45.0 grams	Hydroquinone	3 ounces 265 grains		
37.5 grams	Caustic soda	3 ounces		
30.0 grams	Potassium bromide	2 ounces 175 grains		
1000 c.c.	Water to make	80 ounces		

Dissolve the chemicals in the order given.

For use take 2 parts of stock solution and 1 part of water.

Develop "Kodak" Maximum Resolution plates for 2-5 minutes at 70° F.

\* Available as a "Kodak" Packed Developer Powder.

### D.16 NORMAL CINÉ POSITIVE TANK DEVELOPER

Stock Solution		Avoirdupois		CHARACTERISTICS AND PURPOSE
Metric				
0.31 gram	"Elon"	11 grains		
79.2 grams	Sodium sulphite (cryst.)	6 ounces 150 grains		
(39.6 grams)	(or anhydrous)	(3 ounces 75 grains)		
6.0 grams	Hydroquinone	210 grains		
50.5 grams	Sodium carbonate (cryst.)	4 ounces		
(18.7 grams)	(or anhydrous)	(1 ounce 215 grains)		
0.86 gram	Potassium bromide	30 grains		
(8.6 c.c.)	(or 10% solution)	310 minims)		
0.68 gram	Citric acid	24 grains		
1.5 grams	Potassium metabisulphite	52 grains		
1000 c.c.	Water to make	80 ounces		

Dissolve the chemicals in the order given.

Use without dilution.

For Motion Picture Positive film, development time will vary from 5-10 mins. at 65° F. (18° C.) according to the contrast required and the degree of agitation employed.



## \* "D.76"

## FINE-GRAIN DEVELOPER

Metric		Avoirdupois	
2.0 grams	"Elon"	70 grains	
200.0 grams	Sodium sulphite (cryst.)	16 ounces	
(100.0 grams)	(or anhydrous)	8 ounces	
5.0 grams	Hydroquinone	175 grains	
2.0 grams	Borax	70 grains	
1000 c.c.	Water to make	80 ounces	

Dissolve the chemicals in the order given.  
Use without dilution.

\* Available as "Kodak" Packed Developer Powders.

CHARACTERISTICS  
AND PURPOSE

A low-contrast fine-grain dish or tank developer for obtaining the maximum effective emulsion speed and shadow detail. Recommended for Portrait Commercial, Aero and Motion Picture negatives on panchromatic materials. See Data Sheet on fine grain development.

## \* "D.76R"

## REPLENISHER FOR DEVELOPER "D.76"

Metric		Avoirdupois	
3.0 grams	"Elon"	105 grains	
200.0 grams	Sodium sulphite (cryst.)	16 ounces	
(100.0 grams)	(or anhydrous)	8 ounces	
7.5 grams	Hydroquinone	266 grains	
20.0 grams	Borax	1 ounce 261 grains	
1000 c.c.	Water to make	80 ounces	

Dissolve the chemicals in the order given.

Use the replenisher without dilution and add to the tank to maintain the level of the solution.

\* Available as a "Kodak" Packed Developer Powder.

CHARACTERISTICS  
AND PURPOSE

Replenisher for Formula D.76.

## D.76d NEGATIVE DEVELOPER—BUFFERED BORAX

Metric		Avoirdupois	
2.0 grams	"Elon"	70 grains	
200.0 grams	Sodium sulphite (cryst.)	16 ounces	
(100.0 grams)	(or anhydrous)	(8 ounces)	
5.0 grams	Hydroquinone	175 grains	
8.0 grams	Borax	280 grains	
8.0 grams	Boric acid	280 grains	
1000 c.c.	Water to make	80 ounces	

Dissolve the chemicals in the order given.

Use without dilution.

By increasing the quantity of borax with a corresponding decrease in the boric acid content, the development rate is increased. By decreasing the borax and increasing the boric acid proportionately, the development rate is decreased.

**NOTE:** The slight initial fog of a freshly mixed sample of the Buffered Borax developer (Formula "D.76d") may be controlled by adding 15 grains of potassium bromide per gallon (0.25 gram per litre) of the mixed developer.

CHARACTERISTICS  
AND PURPOSE

A low contrast dish or tank developer for motion picture negatives and variable density sound records.

## D.82

## MAXIMUM-ENERGY DEVELOPER

Metric		Avoirdupois	
48.0 c.c.	Methylated spirit	4 fluid ounces	
14.0 grams	"Elon"	1 ounce 50 grains	
105.0 grams	Sodium sulphite (cryst.)	8 ounces 175 grains	
(52.5 grams)	(or anhydrous)	(4 ounces 85 grains)	
14.0 grams	Hydroquinone	1 ounce 50 grains	
8.8 grams	Sodium hydroxide (caustic soda)	308 grains	
8.8 grams	Potassium bromide	308 grains	
(88.0 c.c.)	(or 10% solution)	(7 ounces)	
1000 c.c.	Water to make	80 ounces	

Dissolve the chemicals in the order given.

Use without dilution. Develop about 5 minutes at 65° F. (18° C.).

The prepared developer does not keep more than a few days in a full bottle or more than 2 hours in an open dish.

CHARACTERISTICS  
AND PURPOSE

High-contrast dish developer, giving maximum energy. For use with extreme under-exposures in Press, Commercial and Industrial photography.

## D.153

## PROCESS DEVELOPER

Metric	Stock Solution A	Avoirdupois	
25.0 grams	Hydroquinone	2 ounces	
25.0 grams	Potassium metabisulphite	2 ounces	
25.0 grams	Potassium bromide	2 ounces	
(250.0 c.c.)	(or 10% solution)	(20 ounces)	
1000 c.c.	Water to make	80 ounces	

Metric	Stock Solution B	Avoirdupois	
50.0 grams	Caustic potash	4 ounces	
1000 c.c.	Water to make	80 ounces	

Dissolve the chemicals in the order given.  
Use equal parts of A and B.

Develop for 2 minutes at 65° F. (18° C.).

CHARACTERISTICS  
AND PURPOSE

Extreme-contrast dish developer. For use with Process and "Photo-script" plates, "Kodaline" and Process films for line and half-tone negatives.

## \* D.154 DEVELOPER FOR "KODALINE" PAPER, "KODALINE" FILM AND "KODALINE" WET STRIPPING FILM (TRANSPARENT)

Metric		Avoirdupois	
1.25 grams	"Elon"	45 grains	
45.0 grams	Sodium sulphite (cryst.)	3 ounces 260 grains	
(22.5 grams)	(or anhydrous)	(1 ounce 350 grains)	
6.0 grams	Hydroquinone	210 grains	
80.0 grams	Sodium carbonate (cryst.)	6 ounces 175 grains	
(30.0 grams)	(or anhydrous)	(2 ounces 175 grains)	
0.5 gram	Potassium bromide	18 grains	
(5.0 c.c.)	(or 10% solution)	(190 minims)	
1000 c.c.	Water to make	80 ounces	

Dissolve the chemicals in the order given.

Use without dilution. Develop "Kodaline" films for 3-4 minutes at 65° F. (18° C.); Kodaline paper for 2-3 minutes at 65° F. (18° C.).

\* Available as a "Kodak" Packed Developer Powder.

CHARACTERISTICS  
AND PURPOSE

A single-solution high contrast developer for Kodaline paper, Film, Wet Stripping Film and Document Recording materials.

## \* D.156

## No. 2 WARM-TONE DEVELOPER

Metric	Stock Solution	Avoirdupois	
1.7 grams	"Elon"	60 grains	
44.0 grams	Sodium sulphite (cryst.)	3 ounces 220 grains	
(22.0 grams)	(or anhydrous)	(1 ounce 330 grains)	
6.8 grams	Hydroquinone	240 grains	
44.0 grams	Sodium carbonate (cryst.)	3 ounces 220 grains	
(16.0 grams)	(or anhydrous)	(1 ounce 110 grains)	
6.3 grams	Potassium bromide	220 grains	
(63.0 c.c.)	(or 10% solution)	(5 ounces)	
1000 c.c.	Water to make	80 ounces	

Dissolve the chemicals in the order given. Use 1 part developer to 1 part water.

Approximate development time at 65° F. (18° C.) is 2 minutes.

\* Available as a "Kodak" Packed Developer Powder and in solution form.

CHARACTERISTICS  
AND PURPOSE

Normal-contrast developer for "Kodura," "Kodapal" and "Bromesko" papers.

## \* D.158

## "VELOX" DEVELOPER

Metric	Stock Solution	Avoirdupois	
3.2 grams	"Elon"	110 grains	
100.0 grams	Sodium sulphite (cryst.)	8 ounces	
(50.0 grams)	(or anhydrous)	(4 ounces)	
13.3 grams	Hydroquinone	1 ounce 40 grains	
186.0 grams	Sodium carbonate (cryst.)	14 ounces 375 grains	
(69.0 grams)	(or anhydrous)	(5 ounces 220 grains)	
0.9 gram	Potassium bromide	32 grains	
(9.0 c.c.)	(or 10% solution)	(350 minims)	
1000 c.c.	Water to make	80 ounces	

Dissolve the chemicals in the order given. For use, dilute with an equal bulk of water.

Develop "Velox" Paper for 30-40 seconds at 65° F. (18° C.).

\* Available as "Kodak" Packed Developer Powders and in concentrated solution.

CHARACTERISTICS  
AND PURPOSE

Normal-contrast developer for blue-black image tones on Velox and Gaslight papers.



**D.159 DEVELOPER—"KODUROL"-HYDROQUINONE**

Stock Solution		Avoirdupois	CHARACTERISTICS AND PURPOSE
Metric			
50.0 grams (25.0 grams)	Sodium sulphite (cryst. (or anhydrous))	4 ounces (2 ounces)	For red tones on "Kodura" paper.
4.0 grams	"Kodurol" (glycin)	140 grains	
7.0 grams	Hydroquinone	250 grains	
70.0 grams (26.0 grams)	Sodium carbonate (cryst. (or anhydrous))	5 ounces (2 ounces)	
1.0 gram (10 c.c.)	Potassium bromide (or 10% solution)	35 grains (350 minims)	
1000 c.c.	Water to make	80 ounces	

Dissolve the chemicals in the order given. For use dilute 1 part developer with 2 parts water.

Exposures should be adjusted so that development is complete in the time required to reach the desired tone.

**\* D.163 "KODAK" SPECIAL DEVELOPER**

Stock Solution		Avoirdupois	CHARACTERISTICS AND PURPOSE
Metric			
2.2 grams	"Elon"	80 grains	Normal—high contrast universal paper developer; may also be used with negative materials as a dish developer. Recommended as a tropical developer for papers.
150.0 grams (75.0 grams)	Sodium sulphite (cryst. (or anhydrous))	12 ounces (6 ounces)	
17.0 grams	Hydroquinone	1 ounce 160 grains	
175.0 grams (65.0 grams)	Sodium carbonate (cryst. (or anhydrous))	14 ounces (5 ounces)	
2.8 grams (28.0 c.c.)	Potassium bromide (or 10% solution)	100 grains (130 minims)	
1000 c.c.	Water to make	80 ounces	

Dissolve the chemicals in the order given.

\* Available as "Kodak" Packed Developer Powders and in Concentrated Solution form.

**FOR BROMIDE PAPERS:**

For normal results dilute 1 part of the above stock solution with 3 parts of water. Develop for 2 minutes at 65° F. (18° C.).

For brighter results dilute 1 part of the above stock solution with 1 part of water. Develop for 1½ minutes at 65° F. (18° C.).

**TIME-TEMPERATURE CHART FOR BROMIDE PAPERS**

65° F.	70° F.	75° F.	80° F.	85° F.
18° C.	21° C.	24° C.	27° C.	30° C.
90 secs.	70 secs.	50 secs.	40 secs.	30 secs.

**FOR "VELOX" AND GASLIGHT PAPERS:**

For normal results dilute 1 part of the above stock solution with 3 parts of water.

For brighter results dilute 1 part of the above stock solution with 1 part of water. Develop for 60-120 seconds at 65° F. (18° C.).

**TIME-TEMPERATURE CHART FOR "VELOX" AND GASLIGHT PAPERS**

65° F.	70° F.	75° F.	80° F.	85° F.
18° C.	21° C.	24° C.	27° C.	30° C.
60 secs.	45 secs.	30 secs.	25 secs.	20 secs.

**D.165 DEVELOPER—"ELON"**

Stock Solution		Avoirdupois	CHARACTERISTICS AND PURPOSE
Metric			
6.0 grams	"Elon"	210 grains	Low-contrast dish developer recommended for photogravure negatives and transparencies, and for bromide papers when a softer result is wanted than that given by D.163.
50.0 grams (25.0 grams)	Sodium sulphite (cryst. (or anhydrous))	4 ounces (2 ounces)	
100.0 grams (37.0 grams)	Sodium carbonate (cryst. (or anhydrous))	8 ounces (3 ounces)	
1.0 gram (10.0 c.c.)	Potassium bromide (or 10% solution)	35 grains (380 minims)	
1000 c.c.	Water to make	80 ounces	

Dissolve the chemicals in the order given.

Dilute 1 part of the above stock solution with 3 parts of water.

As a low contrast developer for bromide prints develop for 2 minutes at 65° F. (18° C.).

For Gravure Positives on B.40 Plates develop for 4-6 minutes at 65° F. (18° C.).

**\* D.166 No. 1 WARM-TONE DEVELOPER**

Stock Solution		Avoirdupois	CHARACTERISTICS AND PURPOSE
Metric			
1.15 grams	"Elon"	40 grains	For maximum warmth of tone (short of red tone) on "Kodura," "Kodopal" and "Bromesko" papers and on Warm-tone Lantern plates.
50.0 grams (25.0 grams)	Sodium sulphite (cryst. (or anhydrous))	4 ounces (2 ounces)	
8.5 grams	Hydroquinone	300 grains	
68.0 grams (25.0 grams)	Sodium carbonate (cryst. (or anhydrous))	5 ounces 220 grains (2 ounces)	
12.5 grams (125 c.c.)	Potassium bromide (or 10% solution)	1 ounce (10 ounces)	
1000 c.c.	Water to make	80 ounces	

Dissolve the chemicals in the order given.

Use 1 part of developer to 3 parts of water.

Develop for 3 minutes at 65° F. (18° C.): with this time of development, the correct exposure will give a first appearance of the image after about 50 secs. development. The warmth of image tone may be varied by increasing or decreasing the time of development with a corresponding decrease or increase in exposure.

\* Available as a "Kodak" Packed Developer Powder and in solution form.

**D.167 STAINING DEVELOPER—PYRO—"ELON"**

Solution A		Avoirdupois	CHARACTERISTICS AND PURPOSE	
Metric				
5.0 grams	"Elon"	175 grains	High contrast "staining" dish developer for Press and Commercial negatives where maximum effective speed, high contrast and rapid processing are required, and for cases of known or suspected under-exposure.	
10.0 grams	Potassium metabisulphite	350 grains		
15.0 grams	Pyro	1 ounce 110 grains		
1000 c.c.	Water to make	80 ounces		
<b>Solution B</b>				
200.0 grams (75.0 grams)	Sodium carbonate (cryst. (or anhydrous))	16 ounces (6 ounces)		
1000 c.c.	Water to make	80 ounces		

Dissolve the chemicals in the order given.

Take 1 part of Solution A and 1 part of Solution B. Oxidation is very rapid and therefore solutions A and B should not be mixed until immediately before use.

Develop for 2-3 minutes at 65° F. (18° C.).

**D.168 KODAK REVERSAL DEVELOPER see page 19.**



**D.169 ULTRA-RAPID DEVELOPER FOR RECORDING PAPERS**

Metric		Avoirdupois	CHARACTERISTICS AND PURPOSE
90.0 grams	Caustic soda	7 ounces 90 grains	Ultra-rapid developer for recording papers. Owing to the caustic nature of this developer, it is unsuitable for use with papers on very thin base.
100.0 grams	Sodium sulphite (cryst.)	8 ounces	
(50.0 grams)	(or anhydrous)	(4 ounces)	
30.0 grams	"Elon"	2 ounces 175 grains	
1000 c.c.	Water to make	80 ounces	

A development time of 3-5 seconds at 65° F. is suitable for most "Kodak" recording papers, although if maximum effective emulsion speed is required longer development time (up to 30 seconds) is necessary, this varying with the type of recording paper concerned.

**\* D.170 DEVELOPER FOR BROMIDE PAPERS—"DOLMI"**

Metric		Stock Solution	Avoirdupois	CHARACTERISTICS AND PURPOSE
50.0 grams	(25.0 grams)	Sodium sulphite (cryst.)	4 ounces	A developer for bromide papers.
		(or anhydrous)	(2 ounces)	
1.0 gram		Potassium bromide	35 grains	
200 c.c.		Water to make	16 ounces	

For use, dilute the above 16 ounces (200 c.c.) of stock solution with water to make 80 ounces (1000 c.c.) and dissolve in this 160 grains (4.5 grams) of "Dolmi." The diluted solution does not keep well and should be made up as required.

Time of development for bromide prints: 2 mins at 65° F. (18° C.)

\* Available as a "Kodak" Packed Developer Powder.

**D.171 RAPID DEVELOPER FOR RECORDING PAPERS**

Metric		Avoirdupois	CHARACTERISTICS AND PURPOSE
50.0 grams	Sodium sulphite (cryst.)	4 ounces	A rapid developer intermediate in rate of development between D.169 and "D.19b."
(25.0 grams)	(or anhydrous)	2 ounces	
162.0 grams	Sodium carbonate (cryst.)	12 ounces 430 grains	
(60.0 grams)	(or anhydrous)	(4 ounces 350 grains)	
0.5 gram	Potassium bromide	18 grains	
14.0 grams	"Elon"	1 ounce 50 grains	
3.0 grams	Hydroquinone	105 grains	
1000 c.c.	Water to make	80 ounces	

Dissolve the chemicals in the order given and use without dilution.

When this developer is used the maximum agitation must be given in order to ensure even development. The normal development time is 20-30 seconds, but longer may be given when too weak a trace is obtained at the shorter development times.

**D.172 REVERSAL DEVELOPER see page 19****D.173 SUBSTITUTE DEVELOPER FOR "VELOX" PAPER CONTAINING NO "ELON"**

Metric		Avoirdupois	CHARACTERISTICS AND PURPOSE
45.0 grams	Sodium sulphite (cryst.)	3 ounces 260 grains	A developer for use with "Velox" papers when "Elon" is not available or for those who suffer from Metol dermatitis.
22.5 grams	(or anhydrous)	(1 ounce 350 grains)	
175.0 grams	Sodium carbonate (cryst.)	14 ounces	
(65.0 grams)	(or anhydrous)	(5 ounces 85 grains)	
0.375 gram	Paraminophenol hydrochloride	13 grains	
7.5 grams	Hydroquinone	265 grains	
0.15 grams	Potassium bromide	5 grains	
1000 c.c.	Water to make	80 ounces	

Dissolve the chemicals in the order given. For use dilute with an equal volume of water and develop for 35-45 seconds at 65° F. (18° C.)

**D.175 TANNING DEVELOPER FOR "SILVALITH" PLATES**

Metric		Solution A	Avoirdupois	CHARACTERISTICS AND PURPOSE
4.0 grams	Pyro		140 grains	A tanning developer specially designed for the first development of "Silvalith" plates.
10.0 grams	Sodium sulphite (cryst.)		350 grains	
(5.0 grams)	(or anhydrous)		(175 grains)	
1000 c.c.	Water to make		80 ounces	
Metric		Solution B	Avoirdupois	
75.0 grams	Sodium carbonate (cryst.)		6 ounces	
(28.0 grams)	(or anhydrous)		(2 ounces 95 grains)	
1000 c.c.	Water to make		80 ounces	

Mix equal parts of Solutions A and B immediately before use.

Develop for 2 minutes at 65° F. (18° C.)

**\*D.177 DEVELOPER—PYRO-SODA**

Metric		Solution A	Avoirdupois	CHARACTERISTICS AND PURPOSE
1.4 grams	Potassium metabisulphite		50 grains	A pyro-soda dish developer for plates and films. For general use.
12.5 grams	Pyro		1 ounce	
1.7 grams	Potassium bromide		60 grains	
150 c.c.	Water to make		12 ounces	
Metric		Solution B	Avoirdupois	
150 c.c.	Solution A		12 ounces	
1000 c.c.	Water to make		80 ounces.	
Metric		Solution C	Avoirdupois	
100.0 grams	Sodium sulphite (cryst.)		8 ounces	
(50.0 grams)	(or anhydrous)		(4 ounces)	
100.0 grams	Sodium carbonate (cryst.)		8 ounces	
(37.5 grams)	(or anhydrous)		(3 ounces)	
1000 c.c.	Water to make		80 ounces	

Dissolve the chemicals in the order given. For negatives of average contrast, use equal parts of Solutions B and C. For portraits and softer negatives, use equal parts of Solutions B and C and 2 parts of water. Develop for 5-8 minutes at 65° F. (18° C.)

\* Available as a "Kodak" Packed Developer Powder.

## "KODALK" DEVELOPER FORMULÆ

The following developer formulæ contain "Kodalk" as accelerator. "Kodalk" is an alkali intermediate in activity between sodium carbonate and borax. It permits of greater control of the energy of the developer: and does not evolve carbon dioxide on acidifying. Risk of blistering is thus eliminated while there is less tendency to precipitate aluminium sulphite sludge from fixing baths containing alum.

### \* "DK.20" EXTRA FINE-GRAIN DEVELOPER

Metric		Avoirdupois	CHARACTERISTICS AND PURPOSE
5.0 grams	"Elon"	175 grains	Normal-contrast dish or tank developer for minimum graininess. For general use with films or plates.
200.0 grams (100.0 grams)	Sodium sulphite (cryst.) (or anhydrous)	16 ounces (8 ounces)	
2.0 grams	"Kodalk"	70 grains	
1.0 gram	Potassium thiocyanate (sulphocyanide)	35 grains	
0.5 gram	Potassium bromide	18 grains	
1000 c.c.	Water to make	80 ounces	

Dissolve the chemicals in the order given.

Use without dilution. Average development time about 15 minutes at 65° F. (18° C.). Times for specific materials are given on their specification sheets. The useful life of this developer can be increased 5 to 10 times by the use of DK.20R replenisher.

\* Available as a "Kodak" Packed Developer Powder.

### \* "DK.20R" REPLENISHER FOR DEVELOPER "DK.20"

Metric		Avoirdupois	CHARACTERISTICS AND PURPOSE
7.5 grams	"Elon"	265 grains	Replenisher for Formula "D.K.20."
200.0 grams (100.0 grams)	Sodium sulphite (cryst.) (or anhydrous)	16 ounces (8 ounces)	
20.0 grams	"Kodalk"	1 ounce	
5.0 grams	Potassium thiocyanate (sulphocyanide)	175 grains	
1.0 gram	Potassium bromide	35 grains	
1000 c.c.	Water to make	80 ounces	

Dissolve the chemicals in the order given.

Add to the tank as necessary to maintain the volume constant.

**DEEP TANK USE.** A given high-light density will be maintained throughout the developer life for a constant development time at a constant temperature, provided the volume of replenisher added is about 5 gallons per 1000 rolls of film (80,000 square inches) processed.

\* Available as a "Kodak" Packed Developer Powder.

### \* DK.50 DEVELOPER—"ELON"-HYDROQUINONE—"KODALK"

Metric		Avoirdupois	CHARACTERISTICS AND PURPOSE
2.5 grams	"Elon"	88 grains	Normal-contrast dish or tank developer for plates and films. Portrait, Commercial and Photomechanical. Recommended for "Kodak" Wash-Off Relief Film and for the making of colour separation negatives from colour transparencies.
60.0 grams (30.0 grams)	Sodium sulphite (cryst.) (or anhydrous)	4 ounces (2 ounces)	
2.5 grams	Hydroquinone	88 grains	
10.0 grams	"Kodalk"	350 grains	
0.5 gram	Potassium bromide	18 grains	
1000 c.c.	Water to make	80 ounces	

Dissolve the chemicals in the order given.

By increasing or decreasing the quantity of "Kodalk" in the formula it is possible (a) to increase or decrease the contrast obtained in a given time of development; (b) to decrease or increase the time of development without affecting the contrast.

Average development time about 10 minutes at 65° F. (18° C.) or as recommended for specific materials on their specification sheets.

\* Available as a "Kodak" Packed Developer Powder.

## REVERSAL PROCESSING

The following method of reversal processing, giving direct positives from camera exposures, has been found to be of general application to "Kodak" materials. The order of processes is as follows:

First development (D.168) for times given below.

Wash for	...	5 minutes
Bleach in R.21A for	...	3-5 minutes
Wash for	...	5 minutes
Clear in R.21B for	...	2 minutes
Rinse for	...	1/2 minute
Expose to white artificial light for about	...	2 1/2 minutes
Second development (D.158) by artificial light for	...	2-5 minutes.

According to the material used, the following are suggested as a guide to suitable first development times at 65° F.:

"Kodalk" Film Rapid	7 minutes	"Kodalk" Paper Rapid	7 minutes
"Kodalk" Film Extra Rapid	20 minutes	Safety Positive Film	4 minutes

### D.168 DEVELOPER FOR FIRST DEVELOPMENT

Metric		Avoirdupois	CHARACTERISTICS AND PURPOSE
2.0 grams	"Elon"	70 grains	Recommended as the first developer for reversal of certain Kodak films, plates and papers.
180.0 grams (90.0 grams)	Sodium sulphite (cryst.) (or anhydrous)	14 ounces (7 ounces)	
8.0 grams	Hydroquinone	280 grains	
120.0 grams (44.5 grams)	Sodium carbonate (cryst.) (or anhydrous)	9 ounces (3 ounces)	
2.0 grams	Potassium thiocyanate (sulphocyanide)	245 grains (70 grains)	
1000 c.c.	Water to make	80 ounces	

Dissolve the chemicals in the order given.

The first development times may be varied according to the contrast required.

### R.21 BLEACHING AND CLEARING BATHS

#### Stock Solution A—Bleaching Bath

Metric		Avoirdupois
1000 c.c.	Water	80 ounces
50.0 grams	Potassium bichromate	4 ounces
50.0 c.c.	Sulphuric acid	4 fluid ounces

Dissolve the bichromate in the water, then add the sulphuric acid slowly, and with constant stirring, to the cold solution. For use dilute one part of stock solution with 9 parts of water.

#### Stock Solution B—Clearing Bath

Metric		Avoirdupois
1000 c.c.	Water	80 ounces
100.0 grams (50.0 grams)	Sodium sulphite (cryst.) (or anhydrous)	8 ounces (4 ounces)
1.0 gram	Sodium hydroxide	35 grains

### \* D.158 DEVELOPER FOR SECOND DEVELOPMENT

Metric		Avoirdupois
3.2 grams	"Elon"	110 grains
100.0 grams (50.0 grams)	Sodium sulphite (cryst.) (or anhydrous)	8 ounces (4 ounces)
13.3 grams	Hydroquinone	1 ounce 40 grains
186.0 grams (69.0 grams)	Sodium carbonate (cryst.) (or anhydrous)	14 ounces (5 ounces)
0.9 gram (9.0 c.c.)	Potassium bromide (or 10% solution)	32 grains (350 minims)
1000 c.c.	Water to make	80 ounces

Dissolve the chemicals in the order given.

For use, dilute with an equal bulk of water.

\* Available as "Kodak" Packed Developer Powders, and in Concentrated Solution.

Re-development should preferably be carried out in artificial light, since staining sometimes results from exposure to strong daylight at this stage.

## REVERSAL PROCESSING OF PHOTOMECHANICAL MATERIALS

The following modification of the normal reversal procedure is suitable for use with photo-mechanical materials. The principal changes in treatment concern the first development and the re-development.

B.10 ("Photocrypt"), B.5 and P.25 plates, Slow and Rapid "Kodaline" films :—

First development : for 3 minutes in developer D.172 at 65° F.  
Rinse in running water for 1 minute.  
Bleach in R.21A solution\* (about 45 seconds).  
Wash in running water for 5 minutes (1 minute rinse for B.10 plates).  
Clear in R.21B solution\* (about 15 seconds).  
Rinse in water and blacken for 2 minutes in a sulphiding solution. This may be carried out in the light, if desired, though no light is necessary.  
Wash in running water for 5 minutes.

Slow and Rapid "Kodaline" papers :—

Proceed as for plates, above, until the prints have been cleared in R.21B solution, then Wash for 5 minutes with room lights on.  
Re-develop in D.172 until completely blackened.  
Wash in running water for 5 minutes.

Maximum Resolution plates :—

First development : for 3 minutes in developer D.8 at 65° F.  
Wash in running water for 2 minutes.  
Bleach in R.21A solution\* (about 45 seconds).  
Turn on room lights.  
Clear in R.21B solution\* (about 30 seconds).  
Wash in running water for 2 minutes.  
Expose close to a 100-watt electric bulb for 15 seconds.  
Re-develop in D.8 for 3 minutes at 65° F.  
Wash for 5 minutes and bathe for 2 minutes in clean industrial spirit to remove the yellow dye.

\* Formulae overleaf, page 19.

## D.172 REVERSAL DEVELOPER

### Stock Solution A

Metric		Avoirdupois
25.0 grams	Hydroquinone	2 ounces
25.0 grams	Potassium metabisulphite	2 ounces
25.0 grams	Potassium bromide	2 ounces
1000 c.c.	Water to make	80 ounces

### Stock Solution B

Metric		Avoirdupois
50.0 grams	Potassium hydroxide	4 ounces
1.5 grams	Sodium thiosulphate (hypo)	53 grains
1000 c.c.	Water to make	80 ounces

Dissolve the chemicals in the order given. Use equal parts of A and B.

**SULPHIDING SOLUTION.** 1% sodium sulphide or ammonium sulphide may be used. A more convenient solution consists of :—

Metric		Avoirdupois
1.0 gram	Thiocarbamide	35 grains
4.0 grams	Sodium hydroxide	140 grains
1000 c.c.	Water to make	80 ounces

This latter solution will keep very well in a corked bottle, but it requires a longer time (about 4 minutes) to blacken the plate.

## TROPICAL PROCESSING

### \* DK.15 "KODAK" TROPICAL DEVELOPER

Metric		Avoirdupois
5.7 grams	"Elon"	200 grains
180.0 grams	Sodium sulphite, (cryst.)	14 ounces 175 grains
22.5 grams	"Kodalk"	1 ounce 335 grains
1.9 grams	Potassium bromide	67 grains
105.0 grams	Sodium sulphate, (cryst.)	8 ounces 175 grains
1 litre	Water to make	80 ounces

Dissolve the chemicals in the order given.

\* Available as a "Kodak" Packed Developer Powder.

### CHARACTERISTICS AND PURPOSE

A normal-contrast dish or tank developer for the development of films or plates at high temperatures (75° to 90° F.) (24° to 32° C.).

**WARNING :** It is important to agitate the films or plates when first immersing them in the developer and at intervals during development to avoid streakiness.

After development, rinse for 1 or 2 seconds in water and then immerse for 3 minutes in the tropical hardening bath (Formula SB.4). After hardening, fix for at least 10 minutes in the hardening fixing bath (Formula F.5) before transferring to the wash water.

### DK.15a

A formula giving much less contrast may be obtained by using only 170 grains of "Kodalk" per 80 ounces of developer (5 grams per litre) instead of the quantities given above. This formula is known as DK.15a.

### SB.4 TROPICAL HARDENING BATH see page 22

### F.5 TROPICAL ACID HARDENING FIXING BATH see page 23

**WASHING :** After fixing thoroughly, wash for 10 to 15 minutes. If running water is not available 5 minutes' immersion in each of three changes of water will suffice, but the negatives should be re-washed in running water as soon as possible. The temperature of the wash water should not exceed 95° F. (35° C.).

**DRYING :** Wipe both sides of the negative with a tuft of wet cotton-wool or damp chamois-leather to eliminate markings. Dry in a draught of air or before a fan, if necessary surrounding the film with mosquito netting to keep out insects.

Very much fuller information is given in Data Booklet A.37, "Photography in the Tropics."

## HOT-WEATHER PROCESSING

During hot weather in the British Isles it may be difficult to keep development temperatures down to 65° F. If they can be kept below 75° F. no special precautions need be taken, though the use of highly alkaline developers should be avoided where possible and all development times should be appropriately reduced. Where the solutions cannot be cooled below 75° F. the tropical processing recommendations above should be followed. For small amounts of work the following modifications of these recommendations may be used :—

(a) A high concentration of a neutral chemical may be added to the normal developer to prevent swelling of the emulsion. For instance, "D.76" developer can be used with the addition of 45 grams per litre of anhydrous sodium sulphate (not sulphite) or 105 grams per litre of the crystalline compound.

(b) Instructions given above regarding rinsing should be carefully followed.

(c) The film or plate should be hardened in Formula SB.4 after rinsing and before fixation.

(d) Washing should not be prolonged if the wash water is also warm. Ten to fifteen minutes' washing in running water is sufficient.

## RINSE AND HARDENING BATHS

### SB.1

#### ACID RINSE

Metric		Avoirdupois	CHARACTERISTICS AND PURPOSE
1000 c.c.	Water	80 ounces	Rinse (stop) bath for papers.
17.0 c.c.	Acetic acid (glacial)	1 ounce 2 drachms	

Rinse prints for 5 seconds. Working life : about 25—8 × 10 prints per quart (litre).

### S.B.1A

#### ACID RINSE

Metric		Avoirdupois	CHARACTERISTICS AND PURPOSE
1000 c.c.	Water	80 ounces	Rinse (stop) bath for films and plates. Stops development almost instantaneously and thus helps to prevent streaks on negatives.
50.0 c.c.	Acetic acid (glacial)	4 ounces	

### S.B.3

#### HARDENING BATH

Metric		Avoirdupois	CHARACTERISTICS AND PURPOSE
1000 c.c.	Water	80 ounces	Hardener-rinse bath for films and plates. For use in hot weather between development and fixation.
30.0 grams	Potassium chrome alum	2 ounces 17.5 grains	

Agitate the negative for a few seconds immediately after immersion. Maximum hardening takes 3-5 minutes in a fresh bath.

### SB.4

#### TROPICAL HARDENING BATH

Metric		Avoirdupois	CHARACTERISTICS AND PURPOSE
1000 c.c.	Water	80 ounces	Tropical hardening rinse for films and plates. for use at temperatures of 75° to 95° F. (24° to 35° C.). Used in conjunction with DK.15 developer.
30.0 grams	Potassium chrome alum	2 ounces 17.5 grains	
140.0 grams	Sodium sulphate (cryst.)	11 ounces 90 grains	
(60.0 grams)	(or anhydrous)	(4 ounces, 350 grains)	

Agitate negatives for 30 to 45 seconds when they are first immersed, to avoid unevenness, and leave them for 3 minutes. After the equivalent of 20 10 × 8 in. films per gallon have been treated, the bath should be replaced, otherwise scum markings will result.

The freshly-made bath is a violet-blue colour and keeps indefinitely while unused. A partially used bath deteriorates on standing for a few days, the colour changing to a yellow-green.

## FIXING BATHS

### F.5 TROPICAL ACID HARDENING-FIXING BATH

Metric		Avoirdupois	CHARACTERISTICS AND PURPOSE
240.0 grams	Sodium thiosulphate (hypo)	19 ounces 90 grains	Tropical acid hardening fixing bath for films and plates, used in conjunction with DK.15 developer and SB.4 hardening bath.
(150.0 grams)	(or anhydrous)	(12 ounces, 100 grains)	
15.0 grams	Sodium sulphite (anhydrous)	2 ounces 17.5 grains	
17.0 c.c.	Acetic acid (glacial)	1 ounce 2 drachms	
7.5 grams	Boric acid	260 grains	
15.0 grams	Potassium alum	1 ounce 90 grains	
1000 c.c.	Water to make	80 ounces	

Dissolve chemicals in the order given.

Films and plates will be fixed properly in 10 minutes if a fresh prepared fixing bath has been used. Prolonged immersion at high temperatures is harmful.

### F.16 CHROME ALUM FIXING BATH

Metric	Solution A	Avoirdupois	CHARACTERISTICS AND PURPOSE
320.0 grams	Hypo	26 ounces	A hardening fixing bath. This formula, when freshly mixed, is especially recommended for use during hot weather, but it rapidly loses its hardening properties, with or without use. Scum which may form on the surface of the negative when an old bath is used is removable by swabbing with cotton-wool before the negative is dried.
40.0 grams	Sodium sulphite (cryst.)	3 ounces 90 grains	
(20.0 grams)	(or anhydrous)	(1 ounce 260 grains)	
1000 c.c.	Water to make	80 ounces	
500.0 c.c.	Water	40 ounces	
60.0 grams	Potassium chrome alum	4 ounces 350 grains	
8.0 c.c.	Sulphuric acid (concentrated)	5 drachms	
1000 c.c.	Water to make	80 ounces	

Pour 1 part Solution B into 3 parts Solution A, whilst stirring. A rapidly, and use same day.

### F.52 NON-HARDENING ACID FIXING BATH\*

Metric		Avoirdupois	CHARACTERISTICS AND PURPOSE
250.0 grams	Hypo	20 ounces	An acid fixing bath for use with materials, such as "Transferotype" or Bromoil papers, with which hardening must be avoided.
25.0 grams	Potassium metabisulphite	2 ounces	
1000 c.c.	Water to make	80 ounces	

\* As an alternative to preparing your own fixing bath, "Kodak" Rapid Fixer is available in powder form.

### F.53 ACID HARDENER STOCK SOLUTION\*

Metric		Avoirdupois	CHARACTERISTICS AND PURPOSE
100.0 grams	Sodium sulphite (cryst.)	8 ounces	Acid hardener stock solution for use with Formula F.54 or F.54a.
(50.0 grams)	(or anhydrous)	(4 ounces)	
75.0 c.c.	Acetic acid (glacial)	6 ounces	
100.0 grams	Potassium alum	8 ounces	
1000 c.c.	Water to make	80 ounces	

Dissolve the sulphite in 250 c.c. (20 ounces) of warm water (about 125° F. (52° C.)) and allow to cool. Then add the acetic acid slowly and with constant stirring. Dissolve the potassium alum in about 500 c.c. (40 ounces) of hot water and allow to cool to below 70° F. (20° C.) before adding to the sulphite and acetic acid mixture. Finally make up to 1000 c.c. (80 ounces) with cold water.

NOTE that "Kodak" Liquid Hardener, as sold, is 2½ times stronger than formula F.53. Therefore if 40 ounces of K.L.H. is specified in a formula it would be necessary to take 100 ounces of formula F.53.

\* As an alternative to preparing your own hardening solution, "Kodak" Hardening Powder or "Kodak" Liquid Hardener are available, see p. 7.



## F.54 ACID HARDENING-FIXING BATHS\*

Metric		Avoirdupois	CHARACTERISTICS AND PURPOSE
500 c.c.	Warm water	40 ounces	Acid hardening - fixing bath for paper.
250.0 grams	Hypo	20 ounces	
To this, when cold, add :			
50 c.c.	"Kodak" Liquid Hardener	4 ounces	
(125 c.c.)	(or Acid Hardener Stock Solution Formula F.53)	10 ounces	
1000 c.c.	Water to make	80 ounces	

## F.54a

Metric		Avoirdupois	CHARACTERISTICS AND PURPOSE
500 c.c.	Warm water	40 ounces	Acid - hardening fixing bath for films or plates.
400.0 grams	Hypo	32 ounces	
To this, when cold, add :			
75 c.c.	"Kodak" Liquid Hardener	6 ounces	
(185 c.c.)	(or Acid Hardener Stock Solution—Formula F.53)	(15 ounces)	
1000 c.c.	Water to make	80 ounces	

\* As an alternative to preparing your own fixing baths, "Kodak" Acid Fixing Salt with Hardener is available in powder form.

## HE.1 HYPO ELIMINATOR

Metric		Avoirdupois	CHARACTERISTICS AND PURPOSE
500.0 c.c.	Water	40 ounces	Hypo eliminators are not usually required in processing negative materials. In the case of prints, however, traces of hypo are tenaciously held by the paper fibres and may lead to fading of the image on long keeping under "tropical" conditions. HE.1 used as directed converts the hypo to inert sulphate and also facilitates its removal. (Comm. No. 780 from Kodak Res. Labs., Phot. J. 1940, p. 458).
125.0 c.c.	Hydrogen peroxide (3% solution*)	10 ounces	
100.0 c.c.	Ammonia (3% solution†)	8 ounces	
1.0 litre	Water to make	80 ounces	

\* i.e. 20 vol. solution, as purchased.

† To make 3% ammonia, dilute 9 parts of .880 ammonia to make 100 parts of solution.

### DIRECTIONS FOR USE

Wash the prints for about 30 minutes at 65° to 70° F.\* in running water which flows rapidly enough to replace the water in the vessel (dish or tank) completely once every five minutes. Then immerse each print for about six minutes at 70° F. in the hypo eliminator solution (Kodak HE.1) and finally wash for about ten minutes before drying.

### LIFE OF HE.1 SOLUTION

About fifty 8 × 10 in. prints or their equivalent per gallon (4 litres). If used on plates, films or lantern slides the eliminator should be diluted with 10 parts of water, otherwise the emulsion may be rendered unduly tender.

**TEST FOR HYPO.** Process with the batch of prints an unexposed white sheet of photographic paper (same weight and size as majority of prints in batch). After the final wash, cut off a strip of this sheet and immerse it in a one per cent silver nitrate solution for about three minutes; then rinse in water and compare, while wet, in subdued daylight or artificial light, with the wet, untreated portion. If the hypo has been completely removed no colour difference should be observed. A yellow-brown tint indicates the presence of hypo.\*\*

**CAUTION :** Silver nitrate solution stains the skin black; avoid direct contact with the solution.

### OCCASIONAL EFFECTS WHEN USING H.E.1 ELIMINATOR

- (1) Tendency for prints to stick on the belt of belt driers, avoided by bathing the prints for 3 minutes in 1% formaldehyde prior to drying.
- (2) Slight change of image colour avoided by adding 15 grains of potassium bromide to each quart (1 gram per litre) of H.E.1.
- (3) Slight yellowing of whites avoided by bathing the prints in 1% sodium sulphite for 2 minutes prior to final wash.

\* For lower temperatures, increase the washing time. Double the washing time should be used when double-weight prints are treated.

\*\* A positive test with silver nitrate may also be obtained in the absence of hypo, if hydrogen sulphide or wood extracts are present in the water supply.

## HT.1a

## HYPO TEST SOLUTION

Metric		Avoirdupois	CHARACTERISTICS AND PURPOSE
1.2 grams	Potassium permanganate	40 grains	Solution for testing for elimination of hypo during washing of films and plates.
2.4 grams	Sodium hydroxide	85 grains	
1000 c.c.	Water (distilled) to make	80 ounces	

To make the test with film, take 8 ounces (250 c.c.) of pure water in a clear glass and add  $\frac{1}{4}$  drachm (1 c.c.) of the permanganate-caustic soda solution.

**FILMS OR PLATES :** Take six films or plates size  $3\frac{1}{4} \times 4\frac{1}{4}$  in. (or equivalent area) from the wash water and drain them into the glass of test solution. If hypo is present, the violet colour will turn orange in about 30 seconds and with a larger concentration the orange colour will change to yellow. In either case the film should be returned to the wash water until further tests produce no change in the violet colour.

**NOTE.** Since oxidisable organic matter, if present in the water, will react with the permanganate in a similar manner to hypo, a blank test should then be made. The permanganate solution is diluted as instructed but with distilled water and about 2 drachms (10 c.c.) of the mains water added.

**PAPERS :** Although the above test can also be used for testing papers (using six 4 × 5 in. prints or equivalent area) when complete freedom from hypo is required (e.g. for chlorobromide prints likely to be submitted to tropical conditions) the test is not a completely reliable indication and the hypo eliminator H.E.1 should be used in conjunction with the test for residual hypo given under this heading.

## AFTER-TREATMENT FORMULÆ

### SH.1

### FORMALIN HARDENER

Metric		Avoirdupois	CHARACTERISTICS AND PURPOSE
10.0 c.c.	Formalin (40% formaldehyde solution)	6 drachms	Alkaline formalin hardener for films or plates or for removing stains. Recommended for the treatment of negatives when the emulsion would otherwise be softened considerably by chemical treatments as in the removal of several types of stains, intensification or reduction.
13.5 grams (5.0 grams)	Sodium carbonate (cryst.) (or anhydrous)	1 ounce 35 grains 175 grains	
1000 c.c.	Water to make	80 ounces	

After hardening for 3 minutes in the above bath, negatives should be rinsed and immediately immersed for 5 minutes in a fresh acid fixing bath and washed thoroughly before they are given any further chemical treatment.

### R.1

### PERSULPHATE REDUCER

Metric		Avoirdupois	CHARACTERISTICS AND PURPOSE
1000 c.c.	Water	80 ounces	Super - proportional reducer for over-developed negatives of contrasty subjects.
60.0 grams	Ammonium persulphate	4 ounces 350 grains	
3.0 c.c.	Sulphuric acid (concentrated)	115 minims	

For use take 1 part Stock Solution and 2 parts water.

When reduction is complete, immerse the negative in an acid fixing bath for a few minutes, then wash.

## R.2 PERMANGANATE REDUCER

Stock Solution A		Avoirdupois	
Metric			
52.5 grams	Potassium permanganate	4 ounces	90 grains
1000 c.c.	Water to make	80 ounces	
Stock Solution B		Avoirdupois	
Metric			
1000 c.c.	Cold water	80 ounces	
32.0 c.c.	Sulphuric acid (concentrated)	2 ounces	4 drachms

### CHARACTERISTICS AND PURPOSE

Cutting reducer for general use. For reducing density without loss of contrast. The stock solutions keep well but the mixture should be used immediately.

Add the sulphuric acid very gradually to the water with constant stirring.

For use, take :

Stock solution A	...	...	1 part
Stock solution B	...	...	2 parts
Water	...	...	64 parts

When the negative has been sufficiently reduced, immerse it in a 2 per cent solution of sodium bisulphite to remove the stain. Fix in a fresh acid fixing bath for a few minutes, after which wash thoroughly.

It is very important to wash the negative thoroughly before giving this treatment—otherwise an iridescent irremovable scum may appear on the negative after drying.

## R.4a FARMER'S REDUCER

Stock Solution A		Avoirdupois	
Metric			
75.0 grams	Potassium ferricyanide	6 ounces	
1000 c.c.	Water to make	80 ounces	
Stock Solution B		Avoirdupois	
Metric			
240.0 grams	Hypo	19 ounces	
1000 c.c.	Water to make	80 ounces	

### CHARACTERISTICS AND PURPOSE

A cutting reducer for correcting over-exposure and cleaning the shadow areas of negatives. Solutions A and B should not be combined until they are to be used. They will not keep long in combination.

For use, take 1 part solution A, 4 parts solution B, then add water 27 parts. Pour the mixed solution at once over the negative to be reduced. Watch closely. The action is best seen when the solution is poured over the negative in a white tray. When the negative has been reduced sufficiently, wash thoroughly before drying.

## R.4b TWO-SOLUTION FARMER'S REDUCER

Solution A		Avoirdupois	
Metric			
7.5 grams	Potassium ferricyanide	260 grains	
1000 c.c.	Water to make	80 ounces	
Solution B		Avoirdupois	
Metric			
200.0 grams	Hypo	16 ounces	
1000 c.c.	Water to make	80 ounces	

### CHARACTERISTICS AND PURPOSE

This formula has the advantage of giving almost proportional reduction, thus correcting for over-development and lowering contrast.

Treat the negatives in solution A with uniform agitation for 1 to 4 minutes at 65° F.-75° F. (18° C.-21° C.), depending on the degree of reduction desired. Then immerse them in solution B for 5 minutes and wash thoroughly. The process may be repeated if more reduction is desired. For the reduction of general fog, one part of solution A should be diluted with one part of water.

## R.5 PROPORTIONAL REDUCER

Stock Solution A		Avoirdupois		CHARACTERISTICS AND PURPOSE
Metric				
16.0 c.c.	Sulphuric acid (10% solution)	1 ounce	2 drachms	A proportional reducer for lowering the contrast of negatives.
0.3 gram	Potassium permanganate	11 grains		
1000 c.c.	Water to make	80 ounces		
Stock Solution B		Avoirdupois		
Metric				
30.0 grams	Ammonium persulphate	2 ounces	175 grains	
1000 c.c.	Water to make	80 ounces		

For use, take 1 part of A to 3 parts of B. When sufficient reduction is secured, the negative should be cleared in a 1 per cent solution of sodium bisulphite. Wash the negative thoroughly before drying.

To obtain consistent results it is recommended that distilled water (or water free from iron) be used in making up these stock solutions.

## R.8 MODIFIED BELITZSKY REDUCER

Avoirdupois		CHARACTERISTICS AND PURPOSE	
Metric			
25.0 grams	Ferric chloride	A single solution cutting reducer that keeps well in a tank. Suitable for professional and motion picture use. Specially suitable for the treatment of dense negatives, by lowering the contrast and clearing the shadows.	
75.0 grams	Potassium citrate		
60.0 grams	Sodium sulphite (cryst.)		
(30.0 grams)	(or anhydrous)		
20.0 grams	Citric acid		
200.0 grams	Hypo		
1000 c.c.	Water to make		
			2 ounces
			6 ounces
			4 ounces 350 grains
		(2 ounces 175 grains)	
		1 ounce 260 grains	
		16 ounces	
		80 ounces	

Dissolve the chemicals in the order given.

Use full strength for maximum rate of reduction. Treat negatives 1 to 10 minutes at 65° F.-70° F. (18°-20° C.). Then wash thoroughly. If a slower action is desired, dilute 1 part of solution with 1 part of water.

## R.21 BLEACHING AND CLEARING BATHS

Stock Solution A—Bleaching Bath		Avoirdupois		CHARACTERISTICS AND PURPOSE
Metric				
1000 c.c.	Water	80 ounces		Bleaching and clearing baths used in conjunction with Formula D.168 in the Kodak Reversal Process (see page 18).
50.0 grams	Potassium bichromate	4 ounces		
50.0 c.c.	Sulphuric acid	4 fluid ounces		

Dissolve the bichromate in the water, then add the sulphuric acid slowly, and with constant stirring, to the cold solution. For use dilute 1 part of stock solution with 9 parts of water.

Stock Solution B—Clearing Bath		Avoirdupois	
Metric			
1000 c.c.	Water	80 ounces	
100.0 grams	Sodium sulphite (cryst.)	8 ounces	
(50.0 grams)	(or anhydrous)	(4 ounces)	
1.0 gram	Sodium hydroxide		35 grains

## R.22 ETCH-BLEACH BATH

Avoirdupois		CHARACTERISTICS AND PURPOSE
Metric		
100.0 c.c.	Hydrogen peroxide (20 vol.)	A bath for etching gelatin from negatives image-wise, to leave a plain gelatin stencil.
10.0 grams	Cupric chloride (hydrate)	
50.0 c.c.	Acetic acid (glacial)	
1000 c.c.	Water to make	
		8 ounces
		350 grains
		4 ounces
		80 ounces

Rock the negative in the solution until the silver image has changed to a light buff colour. The gelatin in these regions will then have been decomposed. Swab the negative gently with cotton-wool to remove the last traces of the image.

## IN.1 MERCURY INTENSIFIER

Bleach the negative in the following solution until it is white, then wash thoroughly:

### CHARACTERISTICS AND PURPOSE

A mercury intensifier recommended where considerable intensification is desired. Where permanence of the resulting image is essential ammonia should not be used for blackening.

Metric		Avoirdupois
22.5 grams	Potassium bromide	1 ounce 350 grains
22.5 grams	Mercuric chloride	1 ounce 350 grains
1000 c.c.	Water to make	80 ounces

The negative can be blackened with 10 per cent sulphite solution, a developing solution, such as Formula D.72, diluted 1 to 2, or 10 per cent ammonia; these give progressively greater density in the order given. To increase contrast greatly, treat with the following solution:

Metric		Avoirdupois
15.0 grams	Sodium or potassium cyanide	1 ounce 90 grains
22.5 grams	Silver nitrate (cryst.)	1 ounce 350 grains
1000 c.c.	Water to make	80 ounces

Dissolve the cyanide and silver nitrate separately, and add the latter to the former, until a permanent precipitate is just produced; allow the mixture to stand a short time and then filter.

**WARNING:** Cyanide is a deadly poison and should be handled with extreme care. It reacts with acid to form poisonous hydrogen cyanide gas. When discarding a solution containing cyanide, always run water to flush it out of the sink quickly. Cyanide solutions should never be used in poorly ventilated rooms.

## IN.4 CHROMIUM INTENSIFIER

### CHARACTERISTICS AND PURPOSE

An intensifier which permits of the degree of intensification being controlled by varying the time of re-development or by repeating the process. The intensification is approximately proportional.

Metric	Stock Solution	Avoirdupois
90.0 grams	Potassium bichromate	7 ounces 90 grains
64.0 c.c.	Hydrochloric acid (concentrated)	5 fluid ounces
1000 c.c.	Water to make	80 ounces

For use take 1 part of stock solution to 10 parts of water.

Bleach thoroughly, wash until the yellow stain is removed (immersing the bleached and rinsed negative in a 5% solution of sodium carbonate for a few moments quickens this stage) and then re-develop with a non-staining developer, e.g. D.72, in artificial light or diffused daylight. Wash thoroughly and dry. If greater density is required, the operation may be repeated. The degree of intensification can be controlled by varying the time of re-development.

**N.B.** Fine grain developers of the borax type containing a high concentration of sulphite, are not suitable for re-development since the sulphite tends to dissolve the silver chloride before the developing agents have time to act on it.

## IN.5 SILVER INTENSIFIER

### CHARACTERISTICS AND PURPOSE

A proportional intensifier which will not change the colour of the image or affect its stability. Easily controlled by varying the time of treatment. Equally suitable for positive and negative film.

Metric	Stock Solution No. 1 (Store in a brown bottle)	Avoirdupois
60.0 grams	Silver nitrate (cryst.)	4 ounces 350 grains
1000 c.c.	Distilled water to make	80 ounces
Stock Solution No. 2		
120.0 grams (60.0 grams)	Sodium sulphite (cryst.) (or anhydrous)	9 ounces 260 grains (4 ounces 350 grains)
1000 c.c.	Water to make	80 ounces
Stock Solution No. 3		
105.0 grams	Hypo	8 ounces 175 grains
1000 c.c.	Water to make	80 ounces
Stock Solution No. 4		
10.0 grams (5.0 grams)	Sodium sulphite (cryst.) (or anhydrous)	350 grains (175 grains)
8.0 grams	"Elon"	280 grains
1000 c.c.	Water to make	80 ounces

Prepare the intensifier solution for use as follows: Slowly add 1 part of solution No. 2 to 1 part of solution No. 1, stirring to obtain thorough mixing. The white precipitate which appears is then dissolved by the addition of 1 part of solution No. 3. Allow the resulting solution to stand a few minutes until clear. Then add, while stirring, 3 parts of solution No. 4. The intensifier is then ready for use and the film should be treated immediately. The degree of intensification obtained depends upon the time of treatment, which should not exceed 25 minutes. After intensification, immerse the film for 2 minutes, with agitation, in a plain 30 per cent hypo solution. Then wash thoroughly.

The mixed intensifier solution is stable for approximately 30 minutes at 65° F. (18° C.).

All dishes used must be scrupulously clean and the operations should preferably take place in artificial light.

## IN.21 URANIUM INTENSIFIER

### Solution A

Metric		Avoirdupois
20.0 grams	Uranium nitrate	2 ounces
10 c.c.	Glacial acetic acid	1 fluid ounce
500 c.c.	Water to make	50 ounces

### Solution B

20.0 grams	Potassium ferricyanide	2 ounces
500 c.c.	Water to make	50 ounces

### CHARACTERISTICS AND PURPOSE

A simple method of obtaining maximum intensification in films or plates. As with all uranium methods, clean working and exact observance of instructions are necessary if satisfactory results are to be obtained.

Use 1 part A, 1 part B and 6 parts of water. The film or plate should be washed very thoroughly after fixing, to remove all traces of hypo. Maximum intensification will be obtained with 2-3 minutes' immersion in the above working solution; further treatment only increases fog. The intensified image should have a reddish-brown colour. Wash only briefly before drying, since the usual alkaline wash water will destroy the intensification.

## T.9 URANIUM TONER

### CHARACTERISTICS AND PURPOSE

A convenient toner for obtaining brown to red tones in slides or films. Suitable for motion picture work.

Metric		Avoirdupois
2.5 grams	Uranium (uranyl) nitrate	90 grains
2.5 grams	Potassium oxalate	90 grains
1.0 gram	Potassium ferricyanide	35 grains
6.0 grams	Ammonium alum	210 grains
5.0 grams	Hydrochloric acid (10% solution)	190 minims
1000 c.c.	Water to make	80 ounces

Dissolve the chemicals in the order given.

The solution should be perfectly clear and pale yellow in colour.

It is light-sensitive, however, and should be stored in the dark. The maximum effect is produced in about 10 minutes, the tone passing from brown to red during this time.

It is convenient to keep 10 per cent stock solutions of the constituent chemicals of the above toning bath for quick compounding of a new bath.

After toning, wash for about 10 minutes, though the washing should not be prolonged, especially if the water is slightly alkaline, since the toned image is soluble in alkali.

## T.11 IRON TONER

### CHARACTERISTICS AND PURPOSE

Toner for obtaining blue tones on lantern slides or films. By mixing the uranium (T.9) and iron (T.11) toning solutions in different proportions, tones ranging from reddish-brown to chocolate are produced. Analogous results may be obtained by immersing in each solution successively for varying times.

Metric		Avoirdupois
0.5 gram	Ammonium persulphate	17 grains
1.4 grams	iron ammonium sulphate (Ferric alum)	50 grains
3.0 grams	Oxalic acid	105 grains
1.0 gram	Potassium ferricyanide	35 grains
5.0 grams	Ammonium alum	175 grains
1.0 c.c.	Hydrochloric acid (10% solution)	40 minims
1000 c.c.	Water to make	80 ounces

Dissolve the chemicals in the order given.

The method of compounding this bath is very important. Each of the solid chemicals should be dissolved separately in a small volume of water, the solutions then mixed strictly in the order given, and the whole diluted to the required volume. If these instructions are followed, the bath will be pale yellow in colour and perfectly clear.

Immerse the slides or films from 2 to 10 minutes at 70° F. (21° C.) until the desired tone is obtained. Wash for 10 to 15 minutes until the high-lights are clear. A very slight permanent yellow coloration of the clear gelatin will usually occur, but should be too slight to be detectable on projection. If the high-lights are stained blue, then either the slide (film) was fogged during development, or the toning bath was stale, or not mixed correctly.

Since the toned image is soluble in alkali, washing should not be carried out for too long a period especially if the water is slightly alkaline.



**T.17 MORDANTING BATH FOR DYE TONING**

Metric	Stock Solution	Avoirdupois	CHARACTERISTICS AND PURPOSE
8.0 grams	Uranium (uranyl) nitrate	280 grains	Uranium mordanting bath for dye toning of lantern slides or film.
4.0 grams	Oxalic acid	140 grains	
4.0 grams	Potassium ferricyanide	140 grains	
1000 c.c.	Water to make	80 ounces	

The uranyl nitrate should be of good quality and should not contain an excess of free nitric acid. First dissolve each chemical separately in a small volume of water. Then add the oxalic acid solution to the uranyl nitrate solution and finally add the ferricyanide solution. After mixing the bath should be light yellow and perfectly clear. The solution should not be exposed to light more than is necessary.

For use take 1 part of stock solution and 4 parts water.

Immerse the film at 65° to 70° F. (18° to 21° C.) until a very slight chocolate-coloured tone is obtained, and remove at once. If mordanting is prolonged much beyond this point, inferior tones will be produced.

With a new bath this will require from 1½ to 2 minutes, but the time will need to be increased as the bath ages. The solution may be revived at intervals by adding a little of the concentrated stock solution.

After mordanting, wash until the high-lights are free from yellow stain. This usually takes about 10 to 15 minutes. Do not prolong the washing for more than 20 minutes or some of the mordant will be washed out.

**T.17a DYE BATH**

Metric	Dye	Avoirdupois	CHARACTERISTIC AND PURPOSES
0.2 gram	*Acetic acid, 10%	7 grains	Dye toning bath for use with T.17.
5.0 c.c.	Water to make	3 drachms	
1000 c.c.		80 ounces	

\* To convert glacial acetic acid into 10% acetic acid, take 1 part glacial acetic acid and add it slowly to 9 parts of water.

Thoroughly dissolve the dye in hot water, add the acid and dilute to volume with cold water.

The following dyes are suitable for toning.

Safranin A	Red
Chrysoidine 3R	Orange
Auramine	Yellow
Victoria Green	Green
Methylene Blue BB	Blue
*Methyl Violet	Violet

\* For methyl violet use one-quarter the quantity of dye given in the formula.

Immerse the mordanted and washed film in the dye bath for 2 to 15 minutes according to the colour desired. The quantity of dye which mordants to the image increases with time. In case an image is over-dyed, some of the dye may be removed by immersing in a 0.2% solution of ammonia; then rinse before drying.

If after dyeing for 10 minutes, the image does not mordant sufficient dye, remove the film, wash thoroughly, immerse again in the mordanting bath, wash and re-dye.

Intermediate colours can be obtained either by mixing the dye solutions or by immersing the film in successive baths.

**T.51 HYPO-ALUM TONING BATH**

Metric	Stock Solution	Avoirdupois	CHARACTERISTICS AND PURPOSE
1 lb. (200 grams)	Hypo solution	1 lb. (200 grams)	Hypo-alum toner — a direct toning bath for papers.
3½ ounces (44 grams)	Ordinary potassium alum	3½ ounces (44 grams)	

To prepare the hypo-alum toning bath, dissolve 1 lb. (200 grams) of hypo in 80 ounces (1000 c.c.) of hot water, then add 3½ ounces (44 grams) of ordinary potassium alum; stir well and boil for two or three minutes; cool down to about 150° F. (65° C.) and add the following silver ripener:—

Dissolve 20 grains (0.5 grams) of silver nitrate in 1 ounce (15 c.c.) of water and add, drop by drop (.880) ammonia with vigorous stirring until the precipitate first formed is just re-dissolved, and stir the solution so formed into the hypo-alum mixture. In a further ounce (15 c.c.) of water dissolve 40 grains (1 gram) of potassium iodide; add this also to the hypo-alum mixture and stir well.

This bath can be used repeatedly. It may be kept up to its original bulk by the occasional addition of fresh solution, being discarded when it ceases to tone satisfactorily.

Prints for toning by this method should be fixed as usual, briefly rinsed in water, soaked for ten minutes in a saturated solution of potassium alum, rinsed and then toned at a temperature not exceeding 140° F. (60° C.). After toning, sponge the prints with lukewarm water to remove sediment and wash as usual.

**\* T.52 SEPIA TONER—SULPHIDE METHOD**

Metric	A. Bleaching Solution	Avoirdupois	CHARACTERISTICS AND PURPOSE
50.0 grams	Potassium ferricyanide	4 ounces	Bleaching and re-development toner; sulphide method for bromide prints.
50.0 grams	Potassium bromide	4 ounces	
1000 c.c.	Water to make	80 ounces	
200.0 grams	B. Stock Sulphide Solution		
1000 c.c.	Sodium sulphide (pure)	16 ounces	
	Water to make	80 ounces	
50.0 c.c.	C. Toning Solution		
1000 c.c.	Stock Solution B	4 ounces	
	Water to make	80 ounces	

Bleach in solution A, wash until yellow stain is removed, and tone in solution C. Complete with brief washing in running water. Throw away solution C after use.

\* Available as "Kodak" Sepia Toner in packed Powder and Solution form.

**\* T.55 SELENIUM TONER**

Metric	Stock Solution	Avoirdupois	CHARACTERISTICS AND PURPOSE
300.0 grams (150.0 grams)	Sodium sulphite (cryst. (or anhydrous)	24 ounces (12 ounces)	A single-solution toner for chloro-bromide papers and warm-tone lantern slides, yielding a variety of tones from brown to red-brown according to depth and colour of the developed image. Images toned in this bath may be further enriched by subsequent toning in T.52.
6.0 grams	Selenium powder	210 grains	
190.0 grams	Ammonium chloride	15 ounces	
1000 c.c.	Water to make	80 ounces	

Dissolve the sulphite in about 700 c.c. of hot water, then add the selenium powder and boil until it is completely dissolved. Allow the solution to cool; then add the ammonium chloride and stir until it is dissolved. Finally make up to the required bulk with cold water.

For use dilute 1 part of stock solution with five parts of water.

Prints should be fixed and well washed before toning in the above solution for 10 to 15 minutes at 65° F. (18° C.). Finally wash well before drying.

\* Available as "Kodak" Selenium Toner in concentrated solution form.

**T.56 SULPHIDE-SELENIUM TONER**

Metric	A. Bleaching Solution	Avoirdupois	CHARACTERISTICS AND PURPOSE
50.0 grams	Potassium ferricyanide	4 ounces	Sulphide-selenium toner for chloro-bromide, gas-light and other papers which do not give a satisfactory tone in Formula T.52.
50.0 grams	Potassium bromide	4 ounces	
1000 c.c.	Water to make	80 ounces	
250.0 grams	B. Stock Sulphide-Selenium Solution		
5.7 grams	Sodium sulphide (pure)	20 ounces	200 grains
1000 c.c.	Selenium powder	80 ounces	
	Water to make		
50.0 c.c.	C. Toning Solution		
1000 c.c.	Stock solution B	4 ounces	
	Water to make	80 ounces	

Bleach in solution A until the yellow stain is removed and tone in solution C. Complete with brief wash in running water. Throw away solution C after use.

**TC.1 DISH CLEANER**

Metric	Stock Solution	Avoirdupois	CHARACTERISTICS AND PURPOSE
1000 c.c.	Water	80 ounces	A useful cleaner which will remove stains caused by oxidation products of developers, as well as silver stains, and some dye stains.
90.0 grams	Potassium bichromate	7 ounces	
96.0 c.c.	Sulphuric acid (concentrated)	8 ounces	

Dissolve the bichromate in the water, cool and add the sulphuric acid slowly, whilst stirring the solution.

Pour a small volume of the dish cleaner solution into the vessel to be cleaned. Rinse the solution around so that it has access to all parts of the vessel. Then pour off and wash the dish thoroughly with six or eight changes of water.



**TC.2****SILVER STAIN REMOVER**

Metric		Stock Solution A	Avoirdupois		CHARACTERISTICS AND PURPOSE
1000 c.c.	Water		80 ounces		Dish cleaner for the removal of silver and most other stains.
5.0 grams	Potassium permanganate		175 grains		
10.0 c.c.	* Sulphuric acid (concentrated)		6 drachms		

\* Add the sulphuric acid slowly while stirring the permanganate solution rapidly.

Metric		Stock Solution B	Avoirdupois	
1000 c.c.	Water		80 ounces	
10.0 grams	Sodium bisulphite		350 grains	

For use, pour a sufficient quantity of solution A into the dish to cover the stains and allow it to remain for a few minutes, then rinse with water. Apply solution B, and wash thoroughly.

**S.5****HAND STAIN REMOVER**

Metric		Solution No. 1	Avoirdupois		CHARACTERISTICS AND PURPOSE
7.5 grams	Potassium permanganate		260 grains		Hand stain remover.
1000 c.c.	Water to make		80 ounces		

Metric		Solution No. 2	Avoirdupois	
480.0 grams	Sodium bisulphite		38 ounces	
1000 c.c.	Water to make		80 ounces	

Rub the hands in a small volume of the No. 1 Solution, rinse in water; then rinse with No. 2 Solution, which will remove the stains. Finally wash the hands thoroughly with water.

**S.6****STAIN REMOVER**

Metric		Stock Solution A	Avoirdupois		CHARACTERISTICS AND PURPOSE
5.3 grams	Potassium permanganate		185 grains		Removal of developer oxidation stains from negatives.
1000 c.c.	Water to make		80 ounces		

Metric		Stock Solution B	Avoirdupois	
75.0 grams	Sodium chloride		6 ounces	
16.0 c.c.	Sulphuric acid (concentrated)		1 ounce	135 minims
1000 c.c.	Water to make		80 ounces	

Use equal parts of A and B.

In mixing Stock Solution B, care should be taken to see that the sodium chloride solution is cool before adding the sulphuric acid slowly and with constant stirring.

The negative should first be hardened by immersion in a 5 per cent formalin solution for 2 or 3 minutes, followed by 5 minutes washing. The image is then bleached, an operation which should be complete in 3 to 4 minutes at 65° F. (18° C.). The brown stain of manganese dioxide is then removed by immersing the negative in 1% sodium bisulphite solution. Then rinse well and develop in strong light with any non-staining developer, e.g. D.72 diluted 1 part to 2 parts water. (Do not use a developer containing high sulphite and low alkali content, because the sulphite tends to dissolve the silver image before the developer can act on it.)

**CLEANING FORMULAE****FOR CLEANING DEVELOPER HANGERS AND CLIPS**

Dilute 5 fluid ounces (60 c.c.) of glacial acetic acid with water to make 80 ounces (1000 c.c.) of solution. Soak in this solution for one hour, and scrub in clean water.

**FOR CLEANING VERTICAL TANKS**

Deep tanks should be scrubbed thoroughly with clean water, preferably by means of a double-sided brush. It is advisable to sterilize the developer tanks occasionally, especially during warm weather, in order to prevent bacterial growth.

Stone tanks can be sterilized by scrubbing the sides and bottom with a paste of bleaching powder (chloride of lime) made by mixing the dry solid with water. The tanks can also be cleaned with a solution of sodium hypochlorite, prepared by adding a 10 per cent solution of sodium carbonate to a 4 per cent solution of bleaching powder until no more precipitate forms. The mixture is allowed to settle and the clear solution of sodium hypochlorite is decanted from the sediment.

Tanks which have been sterilized by either of these methods should be thoroughly washed before use.

*Issued by the Research Laboratories, Kodak Ltd., W'eadstone, Harrow, Middx.*