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The Preparation of Plantation Rubber.

ISSUED BY

The Rubber Growers' Association

(INCORPORATED)

38, EASTCHEAP,
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CONTENTS.

INTRODUCTION.

The Recommendations for the Treatment of Latex and Curing of Rubber previously published were intended to supply instructions for carrying through the main operations for the preparation of sheet and crepe rubber.

In reviewing these Recommendations the Committee has had the advice of its Scientific Officers. The details have been brought up to date and separate Recommendations for Sheet and Crepe drawn up.

In fixing the proportions of water and acetic acid or other ingredients, certain suitable ratios have been adopted, but approximately similar ratios may serve the purpose equally well.

Recognizing that it is not possible to fix once and for all the exact amount of acid or other ingredient necessary for the treatment of a definite bulk of latex, the Recommendations, nevertheless, are to be taken as a guide to be adhered to as closely as possible, with small modifications to suit local conditions.

Appended are two further descriptive Articles on the methods of preparing plantation rubber which have been written independently by the senior local Scientific Officers in Malaya and Ceylon.

As local conditions are not identical, some variations will be noticed in the Articles from Malaya and Ceylon respectively, which may also differ in detail from the Recommendations.

It will, however, be found that these differences are of a minor character and that the results to be aimed at are the same throughout, As regards the preparation of Sheet rubber, attention may also be directed to Mr. Morgan's comprehensive Report of November 20th. 1915, which, although written some time ago, is worthy of careful study.

The Committee also desires to call attention to the circular to members headed "Packing of Plantation Rubber dated 28th. February, 1917, and reprinted at the end of this volume.

CLAYTON, BEADLE & STEVENS.

The Rubber Growers' Association
(INCORPORATED).

Recommendations for the Treatment of Latex and Curing of SHEET Rubber.

Compiled by the Uniformity Committee from information supplied by the Scientific Staff.

SHEET.

IN THE FIELD.

1.—Cups, Buckets and other Utensils should be selected with a view to ease in cleaning, and should be kept absolutely clean. Vessels made of copper, or any alloy of copper, and kerosine tins or receptacles with similar angles should be avoided.

2.—Water in Cups.—The use of this is not desirable. If the latex tends to coagulate too quickly, a very weak solution of Sodium Sulphite (not Bisulphite) may be used.

3.—Water on the Transverse Cuts should not be used. Often the latex coagulates prematurely as a result of employing water on fresh cuts.

4.—Bark Shavings and other impurities should not be allowed in the cups or buckets. Place the cup in position after and not before paring.

5.—Collection of Latex.—Latex should not be allowed to stand in the cups after the flow has ceased. It is recommended that in collecting, the following grades be recognised and kept separate :—

(*a*) Clean uncoagulated latex ;
(*b*) Lump, coagulated in the cups
(*c*) Rinsings from the cups.

6.—Transport of Latex.—The quick transport of latex into the factory is essential. When distance of transport is great, out-station coagulating houses should be erected.

To avoid premature coagulation either of the following may be used :—

Sodium Sulphite (in collecting buckets).

(*a*) Dissolve Anhydrous Sodium Sulphite in water at the rate of 1lb. of powder to 3 gallons of water.

(*b*) Use this in collecting buckets at the rate of about half-a-pint of solution for a 2 gallon bucket.

Formaline (in collecting buckets).

(*a*) Dilute strong Formaline at the rate of 8 fluid ounces per gallon of water.

(*b*) This solution is used at the rate of 2 ounces per gallon of latex.

N.B.—Formaline must not be added if a solution of Sodium Sulphite has already been used.

IN THE FACTORY.

WATER SUPPLY.

7.—Water.—There should be a plentiful supply of good water.

RECEPTION OF LATEX.

8.—Preliminary Treatment.—To avoid dirt in the factory the latex should be received, if possible, on a verandah, so that there is no necessity for tapping coolies to enter the building.

9.—Supervision.—The reception of latex should be under direct European supervision. Causes of defects in the finished rubber are thus often detected.

10.—Cleanliness in utensils and methods is absolutely necessary ; any neglect in this respect is sure to detract from the quality of the rubber.

11.—Straining of Latex should be thorough, care being taken to see that the mesh is in good order.

12.—Bulking of Latex in quantities of not less than 50 gallons is recommended for the following reasons :—

(*a*) To avoid waste of coagulant and preservative.

(*b*) To obtain the maximum percentage of first quality rubber.

(*c*) To secure uniformity.

13.—Standardization of Latex.—As a further means of obtaining uniformity, it is advisable that the Latex should be diluted to a dry rubber content of 1½lbs. per gallon. **For this purpose the use of the METROLAC is strongly recommended.**

14.—Sodium Bisulphite should not be used in making sheet rubber.

COAGULATION.

15.—Coagulant.—Acetic Acid is recommended as the best coagulant. This should be perfectly clear and colourless. If the acid shows the slightest tint of blue it should be rejected, as this indicates the presence of copper.

16.—Strength of Acid Solution.—Stock solution should be made up as follows :—

Take one part of concentrated Acetic Acid, of 98/100 per cent. strength, and dilute it with 100 parts of pure water.

If in making this stock solution a more dilute acid be employed, such as an acid of 80 per cent. strength, a proportionately greater amount of acid must be taken ; thus with an 80 per cent. acid, 1¼ parts must be taken instead of one part.

In effecting coagulation overnight the maximum amount of this stock solution, which need never be exceeded, is :—

1 part of stock solution to 12 parts of standardised latex.

It will frequently be found that less than this amount is enough to produce complete coagulation, and the minimum amount which is effective should be ascertained by trial.

If the latex has been diluted below the standard strength, a proportionate reduction in the amount of the coagulant should be made.

17.—Mixing of acid and latex should be thorough. This is best effected by means of broad wooden paddles. Sticks must not be allowed for the purpose. The scum should be removed and added to the lumps or scrap.

(*a*) For the preparation of sheet rubber in coagulating tanks any quantity of latex may be coagulated in bulk ;

(*b*) When ordinary dishes are used, not more than 50 gallons of latex should be treated with acid in one batch, as the latex sometimes coagulates before all can be poured out into the dishes. It is sometimes expedient to use a diluted solution of Sodium Sulphite or Formaline to prevent rapid coagulation. (*Vide* par. 6.)

MACHINERY.

Glazed white tiles are recommended for the flooring underneath and around the rolling machinery.

18.—(*a*) For economy in working it is recommended that the rubber should pass consecutively through the following 3 machines :—

Twice through a smooth roller machine widely set.

Twice through a smooth roller machine more closely set.

Once through a marking roller machine.

(*b*) **The Thickness of the Rubber** determines the rate of drying. At the standard dilution of Latex of 1½lbs. dry rubber per gallon, it should be arranged that the thickness of the coagulated sheet be 1½in. This when rolled down should take an excellent pattern, giving a sheet about ⅛in. thick, which should dry in 9 to 10 days.

(*c*) **Grooving.**—The grooving should be cut spirally in the same direction on each roller. A type of roller which is proving satisfactory has spiral grooves placed at an angle of 45° across the face of the roller with 3/16 of an inch between the grooves, which have a depth and width of ⅛in. square cut. The close ribbing thus produced gives good appearance and increases the rapidity of drying.

(*d*) **Speed of Rollers.**—The two rollers of each machine should run at equal speed. A high speed is permissible with the smooth rollers. Marking rollers give best impression when working at a steady low speed about 50-60ft. per min.

(*e*) **Output.**—When working under these conditions a set of 3 power driven machines as above should roll not less than 300lbs. (dry weight) of sheet per hour; a similar set of hand power machines not less than 150lbs. per hour.

NOTE.—The Scientific Officers of the R.G.A. are well acquainted with every type of machine suitable for the preparation of rubber on Estates, and also from their practical knowledge can assist in the planning of Factories and Smoke-houses. Their advice is always available to members of the Association or their Superintendents.

SCRAP RUBBER.—

The treatment of Scrap grades is dealt with in the Recommendations for **CREPE.**

CARE OF MACHINERY.

19.—Machines must be well cleaned and inspected each day before commencing work. At frequent intervals (say, once a week), they should be thoroughly cleansed of all traces of oil by means of a 5 per cent. solution of caustic soda. This must be applied under careful supervision, by means of a cloth fastened to the end of a stick. The machines should thereafter be set in motion with the water running for about ten minutes.

20.—Lubrication.—Avoid using an excess of oil or grease. The engine driver, or other responsible person, should attend to this work.

21.—Worn Parts must be replaced at once. Keep spares in pares in stock.

SMOKE CURING.

22.—(*a*) Adequate ventilation in the Smoke-house is essential for efficient curing, otherwise the atmosphere will become saturated with moisture which renders drying impossible, and may be the cause of many defects in the finished sheets.

(*b*) **Fuel.**—It is imperative that the timber used should be dry, and a shed for storing a sufficient supply is recommended.

(*c*) Sheets should always be as uniform in thickness as possible, and the period of smoke curing should also be uniform.

Sheets not exceeding ⅛in. in thickness should dry in 9/10 days.

(*d*) The best temperature for smoking is 110° to 120°F.

23.—DEFECTS.

DEFECTS TO BE AVOIDED.	PREVENTIVES.
(1) **Oil Streaks** ...	See that oil from the bearings does not get on to the rubber— (a) through use of too much lubricating oil; (b) through worn bearings. These should be replaced immediately as oil from worn bearings contains particles of copper or verdigris, which gradually eat into the rubber and reduce it to the consistency of treacle. (c) By taking care that the sheet does not come near the edge of the rollers or other parts of the machinery which may be oily. Trays if used under the washing mills should be narrower than the width of the rollers, or be replaced by a narrow piece of hard wood.
(2) **Cotton Fluff** ...	Do not use cotton waste for cleaning the machines nor for keeping oil off the rollers; use flannel or cloth for cleaning purposes. Avoid using too much oil.
(3) **Tackiness (Heat and Stickiness)**	See that the rubber is not exposed to the direct rays of the sun or left in a heap before it is dried. See also under (1).

23.—DEFECTS—*Continued.*

DEFECTS TO BE AVOIDED.	PREVENTIVES.
(4) **Mouldiness** ...	Smoking must be thorough and ventilation carefully adjusted so that drying is complete. The smoked sheets must not be exposed in any way to dampness or they will pick up moisture sufficient to allow the growth of moulds.
(5) **Rust (Stretching rusty, or resinous)**	(a) Latex standardized in accordance with Par. 13 is less liable to produce rusty sheets. (b) A simple method of avoiding Rust is to allow the sheets to drip for a short interval after rolling, and then place them in the smoke house at once. (c) If method (b) does not succeed, allow the sheets to drip for 5 hours, soak for 10 minutes in water as hot as the hand can bear (not boiling), then wash and scrub well in **running** cold water before transfer to smoke house.
(6) **Over Smoking (Dull Black or glossy surface)**	(a) Do not leave sheets too long in the smoke-house. (b) Avoid the use of too large a proportion of coconut husks, rubber seed, or similar oily material in the fuel used. (c) Fuel should be dry, but the fires must not be allowed to burst into flame. (d) Avoid using an excess of Sodium Sulphite. (e) If these methods are not successful, more ventilation should be given in the roof ridge.
(7) **Tar Deposits** ...	No drip from the roof of the smoke-house must be allowed to come in contact with the rubber. Keep the racks clean. Act also on (6e).
(8) **Surface Dirt** ...	Sheets should be well brushed before packing, or if necessary scrubbed in cold water and then air dried for a day or two.
(9) **Thickened Edges**	Take care that the edges are not doubled over in rolling, or they may not be cured through. Avoid the use of dishes with slightly domed bottoms, which may be the cause of this defect.
(10) **Bubbles** ...	It will help to avoid this blemish if care be taken to use the right proportion of coagulant evenly mixed. There should be no undue delay in working and drying.
(11) **Faint Ribbing**...	Avoid too much rolling with the smooth rollers, and if necessary run the marking rollers more slowly and/or closer together.

SORTING AND GRADING.—

24.—Great attention and careful supervision should be given to these operations. Any sheets over-smoked or showing imperfections should be packed separately.

PACKING.—

25.— (I.) All cases must be planed and thoroughly cleaned inside before packing. Consumers frequently complain of chips, splinters and sawdust getting into the rubber.

(II.) Avoid using cases with cracks or other defects.

(III.) Care should be taken to assemble three-ply cases strictly in accordance with makers' instructions.

(IV.) Cases other than three-ply should be of stout wood not less than $\frac{5}{8}$ths of an inch thick after being planed.

(V.) The usual sized cases employed measure 5 cubic feet; 10 cases (19in. by 19in. by 24in.) measure one shipping ton of 50 cubic feet.

(VI.) In each case it is possible to pack 200lbs., and the case arrives in better condition when full than when the rubber is slack packed. (About 5 per cent. more in three-ply cases.)

(VII.) By packing the maximum amount of rubber consistent with safety in a given sized case, an appreciable saving in freight can be made.

(VIII.) It is recommended to weigh out the rubber for each case before packing. Invoicing, etc., is facilitated by having an exactly similar amount of rubber in each package.

(IX.) Proper attention must be paid to nailing and banding.

GENERAL.

Consumers' worst enemy in Rubber is Tackiness, a very little of which will often spoil an otherwise good parcel.

38, EASTCHEAP,
LONDON, E.C.

March, 1917.

The Rubber Growers' Association

(INCORPORATED.)

Recommendations for the Treatment of Latex and Curing of CREPE Rubber.

Compiled by the Uniformity Committee from information supplied by the Scientific Staff.

CREPE.

IN THE FIELD.

1.—Cups, Buckets and other Utensils should be selected with a view to ease in cleaning and should be kept absolutely clean. Vessels made of copper, or any alloy of copper, and kerosine tins or receptacles with similar angles should be avoided.

2.—Water in Cups.—The use of this is not desirable. If the latex tends to coagulate too quickly, a very weak solution of Sodium Sulphite (not Bisulphite) may be used.

3.—Water on the Transverse Cuts should not be used. Often the latex coagulates prematurely as a result of employing water on fresh cuts.

4.—Bark Shavings and other impurities should not be allowed in the cups or buckets. Place the cup in position after and not before paring.

5.—Collection of Latex.—Latex should not be allowed to stand in the cups after the flow has ceased. It is recommended that in collecting, the following grades be recognised and kept separate:—

(*a*) Clean uncoagulated latex;
(*b*) Lump, coagulated in the cups;
(*c*) Rinsings from the cups.

6.—Transport of Latex.—The quick transport of latex into the factory is essential, When distance of transport is great, out-station coagulating houses should be erected.

To avoid premature coagulation either of the following may be used:—

Sodium Sulphite (in collecting buckets):—

(*a*) Dissolve Anhydrous Sodium Sulphite in water at the rate of 1lb. of powder to 3 gallons of water.

(*b*) Use this in collecting buckets at the rate of about half-a-pint of solution for a 2 gallon bucket.

Formaline (in collecting buckets) :—

(*a*) Dilute strong Formaline at the rate of 8 fluid ozs. per gallon of water.

(*b*) This solution is used at the rate of 2ozs. per gallon of latex.

N.B.—Formaline must not be added if a solution of Sodium Sulphite has already been used.

Collection of Scrap.—Earth rubber should be kept separate from other scrap and pickings.

IN THE FACTORY.

WATER SUPPLY.

7.—Water.—There should be a plentiful supply of good water.

RECEPTION OF LATEX.

8.—Preliminary Treatment.—To avoid dirt in the factory the latex should be received, if possible, on a verandah, so that there is no necessity for tapping coolies to enter the building.

9.—Supervision.—The reception of latex should be under direct European supervision. Causes of defects in the finished rubber are thus often detected.

10.—Cleanliness in utensils and methods is absolutely necessary ; any neglect in this respect is sure to detract from the quality of the rubber.

11.—Straining of Latex should be thorough, care being taken to see that the mesh is in good order.

12.—Bulking of Latex in quantities of not less than 50 gallons is recommended for the following reasons :—

(*a*) To avoid waste of coagulant and preservative.
(*b*) To obtain the maximum percentage of first quality rubber.
(*c*) To secure uniformity.

13.—Standardization of Latex.—As a further means of obtaining uniformity it is advisable that the latex should be diluted to a dry rubber content of 2lbs. per gallon. **For this purpose the use of the METROLAC is strongly recommended.**

14.—Sodium Bisulphite.—For crepe manufacture dissolve 1lb. of the powder in 10 gallons of water. This will be sufficient for 100 gallons of standardized latex. The solution should be well stirred in after bulking and before the addition of acid. Larger quantities of Sodium Bisulphite are unnecessary.

N.B.—Sodium Bisulphite is likely to be defective if delivered in damaged packages or unduly exposed to the air.

COAGULATION.

15.—Coagulant.—Acetic Acid is recommended as the best coagulant. This should be perfectly clear and colourless. If the acid shows the slightest tint of blue it should be rejected, as this indicates the presence of copper.

16.—Strength of Acid Solution.—Stock solutions should be made ould be made up as follows: —

Take one part of concentrated Acetic Acid, of 98/100 per cent. strength, and dilute it with 20 parts of pure water.

If in making this stock solution a more dilute acid be employed, such as an acid of 80 per cent. strength, a proportionately greater amount of acid must be taken; thus, with an 80 per cent. acid, 1¼ parts must be taken instead of one part.

In effecting coagulation overnight the maximum amount of this stock solution, which need never be exceeded, is :—

1 part of stock solution to 50 parts of standardized latex.

It will be frequently found that less than this amount is enough to produce complete coagulation, and the minimum amount which is effective should be ascertained by trial.

If the latex has been diluted below the standard strength, a proportionate reduction in the amount of the coagulant should be made.

17.—Mixing of acid and latex should be thorough. This is best effected by means of broad wooden paddles. Sticks must not be allowed for the purpose. In coagulating tanks any quantity of latex may be coagulated in bulk.

MACHINERY.

18.—Machinery for First Quality Crepe:—

Glazed white tiles are recommended for the flooring underneath and around the rolling machinery.

(1) Substantially built creping machines are recommended, and those with rollers 15in. face by 12in. diameter are suitable. For adjusting the rollers two plain screws are sufficient; worm adjusting gear adds to the cost and contains more working parts to get out of order.

(2) **Grooving.**—Horizontal grooving is as effective as any and has the advantage that the grooves can be easily recut. A square cut groove ⅛in. by ⅛in. and ½in. between centres has proved satisfactory.

(3) **Gear Ratio.**—24 : 25 for both grooved and smooth roller machines is recommended.

(4) **Speed.**—The peripheral velocity of the grooved rollers should not exceed 60 feet per minute, and that of the the smooth rollers 70 feet per minute; if rollers are differentially geared these speeds refer to the faster moving roller;

These speeds give a good rate of output per hour and allow the coolies time so to handle the rubber when passing it through the rollers that the machine can be fed continuously.

Machinery for Scrap Washing :—

(1) The use of one or other of the machines specially designed for washing out the bark and dirt from scrap rubber is recommended.

(2) Creping machines with grooved rollers can be used. A speed of 60 feet per minute for the faster moving rollers, with gear ratio not exceeding

2 : 1 is recommended. In other details these creping machines should be of the same design as already described for this type.

(3) The cleansed rubber can be finished off into thick or thin crepe in the same machinery as is used for first quality crepe

Note.—The Scientific Officers of the R.G.A. are well acquainted with every type of machine suitable for the preparation of rubber on Estates, and from their practical knowledge can assist in the planning of Factories. Their advice is always available to members of the Association or their Superintendents.

19.—Amount of Working. - The extent to which rubber is worked on the machine should be the minimum found necessary.

The following may be regarded as the maximum working required :—

(*a*) Preparation of crepe for Artificial drier :—

5 times through a grooved roller machine.
Once through a smooth roller machine.

Re-making dry rubber to blanket form ;—

4 times through a grooved roller machine without water during rolling. Rollers must not be allowed to get too hot.

(*b*) Preparation of crepe for air drying ;—

6 times through a grooved roller machine.
4 times through a smooth roller machine.

Air-dried crepe should not be converted into blanket form.

When once properly adjusted there is no need for the rollers to be re-set.

20.—The Thickness of the Rubber determines the rate of drying. Crepe should be rolled out thin for air drying, especially thin for artificial drying.

The thickness is best judged by the output of the smooth rollers.

Smooth rollers 15in. face and 12in. diameter should be set to give 80—100lbs. (dry weight) thin crepe per hour for vacuum drying, 60—80lbs. for hot air drying, and at least 60lbs. for ordinary air drying.

For artificial drying, trays should always be charged with the same weight of rubber, about 1lb. per square foot, loosely and evenly spread. The charge of rubber for each tray should be weighed out before spreading. Artificial drying should be slow in the first stages. The standard conditions for operating are:—

Vacuum Driers.—(1) 5lbs. pressure of steam in the shelves. The steam should be shut off before the drying is complete. (2) A vacuum of 28in. (3) A maximum temperature of 170°F. with the thermometer in the folds of the rubber.

Hot Air Driers.—A maximum temperature of 160°F. Drying should be complete in 1½—2 hours. Attention to the proper working of the driers is essential for satisfactory output.

On opening the artificial driers the trays should be taken out at once and the rubber folded or rolled up and allowed to stand before working to thick crepe.

CARE OF MACHINERY.

21.—Machines must be well cleaned and inspected each day before commencing work. At frequent intervals (say once a week), they should be thoroughly cleansed of all traces of oil by means of a 5 per cent. solution of caustic soda. This must be applied under careful supervision by means of a cloth fastened to the end of a stick. The machines should thereafter be set in motion with the water running for about 10 minutes. The rollers once set should be altered as seldom as possible.

22.—Lubrication.—Avoid using an excess of oil or grease. The engine-driver, or other responsible person, should attend to this work.

23.—Worn Parts must be replaced at once. Keep spares in stock. Worn bearings are often the cause of "oil streaks" in crepe rubber. When the grooves of rollers are badly worn they cease to grip the rubber properly. This reduces the output of the machine, because it is necessary to put the rubber through more often, which may lead to its being overworked.

24.—DEFECTS.

DEFECTS TO BE AVOIDED.	PREVENTIVES.
(1) **Oil Streaks** ...	See that oil from the bearings does not get on to the rubber— (a) through use of too much lubricating oil ; (b) through worn bearings. These should be replaced immediately, as oil from worn bearings contains particles of copper or verdigris, causing green or reddish streaks, which gradually eat into the rubber, and reduce it to the consistency of treacle. (c) By taking care that the crepe does not come near the edge of the rollers or other parts of the machinery which may be oily. Trays, if used under the washing mills, should be narrower than the width of the rollers, or be replaced by a narrow piece of hard wood.
(2) **Cotton Fluff** ...	Do not use cotton waste for cleaning the creping machines, nor for keeping the oil off the rollers ; use flannel or cloth for cleaning purposes. Avoid using too much oil.
(3) **Dark Stains** ...	To avoid oxidation and surface darkening of portions of the coagulated latex, a little Sodium Bisulphite may be added to the latex (for proportion see Par. 14 above). Do not allow the rollers to grind against each other at any time. When stationary they should have a small piece of rubber between them.
(4) **Dull Colour** ...	Avoid :— (a) Bad water. (b) General oxidation of the coagulated latex caused by delay in manufacture. (c) Overheating in artificial driers. (d) Sodium Bisulphite of defective quality.
(5) **Mottling, Spots & Discolouration**	In order that the rubber may dry quickly, roll the crepe thin (see No. 20), and do not hang it too closely in the drying room, which should be well ventilated. In case of persistent "spot" trouble apply at the laboratory.
(6) **Mouldiness** ...	Proceed as in (5) and see that the rubber is thoroughly dry before packing.
(7) **Tackiness (Heat and Stickiness)**	See that the rubber is not exposed to the direct rays of the sun or left in a heap before it is dried. Scrap should be brought in, washed and creped as soon as possible—if there is unavoidable delay in washing, the scrap should be kept in water. (See also under (1).)
(8) **Grit and Dark Specks in Scrap Crepe**	The crepe usually known on the market as "specky" is often insufficiently washed ; bark or other impurities left in the rubber reduce the value. The lower grades naturally vary very much, and special attention to washing is most advisable.

SORTING AND GRADING.

25.—Great attention and careful supervision should be given to these operations. The fewer grades the better, and regularity of each grade is most important.

The grading should be as follows ;—

(No. 1) Fine Crepe, made from the free or liquid latex.

(No. 2) Clean light brown Crepe, made from lumps and skimmings.

(No. 3) Scrap Crepe, made from tree scrap.

(No. 4) Dark Crepe, made from bark shavings, earth rubber, and the lower quality of scrap.

Tacky Rubber should be packed separately.

Compound Scrap Crepe.—Estates using scrap washers as recommended in paragraph 18, should make a compound crepe of grades Nos. 2 and 3, which will make one compound free from bark and specks. All rubber intended for No. 4 should be most thoroughly washed.

26.—Even grading is most desirable, and any discoloured, streaky, or mottled pieces must not be left in the No. 1 grade.

All pieces showing the slightest traces of heat must be picked out and packed separately.

PACKING.

27.— (I.) All cases must be planed and thoroughly cleaned inside before packing. Consumers frequently complain of chips, splinters and sawdust getting into the rubber.

(II.) Avoid using cases with cracks or other defects.

(III.) Care should be taken to assemble three-ply cases strictly in accordance with makers' instructions.

(IV.) Cases other than three-ply should be of stout wood not less than $\frac{5}{8}$ths of an inch thick after being planed.

(V.) The usual sized cases employed measure 5 cubic feet; 10 cases (19in. by 19in. by 24in.) measure one shipping ton of 50 cubic feet.

(VI.) In each case it is possible to pack 150lbs., and the case arrives in better condition when full than when the rubber is slack packed. (About 5 per cent. more in three-ply cases).

(VII.) By packing the maximum amount of rubber consistent with safety in a given sized case an appreciable saving in freight can be made.

(VIII.) It is recommended to weigh out the rubber for each case before packing. Invoicing, etc., is facilitated by having an exactly similar amount of rubber in each package.

(IX.) Proper attention must be paid to nailing and banding.

GENERAL.

Consumers' worst enemy in Rubber is Tackiness, a very little of which will often spoil an otherwise good parcel.

38, EASTCHEAP,

LONDON, E.C.

March, 1917.

THE PREPARATION OF RUBBER.

In this pamphlet it is proposed to treat the subject of the preparation of rubber on estates. The subject is one which has been discussed elsewhere at considerable length, but in the present instance the aim of the pamphlet is to afford information on the most recent lines, as concisely as possible. In a publication with such narrow limits it is not possible to consider the less common points which may arise in estate practice, and one must be content with a discussion on the ordinary routine of rubber preparation and on the various forms in which it is usually sold.

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THE PREPARATION OF RUBBER.

The best known present modes of preparing the various grades of Rubber, are :—

1. Unsmoked Sheet
2. Smoked Sheet
3. Air-dried crepe ; first grade quality
   - (*a*) Fine
   - (*b*) Blanket or Medium
4. Artificially-dried crepe ; first grade
   - (*a*) Fine
   - (*b*) Blanket or Medium
5. Lower grades of crepe
   - (*a*) Naturally coagulated rubbers : including "lump" rubber and "tree-scrap"
   - (*b*) Cup-washings and skimmings"
   - (*c*) Bark rubber
   - (*d*) Earth-scrap

(1) UNSMOKED SHEET.

Before the popularity of smoked sheet rubber was established, air-dried sheet rubber was made in large quantities, and most of us have vivid recollections of the worries due to a slow rate of drying and the unsavoury atmosphere of the drying houses, in addition to the trouble caused by moulds. It is not surprising therefore that we should be sorry to see any revival in the vogue of air-dried sheets.

This type of first-grade product continues to be made chiefly by native owners of small areas, and it finds a ready sale in the local markets. Only one further stage is needed in the preparation of the smoked variety which is a much more satisfactory product in every way.

Under former conditions the sheets made were usually much too thick ; they took a long time to dry ; and were rather dark in colour.

At the present time if one works with a latex of not greater density than 1½lbs. dry rubber per gallon, it is possible to prepare sheets which are fairly pale in colour, without the aid of Sodium Bisulphite. The addition of this substance in any but the slightest quantity tends to give a paler rubber which dries slowly if in the form of sheet. If the rate of evaporation of the enclosed moisture is thus retarded conditions favourable to the development of fungoid "spot" diseases are set up, and all the trouble taken in preparing a pale sample goes for nought. The use of Sodium Bisulphite in the preparation of unsmoked sheets is not recommended. Many of the native holders use a patent mixture composed of Alum and Sodium Bisulphite, which would account for the paleness of the product. The rubber may suffer from "spot" disease, but as a rule the fact that the sheets are made thin (from very dilute latex) usually prevents the incidence of this defect by allowing rapidity in drying.

As the preparation of smoked sheet rubber affects by far the greater number of estates the subject of coagulation may be deferred to that section of the present discussion.

(2) SMOKED SHEET.

It is usually acknowledged to be a difficulty in the preparation of sheet rubber that the extra handling of the latex (in comparison with that needed for crepe-making) involves an unwelcome rapidity in coagulation so that as a rule, only comparatively small quantities of latex can be handled at one operation. While this may be so there would appear to be no reason for continuing to treat the latex in each dish with a small quantity of coagulant. Larger quantities up to 50 gallons may be treated with coagulant in one operation, and the mixture of latex and coagulant may be ladled out into the dishes

Naturally a rich latex would present more difficulty in this direction than a dilute one. Furthermore if some harmless substance could be used which would retard coagulation the manipulation of the latex would be rendered less difficult and the process of coagulation would be improved. Among the better known agents which have such an effect upon latex, *Formaline* and *Sodium Sulphite* (not Bisulphite) are the chief. The latter is the more popular as it is slightly cheaper and much more stable. As now used it is in the form of an easily soluble powder (*Anhydrous Sodium Sulphite*). The ordinary crystalline form of Sodium Sulphite as used in photography is not recommended, on account of its comparative lack of power and its poor keeping qualities.

It will be obvious that given two equal quantities of different latices, different amounts of an anti-coagulant may be required to produce the same effect. Hence it should be remembered that a formula which suits the needs of one field or one estate, will not necessarily prove suitable in the case of another field or estate. Unless this point is appreciated trouble may ensue. On some estates it has been the custom to give equal quantities of Sodium Sulphite solution to all coolies irrespective of the ages of the trees in the fields to be tapped. Thus it happened that the latex from one field was found to have insufficient

anti-coagulant present, while that from another field could only be coagulated by the addition of an excess of acid. In this matter the experience of the preliminary trials should have caused some discrimination to be exercised as to the quantities of solution to be issued in each field or division. It has been found sometimes that a moist glossiness in the smoked sheet could be attributed to the use of an excess of Sodium Sulphite. Traces of the salt remained in the rubber, and as the substance is hygroscopic, moisture was being absorbed from the air, to cause a surface deposit which often returned even after the sheets were surface washed and re-dried.

If Sodium Sulphite is to be used in the field, the following formula which is in wide use may serve as a basis for trials.

Formula for use of Sodium Sulphite in the field.

(*a*) Dissolve Anhydrous Sodium Sulphite in water at the rate of 1lb. to 3 gallons.

(*b*) Of this solution each coolie is given about 1½ pints. This is usually sufficient for a task of 350 trees. The solution is used by shaking a few drops into the cup, or it is run down the main channel when the latex flows.

On some estates Sodium Sulphite is not used in the field, but a small quantity is used in the factory to retard coagulation slightly. This retardation is much to be desired when sheet-coagulation tanks are employed. The following formula is used with success for latex having a consistency of 1½ lbs. dry rubber per gallon.

Formula for use of Sodium Sulphite in the factory.

(*a*) Dissolve 2 ozs. of Anhydrous Sodium Sulphite in a gallon of water.

(*b*) The solution is placed in the bottom of the large jar in which the latex is to be received. This guarantees a good mixture of the solution and the latex. The quantity given in (a) is found to be sufficient for the treatment of from 35 to 40 gallons of standard latex.

Coagulation. For sheet-rubber it is recommended that the coagulant be always used in dilute solution. For standard latex the following formula may be used with Acetic Acid.

Formula for coagulation with Acetic Acid.

(*a*) Mix acid with water at the rate of $1\frac{3}{4}$ ozs. to 1 gallon.

(*b*) Of this solution use 1 gallon to 12 gallons of latex.

The lower limit of complete coagulation is so finely touched by this formula that the remaining liquid may be sometimes clear and sometimes turbid. The difference between "turbidity" and "milkiness" must be appreciated. A milky serum denotes an insufficiency of coagulant, while the appearance of a clear serum every day may indicate the use of an excsss of coagulant.

When Acetic Acid can not be procured it is possible to utilise many other substances as coagulants. Unfortunately, however, the limits of choice are narrowed considerably owing to the present high prices of most of the substances.

A good possible substitute for Acetic Acid is found in *Chinese vinegar*, but even this has increased rapidly in price. Some estates successfully use coconut liquor which has been allowed to ferment for five or six days. Other estates are now producing with experimental and crude plant, a *form of crude Acetic Acid* (Pyroligneous Acid) obtained by the dry distillation of wood. This is a feasible scheme and is being elaborated.

At present for the majority of estates in this country the only cheap and available substitute for Acetic Acid is *Sulphuric Acid. There is no doubt that if used in excess this acid causes deterioration in the quality of the rubber produced.* The greatest care must be taken, therefore, in adjusting the minimum quantity for complete coagulation. To suit the type of commercial acid which is now available in this country, a formula has been devised which gives the desired minimum quantity necessary for coagulation

of standard latex (1½lb. dry rubber per gallon). The best acid of its kind which can now be obtained is commercial Sulphuric Acid of specific gravity 1.84.

Formula for use of Sulphuric Acid.

(*a*) Pour 1 pint of strong acid carefully down the inner surface of a large jar containing 20 gallons of water. Stir and mix thoroughly.

(*b*) Of this solution use 1 gallon to 20 gallons of latex.

It scarcely need be pointed out that a latex richer than standard will require more and a dilute latex less, than the quantity given in (b).

It will be clear from what has already been remarked about the possible quality of the rubber produced, that the use of Sulphuric Acid would not be recommended while supplies of Acetic Acid are available at reasonable rates.

Tanks. Eminently satisfactory sheet rubber can be made in the usual small pans, but the difficulty is that it is not possible to mix together large quantities of latex and coagulant prior to handling into the pans. Working with a Metrolac or some such instrument it is possible, of course, to secure just the same uniformity of product in small pans as in large tanks; but the saving effected in labour and in cost of renewals is now bringing the use of tanks into favour. Naturally there has been some disappointment caused by the working of tanks on a few estates at first, but once the method has been fixed there can be no doubt as to the efficiency of tanks for sheet preparation. The writer will always be pleased to answer any enquiries or to show a tank in working if an appointment is made.

Rolling and Marking of Sheet Rubber. Working with standard latex it is found that strips of coagulum 1½ inches in thickness require little rolling to produce sheets of desirable thickness.

(1) The sheets or strips are first given a preliminary rolling with a heavy hand-roller made of hard wood. The roller is passed once in one direction and once in the reverse direction.

(2) The coagulum is then passed through a smooth machine twice, once with the rolls fairly open and once with a narrower space. It is not found advisable to close the smooth-rolls so tightly that the rubber is made too hard.

(3) The sheets or strips are then passed once through a pair of marking rollers. Various types of patterns are used, but the one which appears to give the most satisfactory results is that known as the "close-cut spiral". This produces a small diamond pattern on the rubber. The surface of the sheet is raised in well defined ridges which appear to present the maximum drying surface exposed to the atmosphere of the smoke-house. Thus, not only is the appearance of the sheet rendered attractive, but also the period of drying is reduced. Starting with standard latex and following the procedure here described for rolling and marking, sheets should be ready for packing in 10 or 11 days. If the period is longer it is possible that the design or structure of the smoke-house is at fault.

"Rust" on Sheet Rubber. This defect is caused by the exudation of included moisture which contains dissolved protein matter. To obviate the defect, two courses of procedure may be adopted, the first of which is in more general use.

(1) After being marked the sheets are hung to drip for 2½ - 3 hours. They are then thrown into water which is as hot as the hand can bear. There they remain for 10 minutes after which they are scrubbed in cold water, or for preference under a spray of cold water. They are then hung to drip for half an hour before placing in the smoke-house.

The caution must be given that fresh volumes of hot water should be used for each batch of sheets, and if jars of cold water are used for the later scrubbing, frequent changes must be made. If these rules are not observed the water in the jars becomes in course of time merely a solution of protein matter, which again becomes visible when the surface water has evaporated.

(2) Where latex is fairly dilute it is found that if the sheets be placed in the smoke-house direct from the marking rolls, and if the fires be started at once, rust does not appear on the surface of the rubber.

Washing Sheets when dry. Few smoke-houses are so free from ash and grit that the sheets may be packed without further attention when taken out of the house. At least sheets should be well brushed before packing, and in the majority of cases it is advisable to wash the sheets. This may be done by scrubbing in cold water. The sheets are then hung to air-dry for about two days.

One often hears arguments as to the utility of this washing. On some estates it is not done and yet the rubber appears to command an excellent price. Nevertheless as a measure taken to avoid any possible complaint it would appear to be advisable to wash the sheets. This may be done by scrubbing in cold water. The sheets are then hung to air-dry for about two days.

Smoke house. There may be differences in the detail of construction of smoke-houses in this country, but the same principle applies to all, viz, the installation of smouldering fires, within the building. Smoke-houses having external furnaces whence smoke enters the building by means of ducts, are now very uncommon and not recommended.

It is not essential that the building be constructed of iron. Equally good results are obtained from wooden smoke-houses, or from those which have the lower walls of brick and the upper structure of wood.

It is not necessary that the lower walls should slope inward, as in the "Kent drier". Perpendicular walls may be used, but the Kent drier principle seems to be the most convenient for deflecting the smoke evenly.

There is no reason why a smoke-house should be of only two floors. Given good foundations and suitable girder material three, four or more floors might be built. The probability is that within certain limits the greater the number of floors the better the dis-

tribution of smoke with greater eeonomy in the fuel consumed. Such houses having three floors are in existence and work very satisfactorily ; there seems to be no difficulty in obtaining a reasonable temperature in any of the chambers.

As a rule smoke-houses are not provided with vents in the roof. At least if such vents exist they are not generally opened during the hours of smoking. It is usually notable that smoke escapes by a larger number of small gaps caused by the non-fitting of the iron sheets. While houses of this type give satisfaction generally, it is sometimes found in certain districts that the rubber takes a long time to dry or that it develops a moist surface glaze. Such cases are most common in flat and damp areas.

In such cases it is found that if vents are fitted in the roof ridge, or if the whole of the ridge is opened in the form of a very low jack-roof, not only is drying hastened but also the moist glaze is no longer formed.

All smoke-houses, therefore, should be provided with suitable vents in the roof-ridge, to be opened to a certain extent during smoking if required, but it is necessary that the size of the openings can be regulated.

Fuel. It is not true that *any kind of timber* is suitable as a fuel to be used in a smoke house. All timbers are suitable either alone or in mixture with others, provided that the wood is not too green.

Naturally an absolutely dead and crumbling wood will smoulder, but does not develop sufficient smoke. A green timber will give an acrid and moist smoke but demands the consumption of a certain amount of dry timber as well if it is to be used.

Rubber-tree prunings and sawn rubber trees obtained by thinning-out may be used in mixture with dead wood, provided the logs are stacked to dry in the sun for some weeks before use.

If the timber used is too green steam is formed as well as smoke and the sheets of rubber may have a moist surface glaze.

Furnaces. Various types of *furnaces* are in successful use, but most of them are so designed as to give the maximum of heat with a minimum of smoke. In designing a furnace two rules should be observed :—

(1) It should not be too large. A number of small furnaces evenly distributed will give better results than one large furnace. It is not possible to lay down definite dimensions suitable for all cases, but no furnace should exceed 3ft. in diameter. As some guide to the number of furnaces required, one may state a hypothetical case in which the width of the smoke-house is 20ft. In such a house, for each 25ft. of length, a furnace 3ft. square would be sufficient to provide an adequate temperature with plenty of smoke.

(2) Combustion should be slow. This can only be arranged by providing that there shall be practically no draught. Once the fire is well started it should smoulder without flames. Open furnaces give the maximum of flame, and are expensive in fuel.

There are several crude devices by means of which combustion can be made slow. The simplest form is that in which the actual furnace is a circular hole in the ground. A fire is started in this, and over the hole a conical iron chimney several feet in height is placed. More timber is stacked sometimes in the cone. The only point of ingress for air is the open top of the cone. Sometimes the cone has a baffle-plate cover which can be raised or lowered so as to regulate the ventilation through the top.

As an improvement upon this type, the whole of the furnace is sometimes made of metal and mounted on a low carriage, by means of which the furnace is drawn into, and out of, the smoke-chamber. Such furnaces are in actual working and give satisfaction.

(3) AIR-DRIED CREPES.

Fine Pale Crepe. The pale colour is sometimes obtained without employing Sodium Bisulphite, but in the vast majority of cases, uniformity in colour and general appearance could not be secured without the use of this substance.

One point of great importance has yet to be appreciated by the majority of estates, and unfortunately it cannot be given due consideration in some cases until a supply of Metrolacs is available. It is this: *To obtain uniform appearance and quality from day to day, the latex must always be diluted to a definite standard.* This point is already appreciated in the production of uniform sheet rubber, and there is no reason why the principle should not be applied to the preparation of pale crepe. For sheet-making, we recommend a standard dilution of 1½lbs. dry rubber per gallon, because such a latex gives sheets of a desirable thickness and texture, and the drying period is of reasonable brevity.

In crepe-making, there is no particular reason why a higher standard should not be adopted on some estates. For instance, on old areas, where the addition of water is not allowed in the field, it would be possible to adopt a standard perhaps of 3lbs. dry rubber per gallon. It would not, however, be advisable, because on rainy days the average dry rubber content of the latices might fall below that figure. On the majority of estates where one has to deal with old and young areas, a figure must be selected which is within a reasonable limit for all latices and all climatic conditions. On the whole, it would be difficult for any estate to select a standard more suitable for all practical purposes than the present standard for sheet rubber.

It will be obvious that no matter what the standard may be the advantages are great. With latex of uniform consistency, the proportions of coagulant and Sodium Bisulphite would be fixed always. There

would no longer be any necessity to differentiate in this direction between latices from different fields or of different days. Such an arrangement would conduce to greater economy and simpler control.

The texture of the rubber would be uniform for all time and the colour would be similarly uniform. Given equal conditions in machining, there is no reason why the crepe should not be perfectly uniform on any one estate for all time.

Coagulant. Assuming an attempt is made at such uniformity, the quantity of coagulant required for average coagulation is the same as that given under the section dealing with smoked sheet, provided that the coagulum is to remain untouched until the following morning.

It is customary on some estates, owing to the exigencies of the situation, to machine the rubber in the afternoon of the day on which the latex is collected. To ensure such rapid coagulation in completeness demands the use of an excess of acid, which is to be deplored. Nevertheless, it is recognised that no other arrangement of working is possible on some estates, without great congestion being caused. Wherever possible it should be a rule that the rubber should not be machined until the following morning, and thus the use of an excess of coagulant may be avoided.

Sodium Bisulphite. The quantity of this substance found necessary to produce the desired degree of paleness varies widely on estates. Some estates use it in minimum proportions merely to prevent oxidation. Others aim at producing a very pale rubber, according to the presumed demand of buyers.

Again, in comparing quantities used on any two estates, they may vary widely owing to the different dry rubber contents of the latices. A dilute latex will demand less Bisulphite than a richer latex. Hence on any one estate the effect produced by

uniform proportions of Sodium Bisulphite (calculated on the *volume* of latex) will also vary daily.

Working with a standard latex of 1½lbs. dry rubber per gallon, the following formula should serve as a maximum.

Formula for use of Sodium Bisulphite.

(*a*) Dissolve Sodium Bisulphite in water at the rate of 1lb. to 10 gallons.

(*b*) Of this solution use 1 gallon to every 10 gallons of latex.

A caution should be given regarding the mixture of the solution with latex. The solution should be freshly prepared, but it must be assured that all the powder has been dissolved. Otherwise very pale streaks will be caused in the dry rubber.

Furthermore, good stirring is necessary to make certain of the intimate mixture of solution and latex. It would be well to make a definite rule, such as would ensure stirring for five minutes before the addition of the coagulant. Unless the stirring is thorough, streaks will be found in the dry rubber.

Machining. Beyond stating that the amount of rolling given to the rubber must be the minimum necessary to produce the desired effect, it is difficult to be more definite owing to the variations introduced by the weight of the rolls employed and the speed at which the machines are run.

Some estates can produce a good thin crepe by passing the rubber through the macerators, the medium rolls and the smooth rolls, a total of 8 times. Others can only produce a similar crepe by machining 12 times, while in a few cases, owing possibly to the pace of the rolls and the particular gearing employed, a fine crepe free from holes cannot be produced.

The aim should be to produce a crepe capable of being dried in a maximum of 12 days. It must be acknowledged that on some estates the extra rolling

necessitated by such a demand would cause the hours of work to be prolonged into night. This is undesirable, and estates in such a position should receive additional equipment.

Medium and Thick Crepes. These cannot be prepared direct in their final form without incurring the incidence of "spot" disease. For this reason it is always advisable to prepare first a thin crepe in very rough form. This thin crepe should be dry in less than 12 days, and when quite dry, it is re-worked into a thicker form. Sometimes the thick crepe is made by placing together layers of thin crepe which are passed through a machine. This is not always advisable, as water is forced between the layers, and appears as obstinate spots of moisture long after the bulk of the rubber has dried.

(4) ARTIFICIALLY-DRIED CREPES.

The remarks on coagulation apply equally to artificially-dried crepes and to air-dried varieties.

For artificially-dried rubber, however, the final form is confined to medium and thick crepes. The first form in which the rubber is prepared is always that of a thin rubber of loose texture. The reason for this will be apparent. If a closely consolidated crepe were made, the drying period would be prolonged to a non-economic degree. The preliminary rolling, therefore, must provide for a minimum of machining consistent with a fairly thin crepe.

At present, artificial driers are confined to two systems :—

(1) Vacuum driers.
(2) Hot air and forced draught driers.

The principle of the latter class is applied to two distinct types, one of which treats thin crepes, and the other type of rubber known as "worm" rubber on account of the coagulum being forced through a machine which cuts it up into shreds.

Whatever may be the preliminary form in which the wet rubber is made, to reach the final form as a rule, the rubber has to be machined so as to form a medium or "blanket" crepe. An exception is to be noted in the case of artificially-dried "worm" rubber, which is sometimes pressed into blocks directly without going through the intermediate stage of re-rolling.

There is no possible superiority which can be attributed to artificially dried rubber in comparison with air-dried rubber, and the only claim which can be made for the process is that it is quicker, and that less drying space is required. It does not obviate the erection of a drying-house, for the dried rubber after machining (if in the form of a thick crepe) has to be re-dried for three or four days. The whole question resolves itself into a matter of finance. Is it cheaper to erect a large air-drying house, or to instal an artificial drier with a smaller drying house? It is to be remembered also that the lower grades of crepe, such as tree-scrap and bark-scrap may suffer from tackiness if artificially dried, and that the lowest grade (earth-scrap) most certainly will run a great risk. On some estates, where the two former grades are collected regularly with the shortest possible interval, it is feasible to put the rubber through an artificial drier, but similar treatment with earth-scrap could not be recommended.

The use of artificial driers therefore is restricted to the higher grades of crepe rubber, and even with these the process of drying must be cautiously supervised. In actual practice, however, the driers are so well devised and fitted that they can be put in charge of a native store assistant once the rules of definite temperatures and pressures are settled.

It will be clear from these general remarks that as a rule the use of artificial driers possesses no advantage over the ordinary method of air-drying, except in the case of badly-situated drying houses in which even thin rubber will not dry quickly enough to guarantee the absence of "spot" disease.

(5) LOWER GRADES OF CREPE.

The attitude of both buyers and sellers with regard to the types of lower grade rubbers appears to be changing. In the past, from any one estate there might be obtained as many as six grades of crepe below No. 1. These comprised :—

(1) A pale rubber (often streaked) obtained from coagulation of cup washings and bucket rinsings.

(2) A pale rubber (often streaked) obtained by coagulation of the skim mings from the surface of the No. 1 latex.

(3) A streaked and dull rubber prepared from naturally-coagulated clots found in cups, buckets, and latex-carts.

(4) A streaked rubber prepared from scrap which had coagulated upon the face of the cut-bark.

(5) A brownish and streaked rubber made by maceration of bark shavings to which pieces of tree-scrap adhered.

(6) A dark rubber, often tacky, prepared from scrap found in or on the ground near the base of the trees. As it is often a matter of weeks between any two regular collections, it is easy to understand why the dry rubber was more liable to be "tacky" than any other grade of crepe.

It must have been evident to all who have acquaintance with these grades, as shipped from many different estates, that the diversity in the various shipments must have been rather bewildering. There appeared to be a regrettable lack of uniformity, even in the appearance of, say, a bark-scrap rubber from any two estates. When, in addition to these variations, the further complication of condition of cleanliness is introduced, one may realise the difficulty attaching to the evaluation of these rubbers as they appeared upon the market.

Although the foregoing paragraph is written in the past tense, it should be pointed out that within certain limits the trouble continues to exist with respect to the output of the great majority of estates.

In the case of the minority, it has been realised that the manufacturer does not want to buy a large number of "parcels," all differing in some respect. It is probably correct to state that what a manufacturer requires is a big "parcel" of uniform appearance and treatment, even though the colour may not be so light as that of many smaller lots. This statement is modified with the proviso that the rubber, no matter what its colour or appearance may be, must be free from dirt, grit and bark.

The difficulty of the making a uniform product from several types of lower-grade rubbers has been successfully solved on several estates by the preparation of a "compound" crepe composed of a mixture of the best lower grades in approximately definite proportions daily. Naturally the shade of colour of this compound crepe will depend largely upon the types of rubber employed, but as a rule it is somewhat darker than the highest of the types employed in the mixture. To the writer this seems immaterial as long as the manufacturer is offered a larger and more uniform lot which can be given uniform treatment in vulcanisation processes. Neither would it appear that the seller suffers any monetary loss. In point of fact it will be found probably that the reverse is the case. For instance, supposing it were decided to mix for a compound crepe,

(a) Naturally coagulated lump rubber.
(b) Tree scrap
(c) Bark shavings scrap

The product would be darker in colour than (a) and slightly better than (b). Let it be granted that there might be a monetary loss on (a), it is probable that there would be a slight gain in comparison with the usual prices obtained for (b) and (c). Now as a general rule the actual percentage of crop made into (b) is appreciably less than that made into (c) and still less than (b) and (c) together. Apparently therefore there would be a margin of profit on the whole by making a compound crepe. It may be pointed out on the other hand that there might be expended

on the manufacture of this crepe more time and labour, but as against this the labour of sorting and grading would be simplified.

Unfortunately this process is not open to estates which do not possess a scrap washer. It is essential that the rubber should be free from grit, sand and bark particles. In the absence of a scrap washer for the cleansing of the bark shavings, it would be futile to attempt to make a compound crepe containing that type of rubber, as one would run the risk of spoiling the whole. It seems certain that in course of time a scrap washer will be considered as necessary a piece of machinery as an ordinary crepeing machine in the factories of estates having sufficient means. Until that time the preparation of compound crepes must be the privilege only of well-equipped estates, unless other estates can send their lower-grade rubbers, for treatment in a scrap washer, to their more fortunate neighbours.

In previous publications we have advocated a diminution in the number of grades of crepe rubber, and it is gratifying to find that in a few cases the amending grades suggested have been improved upon. A few estates now make only three grades of crepe, viz.:—

(*a*) No. 1. From latex coagulated in the store.
(*b*) No. 2. Compound.
(*c*) No. 3. Earth-rubber.

It will be seen that the compound crepe includes all types between fine pale crepe and earth rubber. Naturally one could not dare to recommend the inclusion of earth-rubber in any compound crepe, as the risk of possible "tackiness" in the whole would be serious. In the case of the bark shavings rubber to be incorporated, it is first cleansed alone in the scrap washer. Then all types are mixed together again in the scrap washer in proportions ruled by the experience of the usual average percentages of each grade of the crop.

Besides the few estates having only three grades, there are others which make four, viz.:—

(*a*) No. 1. From latex coagulated in the store.

(*b*) No. 2. Compound, from cup washings, &c., skimmings, and naturally coagulated lump.

(*c*) No. 3. Compound, from tree-scrap and bark-shavings rubber.

(*d*) No. 4. Earth-scrap.

Other variations are possible, but their number is limited, and they all conduce to simplification of working, and a supply to the market of rubber having greater uniformity.

In the ordinary procedure of estate-working there appears to be an undesirable variety in the style of lower-grade crepes. On some estates an examination of these rubbers would appear to suggest that there need be no expenditure of care in the preparation or the form in which it is made. This is a great mistake. With the exception of the lowest grade (earth-rubber) it would not be unfair to state that the quality of the rubbers on testing is very little, if at all, inferior to the No. 1 product. Often, as in the case of naturally coagulated rubbers, they are superior to fine pale crepe. Doubtless manufacturers are aware of these facts, but what course is open to them if they find the rubber spoiled for their purpose by the presence of particles of sand, grit or bark? The possible injury caused by these ingredients can not be insisted upon too strongly, and it must be evident that great care should be exercised in the preparation of the lower grades of crepe.

As to the particular form of the crepe rubber, one may apply the remarks made under the section dealing with the best grades. It is common to find thin crepes, medium crepes and "blanket" crepes. More often than otherwise the medium and thicker crepes are prepared direct in those forms. It follows that they are liable to attacks of "spot" disease which,

however, is not easily visible in the lowest grades owing to the dark colour of the rubber. Furthermore it is not possible to cleanse the rubber so thoroughly if thick crepes are made.

Second-rate Qualities of No. 1 Crepe. It will be the experience of nearly all managers that they are confronted with a minor problem with regard to the rubber which can be prepared from the grades immediately below No. 1 quality. This comprises the group.

(*a*) From cup-washings and bucket-rinsings.
(*b*) From clean naturally coagulated lump-rubber.
(*c*) Skimmings from surface of latex.

With the knowledge that these rubbers, as a rule, are no whit inferior to fine pale crepe in actual quality, it seems rather unfair that just because they may make a streaky crepe, the rubber commands an inferior price on the market. It has been shown in previous publications that by treatment with Sodium Bisulphite the natural oxidation of these rubbers may be prevented. The final product to some degree is in appearance not inferior to fine pale crepe. At the worst it is equal to a pale crepe slightly "off-colour." Some of it, therefore, may be labelled as No. 1 rubber, and this procedure would appear to be justified.

To produce the desired effect in cup-washings, &c., a quantity of Sodium Bisulphite is added prior to the addition of the coagulant.

With naturally-coagulated "lump" rubber one of three methods of procedure may be adopted :—

(1) The loose coagulated rubber is lifted from the latex-pails, *without pressure*, and placed in a dilute solution of Sodium Bisulphite. A little coagulant is needed after some time to deal with the latex which attaches to, or is contained in, the loose mass.

(2) The naturally coagulated rubber is passed through the rolls at once, and made up into a thin crepe. This is folded, and immersed in a solution of Sodium Bisulphite overnight. (The strength of solution used is generally

equivalent to 1%). In this method the dilute solution is able to penetrate all the interstices of the crepe, and the area of rubber surface exposed to the solution is much greater than would be the case were the orginal lumps merely submerged in the solution. Next morning the crepe is lifted out, unfolded and shaken vigorously before hanging in order to get rid of the solution as far as possible. Or sometimes, the unfolded crepe is rinsed lightly in clean cold water, with the same object in view.

(3) The naturally-coagulated lumps are passed through a machine which cuts them into thin shreds. These are placed in a solution of Sodium Sulphite over-night, and are then made into thin crepe.

NOTE.—No matter which of these three methods is adopted, the naturally-coagulated rubber as it reaches the store must be examined carefully. Impurities must be removed, and any pieces which exhibit signs of oxidation must be placed apart and made into a lower grade of crepe. Otherwise the resulting rubber when dry will show dark streaks. It should be remembered that Sodium Bisulphite, while preventing oxidation, will not remove any colour already evident. It is not a bleaching agent.

It will be evident that the general appearance of the crepes will depend upon :—

(*a*) The degree of care exercised in sorting the fresh rubber.
(*b*) The interval elapsing before the rubber is handled.

On estates where latex and naturally coagulated rubber are transported by cart, it would be advisable to allow the clots to travel submerged in a solution of Sodium Bisulphite.

FACTORY PRACTICE IN PREPARING PLANTATION RUBBER.

The object of this short pamphlet is to give fuller information on the subject of preparing Rubber on Estates than is contained in the Recommendations of the Uniformity Committee, though these are taken as the basis for the pamphlet.

K. G. MARSDEN, B.A.,

Culloden,

Neboda,

Ceylon.

FACTORY PRACTICE IN PREPARING PLANTATION RUBBER.

Collection of Latex. The need for cleanliness has been emphasised by most writers on the subject of preparing plantation rubber, yet to-day it is a common thing to find all the vessels on an Estate in a deplorably filthy condition. There is no difficulty in cleansing any vessel used to hold latex if the cleansing is done immediately after the vessel has been used. It is when latex has been allowed to dry on the vessels and remain on them until tackiness is setting in that cleansing becomes difficult. Tappers' buckets, pails used for straining at the factory, strainers and bulking vessels should be thoroughly cleansed immediately after using, not only inside but outside as well.

The collection of latex in the field requires care, tappers by carelessly allowing bark-shaving, twigs and leaves to get into the latex cause a loss since these cause lump rubber to form and so reduce the amount of first latex rubber. Latex should be brought in from the field as soon as possible after the flow from the trees has ceased. Too early collection is usually indicated by a high percentage of earth rubber, and too late collection is shown by the difficulty in straining the latex when it reaches the factory.

With reasonable care in collection, latex should arrive at the factory or field coagulating shed in a perfectly fluid condition and passing easily through the strainer.

Determining the Tappers' Amount of Rubber. In Ceylon it is the common practice to pay tappers by results, and for this purpose there is an instrument to be had, the "Metrolac," which shows the rubber content of the latex and this measurement together with a measurement of the volume of the latex allow the necessary calculation to be made. The total of the amounts brought in by the tappers gives the yield

from any field, and if in the tappers check roll the names are put in check roll order for each field it is possible to keep a sufficiently accurate account of the yield from each field, and in the factory all the latex can be bulked in one large vessel.

Straining the Latex. Strainers should be solidly made with a gauze of 40 mesh. Many estates make their own strainers and a very serviceable article can be made by the estate carpenter. The shape of the strainer allows it to fit into almost any size of pail, it is a square strainer with inwardly sloping sides, the sides measuring 12in. at the top and 8in. at the bottom, the depth is 9in.; the mesh is fastened on to the bottom side by slips of wood screwed on to the frame and so can be easily renewed. The strainer must be kept clean all the time it is in use. It requires cleaning when a coolie begins to try and push the latex through the mesh with his hand or a piece of latex lump. Two or three strainers should be in use so that this operation is not stopped whilst the strainer is being washed. When finished with for the day the strainer requires to be cleansed thoroughly and no rubber should remain on it.

Tappers on arriving at the factory should remove any lump rubber that has formed, and without squeezing it place it in a bucket containing clean water.

Each coolie must, after his latex has been strained, wash out his bucket. To wash off the latex adhering to the sides of the bucket it is not necessary to use a bucketful of water, two washings with half a pint of water will remove practically all the latex; if this practice is followed only a few gallons of washings are made by a hundred tappers.

When all the tappers have delivered their latex the bucket washings and the water used for washing the latex lump are mixed and strained. At the end of

the straining operations we have already three grades of rubber in sight.

(1) First latex.

(2) Bucket washings.

(3) Latex lump.

Bulking Latex. The term explains this detail in the factory operations. Most estates use Shanghai jars for bulking, but for large crops teak tanks holding up to 500 gallons are to be preferred, in such a tank with average Ceylon latex, latex corresponding to from 1500 to 2000lbs. rubber can be bulked.

It is desirable to bulk all the latex coming into one collecting centre in order to secure uniformity in the appearance of the finished rubber.

Standardising Latex. The standardisation of latex for all types of latex rubber is advised, since by so doing coagulants and other chemicals can be used in definite quantities.

The volume of water necessary to dilute latex to any desired dry rubber content is easily calculated. After bulking, the total volume of the latex is noted and the dry rubber content of the bulk determined by the Metrolac. The product of these two quantities gives the total amount of dry rubber; this figure divided by the desired dry rubber content gives the final volume of the diluted latex, and subtracting from this the volume of the undiluted latex we get the volume of water to be added.

Rubber makers however do not care for calculations and usually turn on the water until they get the desired dilution ; so long as they get this correctly no harm is done.

The standard quantity of latex recommended for sheet preparation is 1½lbs. dry rubber per gallon; and for crepe the highest average rubber content obtained from day to day. On some estates it is possible to standardise to 3lbs. dry rubber per gallon, others can only work to a 2lb. per gallon standard.

The standardisation of the latex completes the operations preliminary to adding the chemicals necessary to bring about coagulation.

Coagulation. Previously it has been customary to give the quantities of acid required in proportions of one part of acid to a certain volume of latex. Since the use of instruments allowing latex to be standardised and the dry weight of rubber to be determined, it is possible to calculate the acid required, from the weight of rubber to be prepared.

One pound of dry rubber requires a minimum quantity of ½ dram of pure glacial acetic acid to coagulate it from the latex. The acid must not be added without dilution and it is advisable to dilute to a 1% solution for sheet, and 5% for crepe.

SHEET PREPARATION.

Air Dried - Smoke Dried. Where sheets are coagulated separately in dishes, 50 gallons of the latex standardised to 1½lbs. per gallon is as large a quantity of acid as can be added to latex at one time and the latex and acid ladled out into the dishes before coagulation interferes with the operation; 50 gallons of latex at 1½lbs. per gallon contains 75lbs. dry rubber, and each 50 gallons will require 75/2 drams = 4¾ozs. pure acid for coagulation. The 4¾ozs. of pure acid are poured into three gallons of water and the solution is then added to the latex and stirred in thoroughly with a large paddle. For ladling out the latex and acid into the dishes a dipper holding one gallon is necessary, and a

number of buckets for carbisulphite required varies dishes. It has been found speedmum quantity not to tory to carry the latex in buckets tolatex containing the racks than to bring each dish up ftes find that jar and then carry it back to the rack wir of the latex. For the work of ladling out into the zs. for it is best to employ five or six coolies, one coo. stands at the jar and ladles out the latex into the buckets, three coolies carry the buckets to and from the racks and pour the latex into the dishes, the other two coolies remove the scum from the sheets. Working this way six coolies can handle the latex for 500lbs. of rubber in an hour.

Tanks fitted with partitions have not as yet come into use in Ceylon. Some estates use troughs but in these the sheets are set flat, and so far tanks with partitions in which the sheets are set on edge have not been seen in use. These are desirable where large crops are made into sheet.

Rolling Sheets. The usual size of dish used in Ceylon gives a coagulated sheet about 1½in. thick and this requires four to five rollings in the smooth roller to bring it down to the thickness necessary for the marking roller. With machine driven rollers two coolies can handle 100 sheets an hour in the smooth roller. One marking roller is sufficient for several smooth rollers.

Marking rollers give varying patterns, the best pattern is one giving a large surface to the sheets, close cut spiral markings are to be preferred.

After rolling, the sheets should be hung on racks to allow all water to drain away. When dripping has ceased it is advisable to wash the surfaces of the sheets to remove the substances which if allowed to remain cause rust on the dry sheets. This washing may be done with hot or cold water.

When the surface water has drained away the sheets are ready for the drying house. Up to this

stage the detail of preparation is the same for air dried and smoke dried sheets.

Air-dried sheets are now-a-days seldom prepared by estates. Smoke drying is general and though a variety of drying houses and patent cabinets are in use, the use of two storied houses is extending. Variations in practice are met with, such as putting the sheet into smoke cabinets with no ventilation for four or five days and then completing drying in air drying sheds. If smoke drying is adopted it is best to complete the drying in the smoke house, as this is quicker than partial smoking and then air drying.

Successful smoke drying requires attention to several points, and provided this is done the process of drying goes on evenly. Sheets for drying should be of even size and thickness, this condition is easily fulfilled by standardising the latex. The thickness of the sheets should be about $\frac{1}{8}$in. Fuel used should be sound and dry, wet wood causes delay in drying.

The house should have sufficient ventilation to allow the moisture given off by the rubber to escape, otherwise the atmosphere in the smoke house becomes saturated and this leads to a heavy glaze on the surface of the sheets.

A temperature of 120°F. should be maintained when the fires are burning. In dry weather fires should not be kept burning during the day without a strict watch on the temperature especially if the building has an iron roof, in such a house a temperature as high as 150°F. has been found in the afternoon and air bubbles formed in the sheets which had recently been put into the house.

Crepe Preparation. For the various types of crepe the details of coagulation are the same. When sodium bisulphite is used the bulked and standardised latex is treated with the minimum quantity of acid and coagulation takes place over-night.

The quantity of sodium bisulphite required varies on different estates. The maximum quantity not to be exceeded is 8ozs. to 50 gallons latex containing 3lbs. dry rubber per gallon. Many estates find that this is more than sufficient to keep the colour of the crepe and there are estates using as little as 3ozs. for 50 gallons of latex giving 150lbs. dry rubber.

Each estate should determine for itself what is the smallest quantity giving satisfactory results.

The sodium bisulphite should be dissolved in two to three gallons of water and be stirred thoroughly into the latex for several minutes before the acid is added.

For coagulation the same amount of acid is used as for sheet. Where 50 gallon jars are used for bulking, the amount of acid for 50 gallons at 3lbs. per gallon is 10ozs. pure acid. The acid is mixed with two gallons of water and then stirred into the latex.

Crepe is prepared in various forms. The coagulum is worked in the fluted rollers into long strips of thick wet crepe and these are then rolled out into thin crepe by the smooth rollers. The amount of rolling given to the rubber in the fiuted roller is less for preparing rubber for artificial driers than for crepe worked to its final form before putting to air dry.

Taking this last named type of crepe, the rolling in the fluted rollers should give after the last rolling a strip of thick wet crepe of even width. From the state of coagulum a minimum of five rollings is necessary, the first rolling breaks down the coagulum and gives a long irregular strip of rubber, the second rolling puts the rubber into a fairly regular strip of crepe if the rubber is fed into the roller to keep the full working width of the rollers engaged. For the third and fourth rollings the strip is doubled on itself in feeding into the rollers, these two rollings should give the rubber as a long strip of even width, the fifth rolling works the strip into good shape. Throughout this work the setting of the rollers should not be

altered. The continual setting and re-setting of the rollers wastes time and leads to strips of crepe of irregular thickness which do not roll well through the smooth rollers. It has been found best to employ two coolies at the fluted roller provided the space around the rollers allows a man to work at the back of the rollers and there is room for the rubber. Two coolies, one at each side of the roller, can keep a machine fully employed all the time it is running. The rubber is fed from one side of the roller to the other whilst one coolie puts the rubber to the rollers the other removes and arranges it on his side of the machine conveniently for the next rolling. When one coolie has to work the roller he has to feed rubber into the machine and at the same time remove it from under the rollers, a far from easy task with a full sized rubber mill running at 20 revolutions a minute. In addition one coolie can only handle a small piece of crepe at a time, and between the various rollings whilst he is getting his rubber ready for the next rolling the machine runs on doing no work. With two coolies 100lbs. of rubber is easily handled in one long strip.

The number of rollings in the fluted rollers for crepe to be artificially dried should not exceed four, it is not essential to get the thick wet crepe into such good shape as it is for crepe to be fully rolled before putting to dry. It will be found that choking down the working width of the rollers by inserting blocks of wood at sides of the guard frame facilitates working rubber to crepe, these keep the rubber away from the ends of the rollers and there is little danger of getting grease on the edges of the strips of crepe. The blocks used on smooth rollers should be $\frac{1}{4}$in. to $\frac{1}{8}$in. thicker than for the fluted rollers, the strip of thick wet crepe is then restricted a little as it is fed into the smooth roller and this causes it to come from the mill with straight and even edges.

For artificial driers once through the smooth roller is sufficient, and also for air dried crepe subsequently made up into blanket crepe.

Crepe that is rolled to its final form before putting to dry requires several rollings in the smooth roller. These can be made with the rollers at one setting, the rubber is passed through the rollers until it has the desired appearance. three or four rollings are as a rule sufficient. Rubber for this type of crepe should not exceed ⅛in. in thickness or drying is too prolonged.

Where artificial driers are used the thin crepe is spread on the trays of the driers, this is tedious work if done entirely by hand and requires considerable labour. The majority of estates now-a-days wind the thin crepe as it comes from the smooth rollers on to drums. The drums are made of such size that when the rubber is cut off it gives a spread of rubber exactly filling a tray of the drier. For good work the drum should revolve on a spindle one and a half times the length of the drum, this allows the drum to be moved along the spindle and facilitates winding the thin crepe on to it. With a drum so arranged a trained coolie can put on the thin crepe very evenly and get a spread for the drier tray of any desired weight and keep to a given quantity for every tray. This is important in working Artificial Driers especially the Vacuum Drier.

Artificial Driers. Several driers are on the market, two working with a plenum of hot air. All driers work satisfactorily provided the correct working conditions are maintained, and the rubber is worked to thin crepe of suitable and even thickness.

Vacuum Driers. The important points in working are

(1) Pressure.

(2) Temperature.

(3) Cool Condenser.

The first two are indicated by gauges on the Chamber, the pressure gauge should reach from 25in. to 28in. and the steam gauge not more than 5in. A good supply of cool water is necessary for the efficient working of the Plant, the condenser removing 70% of the moisture contained in the rubber. Provided these conditions are obtained successful drying is sure, and all that the coolies have to do is to spread the rubber in regular quantities and evenly on each tray.

The thin Crepe is the correct thickness when the smooth mills are giving 100lbs. each per hour. This method of testing the setting of the smooth rollers is more satisfactory than guessing at the thickness; when the smooth mills are giving this output the adjusting screws of the rollers should be marked so that if for other work it is necessary to use them at a different setting, that for thin Crepe for the drier can be got by adjusting to the mark.

Some estates get a higher output by rolling the crepe thinner, but the output from the smooth roller is reduced, and there is little point in getting a high rate of drying if to do so the output from the rolling mills is reduced and the machinery fails to deal with the crop. It is necessary to keep a balance between the rate of output from the mills and the drier. These remarks apply as well to Factories where hot air Driers are used.

Hot Air Driers. Driers are made in various sizes, the largest size from 24 trays gives an output of 80lbs. an hour. To secure this rate of drying the smooth mills should be set to give an output of 60lbs. thin crepe per hour. Three to four pounds of the thin crepe are spread on each tray. In the older machines the trays dried at different rates, recently an improvement has been made in the drier and a more equal rate of drying is secured.

A temperature of 150°F. should be maintained in the drier. The dried rubber from artificial driers is not in a form that the market likes and it is made up into blanket crepe by rolling in the fluted mills. The rubber is rolled with the mills dry and if this is done correctly the rubber is not softened by the rolling. Four rollings are sufficient to get the rubber into good shape. In doing this work the best procedure is to put each dried fold of rubber through the rollers twice and then let it cool, at this stage any rubber that is not of first class colour can be sorted out. At the third rolling the short strips of crepe can be joined up to form one long strip, and the fourth rolling puts a good finish on the crepe.

The rollers are liable to become hot when dealing with large quantities of crepe, and some estates allow water to run on to the crepe at the fourth rolling, the water keeps the rubber and rollers cool and as it is only on the surface of the rubber dries off with one day's hanging.

All artificially dried crepe rubber should be ready for packing 24 hours after the last rolling. Frequently the rubber is correctly dried but in rolling into blanket crepe form, water, allowed to run on to the rollers, is shut into the crepe and only dries out slowly. In some cases the rubber would have been ready for the market sooner if it had been air dried.

In rolling thin air dried crepe into blanket form the same remarks re working with dry rollers apply.

Scrap. The question by whom scrap is to be collected is one for estates to decide, however it is best to employ separate coolies for scrap collection.

Scrap is collected in three grades, or should be but often is not. The grades are

(1) Clean tree scrap off the tapping out.
(2) Tree pickings.
(3) Earth rubber.

When washed and dried these give three distinct rubbers. No. 1 is clean even light brown in colour, No. 2 is dark in colour and No. 3 is black.

Practice in dealing with scrap grades varies widely according to the factory equipment for dealing with such rubber.

Estates without machinery can usually arrange with a neighbouring factory for scrap to be washed, but if this is not possible something can be done to improve the scrap. The scrap should be collected in the grades given above.

A tank with a grating raised 6in. off the bottom is required, the tree scrap is put into this and the tank is filled with water, the rubber is then agitated with a pole and any sand will drop below the grating and bark floats away, with two or three charges of water, the scrap is got practically clean of sand and bark. For drying it should be spread out on trays of wire netting and preferably smoke dried. Tree pickings and earth rubber are treated in the same way.

Estates with factories can turn out scrap rubber perfectly clean. No difficulty is experienced when the factory is equipped with one or other of the scrap washers now on the market. It is to be desired that the makers of scrap washers will see their way to make these washers in different sizes so that the smallest factory can afford to instal one, an estate of 500 acres does not want a machine capable of dealing with the scrap rubber from 10,000 acres.

Without a washer, cleaning scrap is done on a differentially geared mill with fluted rollers. The operation is lengthy and the wear on the rollers is excessive. Heavy dirt is removed but only prolonged washing will get rid of ground up bark. Estates having to wash scrap in ordinary mills would do well to treat the scrap in the manner described for estates without factories before beginning to wash it in the mills.

Tree scrap and tree pickings can be dried in artificial driers without producing softness. Earth rubber can only be air dried.

Bark Shavings. Bark shavings give varying percentages of rubber on different estates. Before they are in any way worked it is necessary to allow them to dry so that the bark grinds easily. The best way to get rid of the bark is to use a grinding mill, this rapidly frees the rubber from the bark and the ground up bark and rubber is sifted, the rubber collected off the sifter is then washed in the ordinary way and air dried.

CIRCULAR TO MEMBERS.

DEAR SIR(S),

PACKING OF PLANTATION RUBBER.

The Rubber Club of America Inc., of New York, which represents the principal rubber importers and manufacturers of the U.S.A. has collected from its members opinions on the condition in which Plantation Rubber reaches consumers there, the object in view being to ascertain whether the present method of packing, satisfactorily meets the requirements of the trade. The information collected has been placed at the disposal of this Association and the particular attention of members is drawn to the following points.

Three-Ply Cases. It is evident that three-ply cases are the most suitable for carrying Rubber provided they are assembled and closed strictly in accordance with the makers' instructions. Estate Managers appear to think that the patent fasteners provided by the makers are not sufficiently strong and that nails must be driven in after the cases are closed in order to ensure the safety of the contents. This is wrong and is responsible for serious complaints of bad-outturn, particularly when the Rubber has to be opened up for inspection in London and/or New York before being sent on to the manufacturers.

Momi Cases. Well-seasoned Momi Cases, if properly hooped, appear to be satisfactory but they do not stand transhipment well unless fully $\frac{3}{8}$-inch thick after being planed ($\frac{3}{4}$-inch before planing). The importance of using only cases which are sufficiently strong and well put together to ensure safe arrival of the contents does not appear to be sufficiently appreciated, and members are advised to pay whatever additional cost is necessary in order to secure packages that conform to requirements.

Chips and Splinters. All the manufacturers concur in complaining of chips and splinters getting into the rubber. Estate Managers realise how important it is to clean the inside of the cases

thoroughly before packing, but after the Rubber is packed it apparently contracts, until there is a certain amount of play inside the case which results in splinters and particles of wood fraying off during transit and becoming embedded in the Rubber. These are very difficult to remove.

It is essential that the rubber should be spread evenly quite close to the sides of the case, which should contain as much rubber as can be packed without undue pressure. A suggestion made by several American manufacturers is that the cases should be lined with cheesecloth or jackinette. The cost is about ½d. per lb. of Rubber. This expedient is now under trial.

Marking. Cases should be clearly marked :—"STOW AWAY FROM BOILERS."

Copies of the letters transmitted through the Rubber Club of America Inc. are available to members for inspection at this office.

It is in the interests of the trade as a whole that steps should be taken to remedy the defect in present packing methods. The accompanying spare copies of this circular are for transmission to your Estate Managers. Further copies may be had on application to me.

Yours faithfully,

A. C. READ,

Acting Secretary.

THE RUBBER GROWERS' ASSOCIATION (Incorporated),
38, Eastcheap, London, E.C.
28th February, 1917.

NOTES.