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HOW TO GET BEST RESULTS FROM PLASTER PRODUCTS

HISTORICAL FILE
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RETURN AT ONCE

UNITED STATES GYPSUM COMPANY

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HOW TO GET BEST RESULTS FROM PLASTER PRODUCTS

This book has been planned for use in two ways. Its prime object is to acquaint the reader with the laws governing the action of all types of gypsum plasters, so that he can avoid plaster trouble. The old saw, "An ounce of prevention is worth a pound of cure," is particularly applicable to plastering.

The second object of the book is to impart information which will enable the plasterer who is experiencing trouble to service his own job. When using the book for this purpose, first determine the cause of the trouble from the handy tables on pages 5 to 15, then turn back to the pages referred to, where will be found further information, including the remedy if there be one.

All information in the book is practical. It is based on more than thirty years of experience of the United States Gypsum Company with plaster usage and trouble correction in every section of the country.

Because Red Top* Plasters are scientifically made and thoroughly tested before shipment, troubles with these plasters are almost invariably due to job conditions. The plasterer who uses "Red Top" and who carefully follows the directions given in this book will seldom have use for the trouble-correction tables.

Therefore, insure yourself against plaster trouble by reading the book now and applying the knowledge gained. It is certain that raising the standard of plastering not only will benefit each plasterer individually, but will also result in far-reaching benefit to the plastering trade.

*REG. TRADE-MARK

United States Gypsum Company

300 WEST ADAMS STREET, CHICAGO

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RED TOP CEMENT PLASTER IN RED TOP BAGS

This plaster—supplied either fibered or unfibered—is to be mixed with sand on the job. Manufactured under U. S. Patent Nos. 1,683,539 and 1,989,641, it has advantages that eliminate most of the job troubles you have encountered with ordinary plasters.

ADVANTAGES

1. It sets properly whether sanded 2 to 1 or 3 to 1.
2. It sets properly with clean or dirty sand.
3. It sets properly with fine or coarse sand within the limits of A. S. T. M. specifications for size of sand.
4. It sets properly with clean or dirty water.
5. It sets from the lath out, instead of from the surface in, giving more time to darby, trowel, or float.
6. It sets evenly, and once started, sets quickly. It does not set up spotted and uneven.
7. It insures minimum possibility of dry-outs.
8. It eliminates differences in setting time caused by hot or cold weather.
9. It has an unusual richness and slip that give easy mixing, far spreading qualities, resulting in a maximum of coverage with minimum labor.
10. It remains plastic and workable for at least a year.

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These charts will tell you the cause of any plaster trouble, with remedy and how similar trouble may be prevented in the future. To use the chart, find in the left-hand column the description which applies to the condition, then read to the right. Before applying the remedy, turn to the pages in the text referred to and read the more detailed instructions.

TROUBLES WITH PLASTERING BASES

WOOD LATH

IF PLASTERED WALL:	THE TROUBLE IS:	REMEDY:	TO PREVENT TROUBLE:
Has cracks or bulges running horizontally with the lath; sounds hollow and loose when tapped.	Due to swelling and buckling of poor grade, or improperly spaced wood lath or failure to wet the lath.	Remove defective parts of wall and replaster.	Use No. 1 or No. 2 lath, preferably white pine, spruce or other soft, non-staining wood, free from knots, sap or bark. Space lath ¼ to ⅜ inch apart at sides and ends, each group of 5 to 8 lath staggered, ends of each lath to be nailed with 2 nails, with 1 nail at each intermediate stud. Wet lath the day before plastering and again an hour before plastering. See "How to Prevent Wood Lath Troubles," page 17.
Has straight vertical cracks.	Failure to stagger joints.		
Shows stains on the surface.	Sap, pitch, resin, oil, tar or gum in the lath.		
	See "How to Detect Troubles Due to Wood Lath," page 17.		

GYPSUM LATH

Shows cracks around boards.	Too thin coat of plaster. See "Causes of Cracks with Gypsum Lath," page 19.	If plaster is not finished or troweled smooth, apply another coat.	Use proper grounds. See "How to Prevent Too Thin Coats," page 21.
Plaster does not bond.	Extreme oversanding.		Sand properly.
	Freezing before set.		Protect from frost.
	Use of plaster other than gypsum.		Use only gypsum plaster.

TROUBLES WITH PLASTERING BASES—Continued

INSULATING LATH

IF PLASTERED WALL:	THE TROUBLE IS:	REMEDY:	TO PREVENT TROUBLE:
Shows cracks around boards.	Too thin coats. — Or — Lath not spaced ¼ inch apart at ends. — Or — Improper drying conditions.	If plaster is not finished or troweled smooth, apply another coat. Remove defective parts of wall and replace. Dry out job and repair cracks.	See "Insulating Lath," page 20. See Specifications for Insulating Lath, pages 51 to 55.
Plaster does not bond.	Extreme over-sanding.	No remedy.	Sand properly.
	Freezing before set.	No remedy.	Protect from frost.
	Use of plaster other than gypsum.	No remedy.	Use only gypsum plaster.

METAL LATH

Shows cracks or sagging on ceilings.	Use of too light weight lath; failure properly to staple, stretch, lap or tie the lath.		Correct all conditions mentioned.
Mortar does not adhere to lath.	Any of the above causes and, in addition, plaster not "extra fibered," or that is over-sanded.		
	See "Causes of Defects in Metal Lath Walls," page 22.		See "Causes of Cracks with Metal Lath," page 22.

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BRICK AND TILE BASES

IF PLASTERED WALL:	THE TROUBLE IS:	REMEDY:	TO PREVENT TROUBLE:
Has a network of small cracks.	Failure to wet brick clay or terra cotta tile before plastering; or use of too little sand. — Or — Overheating and sudden chilling of plaster.	Float cracks and apply more plaster.	Wet brick or clay tile before plastering. Use 3 parts sand to 1 part plaster by weight for these surfaces. Guard against this condition.
Has cracks at wall and ceiling angle.	Wall not wedged at ceiling. — Or — Too much sand in masonry mortar, which permits shrinkage in horizontal joints.		Wedge walls at ceilings or strip angles with mesh or Cornerite. Do not use over 3 parts sand to 1 part plaster by weight.
Has cracks around the door openings, especially over doors.	Usually faulty laying of tile, omission of proper keying in jack-arch construction over the doors, or incorrect construction or swelling of door bucks.		See manufacturer's specifications for details.
Is loosened from masonry.	Masonry surface is glazed or has insufficient suction, or is seriously efflorescing.		Look to the condition of the plastering base.
Has stains, blisters, soft spots and peeling of finish.	Efflorescence.		Use gypsum stainless tile; or fur masonry walls.
	See "Causes of Trouble with Brick or Tile Bases," page 24.		See "How to Prevent Trouble with Brick or Tile Surfaces," page 25.

TROUBLES WITH PLASTERING BASES—Continued

CONCRETE SURFACES

IF PLASTERED WALL:	THE TROUBLE IS:	REMEDY:	TO PREVENT TROUBLE:
Loosens or falls.	Use of plaster not specially made for concrete surfaces.	Remove loose plaster, put wall in condition, replaster.	Use Bondcrete Plaster.
	Neglecting to prepare concrete surface.		Surface must be rough and must be free from dust, oils and efflorescence. All ceilings must be well hacked or roughened.
Shows discoloration.	Efflorescence or moisture from the concrete.		Concrete must be dry and free of efflorescence.
	See "Causes of Plaster Trouble," page 26.		See "How to Avert Plaster Trouble," page 26.

TROUBLES DUE TO WEATHER CONDITIONS

Remains soft, white, chalky, usually in spots, particularly on ceilings over openings, a hot weather condition.	A "Dry-Out." The plaster has dried out before it has had time to set. See "How to Detect 'Dry-Outs'," page 28.	Spray walls with clean water; repeat operation if necessary. See "How to Remedy 'Dry-Outs'," page 29.	Screen openings. Wet lath. Beware of too thin coats. See "How to Prevent 'Dry-Outs'," page 29.
Remains damp and soft, not chalky, usually a winter condition.	"Sweat-Out." See "How to Detect 'Sweat-Outs'," page 30.	After plaster has set open doors and windows. Supply artificial heat in cold weather.	After plaster has set, open the doors and windows. Supply artificial heat in cold weather.

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IF PLASTERED WALL:	THE TROUBLE IS:	REMEDY:	TO PREVENT TROUBLE:
		See "Remedy for 'Sweat-Outs'," page 30.	See "How to Prevent 'Sweat-Outs'," page 30.
Remains soft, something like a "Sweat-Out," and the rooms have been at freezing temperature.	The wall is frozen. See "How to Detect Frozen Plaster," page 31.	Keep building closed, provide artificial heat and thaw out walls. Then provide ventilation and heat to remove moisture.	Don't let walls freeze for 24 hours after application of plaster.
		See "Remedy for Frosen Plaster," page 31.	

TROUBLE DUE TO SAND CONDITION

Is soft (plaster often Quick Set), and trouble is not due to Slow Set, or to retempering of the plaster or to a weather condition.	Too much sand. See "How to Detect Over-Sanded Plaster," page 35. — Or — Too fine or dirty sand. See "Detecting Trouble Due to Too Fine, Too Coarse or Dirty Sand," page 37.	No remedy.	Measure sand accurately. See "How to Prevent Over-Sanding," page 36.
		No remedy.	Use other sand. See "How to Prevent Troubles Due to Poor Sand," page 37.

TROUBLE DUE TO TOO THIN COATS

Is weak and trouble is not due to causes already mentioned.	Too thin coat. See "How to Detect Too Thin Coats," page 38.	If plaster is not finished or troweled smooth, apply another coat.	Fill plaster out to grounds. See "How to Prevent Too Thin Coats," page 38.

IRREGULARITY OF SET

TOO SLOW SET

NATURE OF TROUBLE:	HOW TO PREVENT THIS TROUBLE:
If mortar fails to set after being on the wall over 6 hours, provided all precautions given under "Trouble Due to Weather Conditions," page 28, have been taken, the trouble is probably Slow Set. See "How to Detect Slow Set," page 32.	Be sure that the sand is clean (see "Troubles Due to Sand Conditions," page 35), and that water is pure. If this does not remedy the trouble, try mixing more thoroughly or any of the other ways to quicken set listed under "Remedies for Slow Set" page 32.

TOO QUICK SET

If the mortar sets in the box before it can be used, or sets on the wall before it can be darbied, and if it feels hard and firm, not crumbly, the trouble is probably too Quick Set. See "How to Detect Quick Set," page 33.	First correct local conditions. See that tools and mixing box are free from set plaster; that sand is clean (see "Troubles Due to Sand Conditions," page 35), and that water is pure. Send for U S G Retarder, or, if there isn't time, use pulverized glue, as directed under "Remedies for Quick Set," page 33.

SHORT WORKING PLASTER

If the mortar works hard and does not carry the sand, the trouble is Short Working Plaster. See "How to Detect Short Working Plaster," page 34.

Provide proper storage; do not pile plaster against green wall or damp ground. See "How to Prevent Plaster from Becoming Short Working," page 34.

REMEDIES FOR SHORT WORKING PLASTER

Add a sack of fresh plaster to each sack of short working plaster.

— Or —

Add about two shovels of well slaked lime to each sack.

— Or —

Decrease amount of sand and water.
Make sure that sand is not too coarse or too fine.
See "Remedies for Short Working Plaster," page 35.

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TROUBLES WITH PLASTER FINISHES

LIME PUTTY FINISHES

IF FINISH:	THE TROUBLE IS:	TO PREVENT TROUBLE:
Is dry, brittle and cracked and can be easily removed from base coat.	Defective base coat; or too wet base coat; or finish laid on in one thick coat; or insufficiently troweled; or too little gauging plaster.	Base coat must be hard; must not be too wet; finish must be properly mixed and applied. Follow directions on "How to Prevent Trouble with Lime Putty Finish," page 39.
Soft and weak.	Insufficient gauging plaster; or finish applied with gauging plaster in retempered state; or improper drying conditions.	Use 1 part of gauging (by volume) to not over 3 parts lime putty. See "How to Prevent Trouble With Lime Putty Finish," page 39.
Chip cracked.	Base coat too wet or too dry; or insufficient troweling; or too little gauging plaster.	Apply finish, properly mixed, to properly prepared base coat. See "How to Prevent Trouble with Lime Putty Finish," page 39.
Pops.	Quick lime insufficiently slaked before application.	Quick lime should be slaked for several weeks. The use of hydrated lime insures against pops.
Streaks and discolorations.	Lime and gauging plaster not thoroughly mixed; or too much water used in troweling; or efflorescence from masonry walls.	
Blistered.	Application over a "green" base.	Base coat must not be too wet.
	See "How to Detect Causes of Lime Putty Finish Trouble," page 40.	

TROUBLES WITH PLASTER FINISHES—Continued

KEENE'S CEMENT

IF FINISH:	THE TROUBLE IS:	TO PREVENT TROUBLE:
Lacks strength.	Too high a percentage of lime used.	See specifications, page 59, for correct proportions.
	— Or —	
	Insufficient suction in the base coat.	Base coat should be dry.
	— Or —	
	Insufficient troweling.	Trowel well.
Pops, blisters, chip cracks.	Due to the lime ingredients. See "How to Detect and How to Prevent Troubles With Lime Putty Finish," page 39.	See "Keene's Cement," page 42.

GYPSUM PREPARED FINISHES

Does not bond satisfactorily.	The base coat was too smooth.	Roughen base coat.
	— Or —	
	Base coat was too dry.	Apply to a dry base.
	— Or —	
	Base coat was too weak to hold finish.	Base coat must be in proper condition.
	— Or —	
	Finish was not properly applied.	See specifications, page 56.
Appears to work hard and curl under the trowel.	It is mixed too stiff. Base coat too dry.	Mix thin. Dampen base lightly. Do not soak.
Shows streaks and slobbers.	Improper troweling.	Be sparing of water; trowel so as to incorporate slobbers in wall; work wall "top-and-bottom".

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IF FINISH:	THE TROUBLE IS:	TO PREVENT TROUBLE:
Is soft.	A "Dry-Out." — Or — Finish has been retempered.	See "Dry-Out" page 28.
		Do not retemper finish.
Sets too fast or too slow.		See "Quick Set" and "Slow Set," pages 32 and 33.
	See "How to Detect Cause of Trouble," page 42.	See "How to Prevent Prepared Finish Trouble" page 43.

RED TOP TROWEL FINISH

Does not bond.	The base was too smooth; or not dry when finish was applied, or defective.	See that base coat is hard, roughened and dry.
Shows streaks or slobbers or is not smooth.	Improper troweling.	Trowel top and bottom together to avoid joinings.
Is blistered or weak.	Applied to a green base.	Apply to a dry base.
Is not white.	It has not dried. Give it ventilation, with artificial heat in winter.	Give finish ventilation, with artificial heat in winter.
	See "How to Detect Cause of Trouble," page 43.	See "Red Top Trowel Finish" page 43.

SAND FLOAT FINISH

Shows light and dark spots or light stains not due to plastering base.	Improper floating, or use of too much water in floating, or use of varying amounts of sand. See "Float Finishes," page 44.	Use a prepared float finish, or use care in floating and proportion sand and plaster uniformly. Keep tools clean.

TROUBLES WITH ORIENTAL INTERIOR (Colored Finish Plaster)

IF FINISH:	THE TROUBLE IS:	TO PREVENT TROUBLE:
Is of uneven color. (Note. There will be a slight variation in lights and shadows in textured and float finishes. See page 47.	Uneven absorption in base coat. — Or — Poor drying conditions. — Or — Too much water used in floating, which carries color from aggregate. — Or — Dirty box or tools. — Or — Water-stained from leaks or condensation.	Apply over fairly green base. If base coat is dry, dampen lightly and evenly with clean water. Give proper ventilation, with artificial heat in winter. Use less water in floating. Keep box and tools clean. Protect the finish and supply heat and ventilation if needed.
Fails to bond properly.	Failure to broom base coat; or failure to grind in thin finish coat; or application over over-sanded, weak or frozen base coat.	See "Oriental Interior Specifications," page 58, for proper method of application.
Cracks over wood lath.	Lath buckling, etc. See "Wood Lath," page 17.	See "Wood Lath," page 17.
	See "Oriental Interior," page 46.	Refer to "Oriental Interior," page 46.

TROUBLES WITH ORIENTAL EXTERIOR STUCCO

IF STUCCO:	THE TROUBLE IS:	TO PREVENT TROUBLE:
Has cracks.	Settlement cracks, particularly if cracks are large.	Have general contractor correct structural defects.
	Stucco applied too thin; or too heavy coat put on in one application.	Apply base coat in two coats to proper thickness. Wet each successive coat. Keep wall damp by spraying after finish is applied.

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IF STUCCO:	THE TROUBLE IS:	TO PREVENT TROUBLE:
Has cracks (continued).	Metal lath improperly nailed or not lapped.	Nail and lap lath properly. Never use wood lath on exterior.
	Stucco may have been frozen.	Do not apply in freezing weather.
Corner cracks.	Lath not carried around corners.	Follow directions for applying lath.
Broken bond.	Failure to rake undercoats.	Each coat must be thoroughly raked to prevent water glazing.
	Scratch coat not troweled in.	Trowel in scratch coat.
	Frozen stucco.	Do not apply stucco during the cold season.
Finish shows uneven color.	Uneven absorption of base coat and slow drying condition.	Apply over fairly dry base. If base coat is too dry, dampen lightly with clean water.
	Partly frozen areas.	Keep stucco from freezing.
	Improper flashing; lack of drip on sills, etc.	See that proper flashings and drip are installed.
	Dirty boxes or tools.	Keep all boxes and tools clean.
	Driving rain within twelve hours after application.	Do not apply when rain threatens.
	See "How to Detect Cause of Trouble" page 48.	See "How to Prevent Trouble" page 49.

(Note. "Water glazing" or "lime bloom" appears lighter in color than the rest of the work, may occur under poor suction or drying conditions. They may be removed by scrubbing with 10 per cent muriatic acid and rinsing with clear water.)

Plastering Bases

Since all plasters must be applied to a base of some sort and since the greater percentage of defects in gypsum plastered walls, except those caused by general structural conditions (see "Other Causes of Plaster Troubles," page 49) are caused by the plastering base, everyone having to do with plastering should understand what constitutes a good plastering base.

SECURE BONDING IS REQUISITE

Plaster bonds to the base in one of two ways: One way is by means of a key—known as a "mechanical bond"—such as is formed in plastering wood lath or metal lath. The other way is by *suction*, the suction (absorption) drawing the plaster into the surface pores of the base, so that when the plaster is set, it and the lath are virtually one piece. The keys are present, but they are so minute they can be seen only with a microscope; so that whereas this type of bond also could properly be called "mechanical," it is convenient to think of it as being different from the large, visible keys of wood or metal lath. Examples of suction-bond bases are gypsum lath, insulating lath, masonry, and undercoats of plaster.

WOOD LATH

CAUSES OF WOOD LATH TROUBLES. Below are five causes of wood lath troubles over which the contractor has control:

1. The use of inferior grade lath, which swell, warp and buckle unduly, shearing the keys and cracking the plaster, or lath that contains sap which may stain the plaster. Only a few poor quality lath in a wall may cause glaring defects.
2. Neglecting to wet the lath in order to make them swell as much as they can before the plaster is applied.
3. Improper spacing of lath. Correct spacing is important because the bond here depends entirely upon the keys.
4. Improper nailing.
5. Poor plastering.

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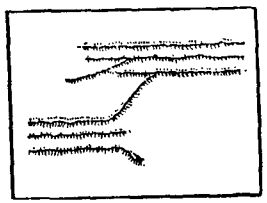
In addition there are the following three causes of trouble which are uncontrollable when wood lath are used:

1. General structural defects (see page 49).
2. The tendency of all wood to swell and warp may cause defects regardless of the care used in selecting, spacing, and nailing of the lath. Wood lath affords little or no bonding strength; accordingly when the lath dries, it shrinks away from the plaster, so that if the keys have been broken, the plaster is without support.
3. Expansion, contraction and twisting of framing members, with which wood lath permits the wet mortar to come in direct contact.

HOW TO DETECT TROUBLES DUE TO WOOD LATH. Cracks and buckles in the plaster coat running horizontally with the lath are always traceable to lath conditions. If the plaster sounds hollow and loose when tapped, but is hard, faulty spacing should be looked for. An exception is where, due to dry-outs or over-sanding, the weakened keys have fallen off.



Cracks following the direction of wood lath are the result of buckling lath. The plaster is often bulged out along the cracks.

Straight vertical cracks, either chip cracks or larger ones, are often the result of failure properly to break joints in the lath. Settlement- and shrinkage-cracks often follow lath joints not properly staggered.

Lath stains on the surface of the plaster are caused by sap, pitch, resin, oil, tar or gum in the lath.

HOW TO PREVENT WOOD LATH TROUBLES. Careful attention to the following points will do much toward preventing wood lath troubles:

Look to the Quality. Use No. 1 or, at least, No. 2 lath. White pine, spruce, or other soft, non-staining wood, free from knots, sap, bark and rot, is preferable. Do not depend entirely on appearance; much clear lath on the market today warps and buckles unduly.

Wet Lath Before Plastering. Swelling wood exerts tremendous pressure, pressure which shears off the keys and causes the plaster to loosen and crack. This condition can be minimized by using lath of good grade and by swelling them to the limit before plastering, so that they will not swell afterward. Soak the lath thoroughly in a barrel of water the day before application to the frame, and wet them again before applying the plaster.

Proper Spacing is Important. Wood lath should be spaced ¼ inch to ⅜ inch apart, at ends as well as sides, because lath swells endwise as well as sidewise. Narrower spacing will not provide sufficient room for the lath to swell, resulting in buckling and weakened keys. A wider spacing, on the other hand, is unnecessary and wasteful of material. Lath should be applied in groups of five to eight lath and staggered—that is, each group moved to the stud at right or left of the group below.

Proper nailing requires nailing to each stud, joist, or other bearing with at least one three-penny fine No. 16 gauge wire nail.

REMEDY FOR LATH CRACKS. The only remedy for this condition is to remove the cracked or weak sections of the wall and replaster. Before doing so, inspect the condition of the lath and attend to the directions for spacing, nailing and wetting heretofore given.

GYPSUM LATH

Gypsum lath is not open to many of the objections of ordinary lath. Being composed of fiber-covered gypsum, it comes in uniform grade and does not swell, warp or buckle. It therefore does not require wetting and should not be wet before plastering. When the lath are butted together over studs and joists, those members are protected from water in the mortar.

There is also no difficulty with bonding, the gypsum plaster knitting into the surface fibers in such a way that the entire surface acts as a key, assuring a maximum bonding area.

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CAUSES OF CRACKS WITH GYPSUM LATH. From the foregoing it will be seen that with gypsum lath the factors which can cause trouble are reduced from eight to three:

1. Faulty design or construction of the building, which results in the expansion and contraction of large timbers, settling in the foundations, deflection of joists and consequent stretching of the ceiling surface due to the employment of too light members or to the improper distribution of loads, etc.

Note. Cracking of plaster even from this cause has now been largely overcome by the employment of a simple, inexpensive resilient clip for attaching the gypsum lath. (See U S G Resilient Plastering System and Standard X reinforcement, page 50.)

2. Failure to observe the very simple directions for the application of gypsum lath.

3. Improper mixing or application of plaster, such as too thin coats or improper drying conditions.

Note. Failure to provide proper heat and ventilation for the plaster in cold weather may result in gradual expansion of the framing. (See "Sweat-Outs," page 30.)

Of the controllable causes of plaster trouble when this fireproof lath is used, by far the most common is the use of a too thin coat of plaster. In order to understand why a full coat of plaster is important on gypsum lath, nailed rigidly to the studding, you have but to realize that the plaster must be depended upon to maintain the integrity of the wall at the joinings of the boards. When the plaster coat is too thin, vibrations and strains naturally cause cracking at the joints. A too thin plaster coat is more likely to be on ceilings, where there are no ground-strips, than on walls. Proper thickness of plaster is necessary to joint reinforcement.*

HOW TO DETECT TOO THIN COATS ON GYPSUM LATH. When cracks following the joints of the lath are noted, measure the thickness of the plaster at those points.

* Additional reinforcement may be given the joints by the use of Standard X Fabric (see page 50).

HOW TO PREVENT TOO THIN COATS ON GYPSUM LATH. For the standard 3/8-inch gypsum lath, use 7/8-inch grounds, which means 1/2 inch of plaster over the lath. With 1/4-inch gypsum lath, the grounds should be 3/4 inch. As it is difficult to apply this 1/2 inch of plaster in one coat, it is recommended that the base coat be made in two applications—first a scratch coat, and after this has set, a second or browning coat.

Follow specifications for Rocklath as shown on pages 51, 52, 54 and 55.

INSULATING LATH

This lath, like gypsum lath, is a suction-bond material, the gypsum plaster bonding to its entire area without requiring any mechanical roughening or visible key to aid it.

CAUSES OF DEFECTS WITH INSULATING LATH. The three reasons for cracks with gypsum lath shown under "Causes of Cracks with Gypsum Lath," including the paragraph on too thin coats, apply also to Insulating Lath.

In addition, since Insulating Lath is composed of wood or vegetable fiber, which is more affected by moisture conditions than is gypsum, it is necessary that several precautions be observed in its use.

HOW TO PREVENT INSULATING LATH TROUBLE. Break joints, spacing the sheets 1/4 inch apart at ends, and fasten securely to the framework.

Apply a 4-inch strip of metal lath or Standard X Fabric in all corners to reinforce the plaster and reduce corner cracks. The tongue-and-groove type of insulating lath is preferable, for it prevents wavy walls due to the edges of the lath being forced inward by pressure of the trowel.

Apply plaster to full grounds specified. As soon as the plaster has set, provide ventilation so that it will dry rapidly. *In cold weather, ventilation to carry off the moisture is absolutely necessary.*

Follow specifications, pages 51, 52, 53, 54 and 55.

BB007 0725

METAL LATH

Metal lath holds the plaster by a mechanical bond. Since the keying spaces are formed in the lath, it is unnecessary to space for keys as in the case of wood lath. Metal lath affords a strong reinforcement for the plaster, and, since there is no expansion or contraction, it does not damage the plaster.

CAUSES OF DEFECTS IN METAL LATH WALLS. Stresses due to defects in the design or general construction of the building, as treated under "Other Causes of Plaster Cracks," page 49, will cause cracks in metal lath walls. This danger can be minimized by the use of the simple, inexpensive, resilient clip described under U S G Resilient Plastering System, page 50.

One cause of weak walls is the use of a lath of too light weight. The stiffness of metal lath is determined by the weight per square yard and in some cases also by the design.*

A too light lath may cause sagging on ceilings, as also will failure properly to stretch and attach the lath.

A cause of cracks at the horizontal joints is failure to tie the lath between studs or to lap the bottom sheet over the one above, instead of vice versa.

Wet plaster standing against the unprotected studs and joists may result in cracks from swelling and shrinkage of those members.

Note. The action of air and water will cause initial corrosion on metal lath where the paint or galvanizing has been knocked off. This action is not so marked on copper-bearing or Armco iron lath. There is nothing in gypsum that will cause corrosion of metal.

HOW TO PREVENT METAL LATH TROUBLE. Use the proper weights of lath, as shown on the following page.

* Junior Mesh Lath has small, plastering-saving meshes yet has unusual rigidity.

MINIMUM WEIGHTS WHEN NAILED TO WOOD STUD PARTITIONS

Type of Lath	Maximum Stud Spacing	Minimum Weight per Square Yard
Expanded Metal (Diamond Mesh).....	16-inch	2.5 lbs.
Rib Lath.....	16-inch	2.75 lbs.
	19-inch	3.0 lbs.
Rib Lath.....	19-inch	2.5 lbs.
	24-inch	2.75 lbs.
	31½-inch	3.4 lbs.
Lath.....	24-inch	4.5 lbs.

MINIMUM WEIGHTS WHEN NAILED TO WOOD CEILING JOISTS

Type of Lath	Maximum Stud Spacing	Minimum Weight per Square Yard
Expanded Metal	13½-inch	3.0 lbs.
(Diamond Mesh).....	16-inch	3.4 lbs.
Rib Lath.....	16-inch	2.75 lbs.
	19-inch	3.0 lbs.
Rib Lath.....	19-inch	2.75 lbs.
	24-inch	3.0 lbs.
Lath.....	24-inch	4.5 lbs.

The minimum weight of Expanded Metal (Diamond Mesh) Lath for use on metal channels for partitions is 2.5 lbs. per square yard for 12-inch centers, and 3.0 lbs. per square yard for 16-inch centers.

The minimum weight of Expanded Metal (Diamond Mesh) Lath for use on suspended ceilings is 3.0 lbs. for 12-inch centers and 3.4 lbs. for 16-inch centers.

Expanded metal lath affords a better reinforcement for plaster than does lath consisting of punched metal sheets. The Junior Mesh Lath is exceptionally economical and efficient.

Stretch metal lath as tightly as possible. See that there are no loose or wavy areas. Lap all ends and edges, the bottom sheet over the one above, and either wire together securely or nail to the supporting frame.

BB007 0726

When fastening to steel studs or suspended ceilings, use non-corrosive wire. No. 18 galvanized wire is standard for this purpose.

Use a standard grade of gypsum plaster, mixed according to directions, and see that the lath is thoroughly imbedded in the plaster so that it will give the plaster maximum support.

WIRE LATH

Woven or welded wire lath provides a mechanical key for plaster. Its function is the same as that of metal lath, and what is said under "Causes of Defects in Metal Lath Walls" applies in a general way to wire lath.

BRICK OR TILE BASES

These consist of gypsum partition tile and column- and beam-covering, common brick, clay tile, concrete block with gravel, cinder or other aggregate. These materials furnish a surface (suction) bond for the plaster.

CAUSES OF TROUBLE WITH BRICK OR TILE BASES. The majority of cracks found in plaster in fireproof structures are due to deflection and deformation strains, to which fireproof as well as non-fireproof buildings are subjected. See "Other Causes of Plaster Cracks," page 49.

Stains, blisters, soft spots and peeling of the finish coat on the surface of plaster applied to clay tile, brick, concrete block, cinder block, etc., result from efflorescent substances ("alkali" or "saltpeter") which are present in these materials. Moisture often comes through the mortar joints of outer walls by capillary action, discoloring the plaster.

Cracks may result from the expansion and contraction of the plastering base. Such cracks will be more likely to occur where brick, clay tile or concrete block serve as the plastering base than where gypsum tile is used, for the reason that gypsum tile has the same coefficient of thermal expansion as the gypsum plaster.

If a properly prepared plaster coat loosens from masonry, it is probably due to the masonry surface being glazed or of non-absorbent material which does not provide the necessary suction.

Cracks at wall- and ceiling-angles are due to failure to wedge the wall at the ceiling; or to the use of too much sand in the masonry mortar permitting shrinkage; or to settlement of the floors.

Cracks around door openings—especially over doors—are usually traceable to faulty laying of the tile, to omission of proper keying in jack-arch construction over doors, or to improper construction of the door bucks. Wood bucks swell and contract when damp, sometimes causing the entire partition to crack.

A network of small cracks in the plaster might be due to any of the following causes:

First. Failure properly to wet brick, clay tile or terra cotta tile before plastering.

Second. The use of too little sand (use three parts to one by weight) with the plaster.

Third. Overheating of the plaster, followed by sudden chilling; this will cause craze-cracking in lime putty finish coats.

HOW TO PREVENT TROUBLE WITH BRICK OR TILE SURFACES. Before plastering, examine the condition of the base and call the general contractor's attention to any faults. Are the walls properly wedged at the top? Is the mortar properly sanded? (Oversanding may result in shrinkage.) Are metal door bucks used and do they properly extend from floor to ceiling? Is the tile work solid, with jack arches properly keyed?

Suggest that the outer walls be furred and lathed—if this has not been done—in order to prevent moisture or efflorescence from discoloring the plaster. Furring is much preferable to damp-proofing. When damp-proofing is used, it should be applied heavily over the entire surface to be plastered, so that all evaporation will be forced to take place from the opposite side of the wall. As walls that have been damp-proofed have no suction, the surface must be sufficiently rough to afford a good mechanical bond, and the plaster must be mixed as required for wood or metal lath.

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Note. Gypsum tile contains no efflorescence and affords a natural bond for gypsum plaster.

When suction is too great, wet brick, clay tile or terra cotta tile before plastering.

Mix the plaster in the proportions of three parts sand to one part plaster by weight.

In winter, be careful to see that the plastered walls are not overheated and then chilled.

Follow specifications, pages 51, 54 and 56.

CONCRETE SURFACES

Although clean concrete surfaces will form a suction bond with gypsum plaster, the bond is not so strong as formed with other masonry surfaces, due to the high expansion and low absorption of concrete. Before plastering, therefore, be sure to see that the surface is in proper condition. It is also desirable that a plaster with unusual adhesive qualities be used.*

CAUSES OF PLASTER TROUBLE. As in the case of other plastering, cracks may result from structural stresses and strains. See "Other Causes of Plaster Cracks," page 49.

Because of the high expansion and low absorption of concrete, trouble may be experienced in plastering directly to concrete unless Bondcrete Plaster is used.

Loosened plaster will result from a too smooth concrete surface or from the presence of dust, oil, or efflorescence on the surface at the time of plastering.

The plaster may not be sufficiently adhesive.

Discoloration of the plaster may result from efflorescence or moisture from the concrete.

HOW TO AVERT PLASTER TROUBLE. If there is any sign of efflorescence on the concrete surface, remove it entirely with a wire brush, then wash the concrete with a 1-to-5 solution of muriatic acid. Wash off the acid thoroughly before applying the plaster. Concrete must be dry before plastering.

* Bondcrete Plaster is specially prepared for use on concrete. It will greatly reduce the chances of trouble occurring.

the concrete is smooth, or if oil has been the concrete forms, the walls should be and lathed, hacked before the plaster is and all oil removed. All ceilings must be acked or roughened to provide a mechan-

rich gypsum plaster should be used. ete, a plaster specially prepared for use crete, is recommended. See specifications, 55 and 56.

ot apply a sanded browning coat over te, and under no conditions do so on In plastering on concrete, the thick- the Bondcrete must not exceed ⅜" on ⅝" on walls.

Gypsum Base Coat Plasters

er that one may get the best results from plaster an understanding of the general ter and setting action of gypsum is neces-

AT IS MEANT WHEN WE SAY PLAS- ETS. In the making of gypsum plaster, rock is subjected to heat (calcined). This drives off a large portion of the water tallization (chemical moisture) contained rock. When plaster is mixed with water job, it takes up the water that was ex- during calcination and recrystallizes, sets. cess water is then evaporated. From this ation, you will readily understand the rea- the great hardness and density and the stance of gypsum materials.

ERES TO ANY STANDARD BASE. Since tting action of gypsum plaster is one of llization, the plaster adheres equally well bases requiring a suction bond and to providing a mechanical key. In the former crystals knit into the porous surface, perfect bonding.

THE SET IS REGULATED. Calcined ets in a few minutes after being mixed ater. In order to delay the set until the can be used, retarder is added at the

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factory, the amount varying with the locality and the season. Due to the rapid setting and drying of gypsum, successive coats can be applied and the building finished without loss of time. This, together with the quickness with which the plaster can be mixed and applied, makes it economical.

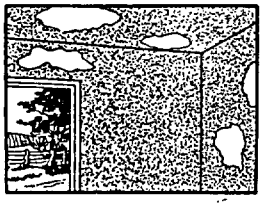
POSITIVE ACTION. Another reason why gypsum plaster is today the standard plastering material is its positive results. No material used by any trade is more dependable. Red Top Plaster is so carefully made and so thoroughly tested before shipment that any trouble experienced is practically certain to be due to job conditions, such as incorrect lathing, mixing, application, or drying. It is the object of this book to explain what these wrong practices are and how troubles arising from them can be remedied and avoided in the future.

PLASTER TROUBLES DUE TO WEATHER CONDITIONS

"DRY-OUTS"

CAUSE OF "DRY-OUTS." "Dry-out" means that the water that has been mixed with the plaster has evaporated from the wall before the plaster has set. By far the greater number of plaster troubles during the hot summer months are "dry-outs." They can be cured, but it is easier to prevent them.

HOW TO DETECT "DRY-OUTS." Dried-out walls are soft, crumbly, and of a light, chalky appearance. If the condition is a partial dry-out, as is usually the case, the dried-out portion of the wall will appear as chalky, light-colored spots, usually more numerous over openings; whereas the portions of the wall that are set will be darker colored and hard. After two or



The presence of white, chalky spots indicates a "Dry-Out."

three days the entire wall will be lighter; however, the dried-out places, if not attended to, will always be somewhat lighter and soft, and cracks will also probably appear.

HOW TO PREVENT "DRY-OUTS." Since the setting of gypsum plaster is a law of nature, plaster will always set in time if kept wet. Therefore, the following three simple precautions will prevent dry-outs:

First. Before plastering in warm weather, screen the openings so that the hot winds cannot strike the walls.

Second. Soak wood lath thoroughly the day before plastering and wet them again an hour or so before plastering. Besides helping to prevent dry-outs, wetting the lath as directed will reduce the danger of lath buckling. Wet as directed, for if the lath are wet for the first time an hour or so before plastering, they may be in the process of buckling when the plaster is being applied.

Third. Apply plaster to proper thickness, because such plaster is less liable to dry out than a too thin coat.

REMEDY FOR "DRY-OUTS." *Do not tear dried out plaster from the wall.* It can be made to set strong and hard.

Dried-out plaster is identical chemically with the plaster in the bag. All that is needed to make it set is to keep it wet. Using a spray pump or a garden hose with spray nozzle, spray the dried-out portions of the walls thoroughly with water. When the spraying is done with a hose, do not have the pressure so strong as to wash off the plaster.

Spray all the dried-out places systematically. After the plaster has stopped absorbing water—a condition which can be recognized by the excess water running down the wall in little streamlets or appearing on the surface in drops—discontinue spraying for the time being.

About two hours after spraying, inspect the wall and if it is not completely set, spray it again. Several applications may be necessary to cause it to set. Do not become discouraged. Remember that plaster *must* set in time if kept wet.

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When the plaster is set and thoroughly dry, "sound" the walls and if any plaster is found to be loose on account of the lath buckling, remove the loose portions and replaster.

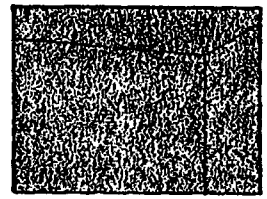
If the dried-out spots are very small and if a spray pump or hose is not available, the water may be whipped on from a plasterer's brush. This, however, will not suffice for a large dry-out.

Clear water is the best treatment for dry-outs. However, when speedy action is necessary, it may be had by applying with a spray pump or a plasterer's brush a solution of six ounces of pulverized commercial sulphate of zinc or alum mixed with twelve quarts of water.

"SWEAT-OUTS"

CAUSE OF "SWEAT-OUTS." A "sweat-out" is the reverse of a "dry-out." Walls in this condition are set but have not expelled the water in excess of that needed to cause crystallization, thus resulting in a partial re-dissolving of the gypsum. Sweat-outs are more likely to be encountered in winter than in summer.

HOW TO DETECT "SWEAT-OUTS." The walls, instead of being white and chalky, as in the case of a dry-out, remain damp, dark in color, and soft. If the condition is not corrected, the walls will in time acquire a damp, musty odor and lose ultimate strength.



When walls remain damp and soft and are dark in color, the condition is a "Sweat-Out."

HOW TO PREVENT "SWEAT-OUTS." For every ton of plaster about one ton of water must be evaporated. Therefore, dry out the walls as quickly as possible after they are set by opening doors and windows and admitting a free circulation of air. In extremely cold weather also provide artificial heat. There will then be no danger of sweat-outs.

REMEDY FOR "SWEAT-OUTS." When a sweat-out condition is detected, open up doors and

windows. In very cold weather use artificial heat in addition to the ventilation to dry out the walls as rapidly as possible. Do this immediately, because if set plaster remains damp for an extended length of time, it loses strength and will eventually become worthless.

FROZEN PLASTER

CAUSE OF FROZEN PLASTER. Walls freezing before they are set.

HOW TO DETECT FROZEN PLASTER. If the temperature inside the building was at freezing before the plaster had set, and if the walls remain damp and dark in color, the plaster is probably frozen. Frequently ice crystals ("crow's feet") are present.

HOW TO PREVENT PLASTER FROM FREEZING. Before the plaster has set use artificial heat in the building, with good ventilation. Frost will not injure plaster that is set.

REMEDY FOR FROZEN PLASTER. Keep the building closed. Provide artificial heat until the walls are completely thawed. When the plaster has thawed and set, provide ventilation and heat to remove the moisture and prevent a sweat-out.

Never apply a finish coat over a base coat containing frost. It results in blistering or peeling of the finish.

IRREGULARITIES OF SET

The setting time of plaster is regulated by the addition of retarder at the mill. Plaster made for summer use is made to set faster than plaster made for winter use, so as to lessen the danger of summer dry-outs. Red Top plasters are so carefully made today that wrong setting time will in almost every case be found to be due to job conditions. In the United States Gypsum Company mills samples of sand and water from every locality are tested and the Red Top Plaster is retarded specially for markets in which the sand or water varies from standard.

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TOO SLOW SET

CAUSES OF SLOW SET. Impure sand may cause plaster to set too slowly, especially if the sand contains organic matter. Water containing sulphur or considerable vegetable matter may also be responsible for the condition.

HOW TO DETECT SLOW SET. When plaster fails to set after being on the wall for over six hours and has a tendency to dry out near openings, a slow-setting condition is suggested.

Before concluding that a plaster is slow-setting, make a simple test as follows: Mix dry a sample of sanded plaster on a clean hawk or mortar board. Put about a pint (two tumblers full) of the mixture in the center of the hawk or mortar board. Now, with the handle of a pointing trowel, make a hole in the center of the dry-mixed material and work it into a ring about five to eight inches in diameter. Into this ring pour clean water, then fold the plaster into the water slowly and mix *thoroughly*. Place the mortar on a well cleaned wet board or, better still, on a piece of glass or the bottom of an old plate or saucer. Protect the patty from hot drafts. Take the time of set. The time will vary from an hour and a half in some sections of the South to four hours or more in other sections.

REMEDIES FOR SLOW SET. Below are listed nine measures which may be taken to make plaster set quicker. None will have any injurious effect on the plaster.

1. Send to the United States Gypsum Company for U S G Accelerator and add four to six ounces (about a handful) to each sack of plaster.

2. Scrape the mixing box vigorously with the hoe so as to incorporate with the mixture all the set plaster accumulated on the sides of the box. Also mix plaster more thoroughly.

3. Crush some plaster droppings, screen through a fly screen, and use about a quart of this set plaster to each sack of plaster.

4. Add about a quart of hydrated lime to each sack.

5. Add about a quart of Portland Cement to each sack.

6. Use water in which tools have been washed for mixing the plaster.

7. Put fifteen pounds of any kind of unretarded plaster (plaster of Paris, moulding plaster, etc.) into a barrel of water about one hour before it is desired to mix the plaster. Use this water, thoroughly stirred, for mixing.

8. Add alum to the mixing water in proportion of one pound of alum to twenty gallons of water.

9. Add zinc sulphate to the mixing water in proportions of two ounces of zinc sulphate to a gallon of water.

TOO QUICK SET

Read the paragraph under "Irregularities of Set."

CAUSES OF QUICK SET. Although the too quick setting of plaster may be caused by underretarding, the condition is far more likely to be due to one or more of the following job conditions:

Mixing of plaster in water in which tools have been washed; permitting set plaster to accumulate in the mixing box; the use of water that has been treated with alum or other salts in a filtration or purifying system; the use of dirty sand or of sand containing silt; permitting plaster and sand to stand "dry-mixed;" use of too much sand; or dirty machine mixer.

HOW TO DETECT QUICK SET. Note if the material stiffens in the mortar box or machine mixer before it can be handled by the plasterer, or if it sets on the wall before it can be darbied.

If there is any doubt as to the condition, mix up a little of the plaster and time the set as described under "How to Detect Slow Set," page 32.

REMEDIES FOR QUICK SET. Correct local conditions. See that tools and mixing box are free from set plaster. See that mixing water does not contain set plaster. If you suspect that the water contains alum or salt, try other water. If the sand is dirty or contains silt, try other sand. Whether the sand is dirty can be determined by making a wash test as described under "How to Detect Poor Sand," page 37. Do not permit plaster and sand to stand dry-mixed before adding the water.

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If an investigation of local conditions does not suggest a remedy, get from your dealer or from the United States Gypsum Company some U S G retarder.

Retarder tends to cake in storage and must always be used with water. Mix the desired amount for each batch in a half pail of water, breaking up all lumps completely. Add this solution to the mixing water. Start with one to two ounces (a fair handful) per 100 lb. bag of plaster. Increase or decrease this amount to secure desired set.

If there is not time to procure U S G Retarder, mix pulverized glue in the proportions of one pound of glue to five gallons of water, and use about a quart of this solution with the gauging water for each 100-pound bag of plaster.

SHORT-WORKING PLASTER

CAUSES OF SHORT-WORKING PLASTER. Gypsum is composed of minute crystals, which are broken down when the gypsum is made into plaster. When the plaster is mixed with water, the crystals return. When plaster is stored for long periods, or in a damp place, it absorbs moisture from the air; this causes a partial recrystallization, resulting in short-working plaster.

In addition to normal aging, short-working may result from improper storage, either in the warehouse or on the job.

HOW TO DETECT SHORT-WORKING PLASTER. The plaster will not carry the customary amount of sand. It will be difficult to mix and to apply. After being mixed it will appear "sloppy"—thin in some places and stiff in others. It will not take water properly, the excess water remaining on the surface. The mortar will appear over-sanded and will not adhere to the ceilings. Squeeze a handful of the mortar and if a core of sand remains in your hand, the plaster is short working, provided that it has not been over-sanded.

HOW TO PREVENT PLASTER FROM BECOMING SHORT-WORKING. Proper storage should be provided and the older stock should be sold first. Plaster should never be piled on the damp ground or against a green plastered wall.

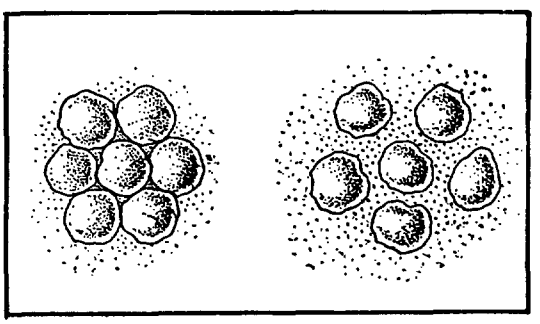
REMEDIES FOR SHORT-WORKING PLASTER. 1. The best remedy is to add one bag of fresh plaster to one bag of the short-working material. In some cases it may be necessary to use two bags of the fresh plaster. A more thorough mixing will often improve the working qualities.

2. Use a well-slaked lime putty or hydrated lime that has been soaked overnight, in proportions of about one shovel of putty to each bag. If lime putty is not available, five pounds of hydrated lime may be used. Since lime accelerates the set of plaster, about one and one-half ounces of U S G Retarder will usually have to be added.

3. A short-working plaster can usually be used by decreasing the amount of sand and water in the mixture. Remedies No. 1 or No. 2, which make the plaster carry its full measure of sand, will, however, be more economical.

TROUBLES DUE TO SAND

CAUSE OF OVER-SANDING. In order that a sanded plaster wall may be strong, each grain of sand must be cemented to the grains on all sides of it. When the proportion of sand to plaster is too great, the sand grains are not properly cemented.



At left are magnified sand grains as they would appear when plaster is over-sanded. At right are sand grains properly cemented for wall strength.

HOW TO DETECT OVER-SANDED PLASTER. The walls are not strong. Holes may be easily bored into the walls with a key or a coin.

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Sand may be brushed off the wall by rubbing the hand over it, and the excess sand can be seen by close inspection. The color of the wall indicates that the condition is not a "dry-out." If any of the mixed mortar is at hand, squeeze a handful, permitting it to ooze out between the fingers, and if a core of sand remains in the hand it indicates one of two things: over-sanding or old plaster.

Fresh plaster is more easily over-sanded than aged plaster, due to its ability to work well and spread easily. It is not common to hear of old plaster being over-sanded, because it is extremely difficult to apply short-working plaster that has been over-sanded.

Whether plaster is over-sanded can be proved by a wash test made as follows:

Crush and dry a sample of set plaster. Place 100 grams of this material in a quart pan. Add a liberal quantity of water; stir, then pour off most of the water, being careful to retain the sand. Repeat this operation until sand alone remains and until the water you add remains clear when the mixture is stirred. Dry over a stove or a Bunsen burner, and the weight in grams will give you the percentage of sand used. More than 75 grams of sand is proof of over-sanding, as this means more than a three-to-one mix. The proportion of sand actually added will be a little greater than shown by the test, for the reason that some particles of loam, etc., contained in the sand will have been washed away. A druggist will lend you the necessary apparatus, or he will usually make the wash test for you at small cost.

HOW TO PREVENT OVER-SANDING. Architects can do much to insure the proper sanding of material by rigid and detailed specifications.

Plasterers who understand that proper sanding not only will save them much trouble and expense but also will save much time and labor in application of the material will be very particular about the sanding of plaster.

The proper amount of sand to be used with gypsum cement plaster for application to wood lath, gypsum lath, or first coat on metal lath is two parts of sand to one of plaster by weight. This is equal

to 60 quarts (six 10-quart pails) of sand to a 100-pound bag of cement plaster; or about 48 quarts (less than five 10-quart pails) of sand to one 80-pound bag of cement plaster.

For application to brick, gypsum tile or clay tile the correct proportion is three parts of sand to one of cement plaster by weight. This is equal to about 90 quarts (nine 10-quart pails) of sand to a 100-pound bag of plaster, or about 72 quarts (seven 10-quart pails) of sand to an 80-pound bag of plaster.

A positive method of preventing over-sanding is to specify Red Top Wood Fiber Plaster to be used without sand. The wood fiber plaster has supplanted the sanded material in many markets, and owing to its greater strength and durability, to its superior resistance to heat, cold, sound and fire, and to its low cost on the wall, it is recommended to those desiring the greatest possible assurance of perfect results.

The use of Red Top Prepared Plaster (mill sanded) or of Standard X Plaster are other safeguards against over-sanding.

DETECTING TROUBLE DUE TO TOO FINE, TOO COARSE OR DIRTY SAND. When plaster sets too quickly or too slowly, or when the finished walls are weak, the trouble may be due to the quality of sand employed. Sand should be clean, sharp, and graduated from fine to coarse. It should be free from clay, loam or other foreign matter.

To determine whether a sand contains loam or clay, note whether the hands are dirtied when a sample of the damp sand is rubbed between them. Or fill a bottle half with sand and half with water, shake it, let it stand, and the clay or loam sediment will settle on top of the sand.

HOW TO PREVENT TROUBLES DUE TO POOR SAND. Use clean sand. Washed sand, if available, is preferable to pit sand. Sand should not be too fine or too coarse, although there is less danger in the coarse than in the fine.

The following is the American Society for Testing Materials' Standard Specification for Gypsum Plastering Sand:

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"Sand used for plastering in which gypsum is employed, shall consist of fine granular material, naturally or artificially produced by the disintegration of rock containing not less than 80 per cent by weight of silica, feldspar, dolomite, magnesite or calcite, and shall be free from saline, alkaline, organic or other deleterious substances.

"Gypsum plastering sand shall be graded from fine to coarse within the following limits:

	Percentage Retained	
	Maximum	Minimum
Retained on a No. 4 sieve.....	0%	.....
Retained on a No. 8 sieve.....	10%	0%
Retained on a No. 30 sieve....	80%	15%
Retained on a No. 50 sieve....	95%	70%
Retained on a No. 100 sieve...	.....	95%
Weight removed by decantation	Not more than 5%	

"The sieves shall conform to the requirements of the Standard Specifications for Sieves for Testing Purposes (A. S. T. M. Designation: E 11) of the American Society for Testing Materials."

The danger of poor sand and of over-sanding can be avoided by the use of Red Top Wood Fiber Plaster (without sand) or Red Top Prepared (mill-sanded) Plaster, or Standard X Plaster.

TOO THIN COATS

HOW TO DETECT TOO THIN COATS. When walls are hard but lacking in strength, the trouble, provided the sand conditions are all right, is probably due to too thin grounds. This can be definitely determined by pulling off a piece of plaster and measuring its thickness.

HOW TO PREVENT TOO THIN GROUNDS. Specify and use the following grounds: For wood lath, ¾ inch; for ¼-inch gypsum lath, ¾ inch; for ⅜-inch gypsum lath, ⅞ inch; for metal lath, ¾ inch; for insulating lath, 1 inch; for brick or clay tile walls, ⅝ inch; for gypsum tile walls, ½ inch.

The work should be rodded and brought to a true and even surface, so that the thickness of the plaster coat will be uniform between ground strips.

Plaster Finishes—General

Finishes made of gypsum or that contain gypsum are, in general, subject to the same abuses as are gypsum base coats. Quick sets and slow sets are detected and treated in a similar manner.

Proper heat and ventilation should be provided, as explained under "Base Coat Plasters." Lime putty finishes particularly are subject to sweat-outs, and measures for drying them should be taken immediately after their application. Gypsum Prepared Finishes—both trowel and sand float—are also subject to dry-outs.

CONDITION OF BASE COAT IS IMPORTANT. A base coat that is to receive finish should be firm and hard; it must be free from frost, which would cause the finish to peel; it should be properly sanded; it must not be in a dry-out or a sweat-out condition; and it must be roughened. Wood Fiber Plaster, also sanded plaster bases applied to metal lath ceilings, must be thoroughly broomed before finishing. Old walls must be scratched or hacked.

If the base coat is too dry, it should be dampened (not soaked) with clean water before applying a trowel finish, in order to reduce the suction, thus producing a good bond and at the same time preventing the tendency of the finish to roll under the trowel. A sand float finish should be applied when the base is in a half green condition.

Trowel finish should not be laid on in a single coat. To assure a satisfactory bond, "grind in" first a thin application of the finish, followed by second coat to level up surface. The third time over use thin and fill all imperfections.

LIME PUTTY FINISH

(Lime Gauged with Gypsum Gauging Plaster or Keene's Cement)

CAUSES OF TROUBLE WITH LIME PUTTY FINISH. See under "Plaster Finishes—General."

One of the commonest causes is failure to provide proper drying conditions; the lime is thus prevented from carbonating and remains soft.

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The use of too little gauging plaster results in a soft, weak finish and in chip cracking due to shrinkage. The larger the percentage of gauging plaster, the stronger the finish. Lime does not set and has practically no initial strength.

Chip cracks are sometimes due to insufficient troweling of the finish.

The sluggishness of the base coat in drying during the winter and "slow drying" months often produces chip cracking.

Lime putty is a strong accelerator; consequently, when the gauging plaster is unretarded or quick set, there is danger of the putty being applied in a setting or retempered state.

Note. Retarded or slow set gauging allows more working time than quick set gauging.

If the brown coat has been over-sanded or applied in a retempered state, it is further weakened by absorption of water from the finish coat, which, when hardened, may loosen or flake off in places, taking part of the sanded coat with it.

Lime that has been insufficiently slaked before application may cause pops and blisters in lime putty finishes. To obviate the danger, common lime should be slaked several weeks before being used. A better, quicker and cheaper insurance against this trouble is to use Red Top Ivory or Grand Prize Hydrated Finishing Lime.

HOW TO DETECT CAUSES OF LIME PUTTY FINISH TROUBLE. Dry, brittle and cracked finishes, which can be easily removed from the base coat, are the result of one or more of the following conditions:

1. Base coat over-sanded, dried-out, sweat-out, retempered, efflorescent, frozen, water glazed, or too wet when finish was applied.
2. Laying on the finish in one thick coat.
3. Insufficient troweling.
4. Insufficient amount of gauging plaster used in the finish to prevent shrinkage of lime.

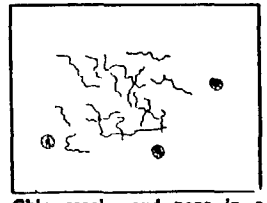
Soft, weak finish coats are due to:

1. Insufficient gypsum gauging plaster.
2. Finish being applied with gauging plaster in a retempered state.

3. Failure to provide drying conditions.

Chip cracks may be caused by:

1. Base coat too wet or too dry.
2. Insufficient troweling.
3. Too small percentage of gauging plaster.



Chip cracks and pops in a lime putty finish.

Pops in lime putty finishes are caused by quick lime being insufficiently slaked before application.

Streaks and discolorations in lime putty finishes, if not due to efflorescence or moisture from masonry walls, are the result of the lime and the gauging plaster not being thoroughly mixed or of too much water being used in troweling.

Blisters are caused by application over a "green" base coat.

HOW TO PREVENT TROUBLE WITH LIME PUTTY FINISH. 1. Be sure that the base coat is hard and firm, is roughened, and fairly dry. (See "Condition of Base Coat is Important," page 39.)

2. If quick lime is used, see that it is thoroughly slaked and aged. If hydrated lime is used, soak it over-night.

3. Use one part (by volume) of gauging plaster to not to exceed three parts of lime putty (by volume). Mix thoroughly.

4. Apply in two or three coats, according to local custom. Spread first coat thin, filling all voids to an even surface. Spread succeeding coat or coats, allow to "draw," then trowel to a finished surface. Use no more water than is necessary in troweling. Complete troweling before finish sets.

5. Attend to drying conditions, using heat in winter and ventilation. (See under "Plaster Finishes —General.")

Plasterers who experience trouble with chip cracking are advised to check the proportions of lime and gauging plaster and drying conditions. If check cracking continues, a small amount of silica sand may be mixed with the finish, or the

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base coat dampened to offset the effect of too much suction. Follow specifications, page 60.

There is no remedy for defective finish, except refinishing, and replastering if the base coat is found defective.

KEENE'S CEMENT

Although Keene's Cement is a gypsum material, it differs from other gypsum plasters in several particulars. It is slow-setting, can be retempered, and the finish coat requires more troweling.

When Keene's Cement is mixed with lime, the lime troubles of chip cracking, popping, etc., explained above, may occur.

When Keene's Cement is used for base coat, it requires a satisfactory base with a mechanical key, and it should not be over-sanded.

The same measures must be taken to prevent dry-outs as for gypsum base coat plasters.

Lack of hardness and strength in a Keene's Cement finish is usually due to the presence of a too high percentage of lime. It may also be due to not enough suction in the base coat (the base coat should be dry), or to insufficient troweling. Keene's Cement must be troweled more than other finishes.

See specifications, page 59, for correct proportions.

PREPARED GYPSUM FINISHES

As these finishes are scientifically prepared at the mill and require the addition of water only at the job, the few troubles attending their use are due to wrong handling and application.

HOW TO DETECT CAUSE OF TROUBLE. If the finish is too quick set or too slow set, see "Quick Set" and "Slow Set," pages 32 and 33.

If the bond is not satisfactory, it is because (1) the base was too smooth or not dry when the finish was applied; or (2) was weak due to being over-sanded, sweat-out, dried-out, retempered, efflorescent, or frozen; or (3) because the finish was not properly applied. If the finish works hard and curls under the trowel, it is mixed too stiff.

If the finish is not smooth, it has not been properly troweled.

Streaks and slobbers are caused by the use of too much water in troweling or to inexperience in troweling this type of finish.

If the finish is soft and chalky, the condition is a "dry-out" resulting from proper drying and ventilation not being provided. See "Dry-Outs," page 28.

Soft spots may be due also to some of the finish being retempered.

HOW TO PREVENT PREPARED FINISH TROUBLE. See that the base coat is hard and firm, roughened and dry. If too dry to permit easy application of the finish, it can be conditioned by spraying lightly with water just before finishing.

Do not mix the finish too stiff, and be careful to see that it is not retempered.

Apply a thin coat first, grinding it well into the base coat, so as to assure a good bond, facilitate application and prevent curling under the trowel.

Avoid streaks and slobbers by being sparing of water in troweling and by troweling down the slobbers and incorporating them in the wall. Also have one man on the scaffold and one below finish the walls simultaneously so as to avoid joining marks.

Since this finish is a gypsum material, proper drying conditions and ventilation should be provided as shown for gypsum base coat plasters, pages 28 to 31.

Follow specifications, page 56.

SAND FLOAT FINISHES

When these finishes are compounded on the job, they are subject to the same dangers of oversanding, etc., as are gypsum base coat plasters. All the directions given for base coats regarding quick set, slow set, proper drying, ventilation, etc., also apply to these finishes. The chief causes of trouble are improper floating, the use of too much water in floating, or in job-prepared material lack of uniformity due to the use of varying quantities of sand with different batches.

HOW TO DETECT THE CAUSES OF TROUBLE. If the finish rolls and works hard under

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the float, it is due to the base coat being too dry when the finish is applied or to attempting to apply the finish in a thick coat.

"Scoured-out" spots in the finished walls result from the use of so much water in floating that the surface has been killed in places.

Unevenness of the finished surface is due either to a too heavy coat or to improper floating.

Lack of uniformity in different areas points to variation in the quantities of sand mixed on the job.

Separation of finish and base, provided the finish has been properly mixed, applied and dried, is due to an unsatisfactory condition of the base coat.

(See under "Condition of Base Coat is Important," page 39.)

HOW TO PREVENT TROUBLE WITH SAND FLOAT FINISHES. See that the base coat is hard and firm and in the proper condition of moisture—50 per cent dry, or "half-green."

Mix the finish thoroughly, thin and plastic.

Apply with a trowel, then float with a cork-, carpet- or felt-float, working the material to an even surface, free from float marks and cat faces. Use water sparingly in order not to kill the surface—the separation of the sand from the rest of the material, which gives the walls a "scoured" appearance. Keep floating tools clean.

Never apply a sand float finish in a thick coat, because this causes the material to roll or slide on the base coat, making it difficult to get a true, even surface.

Attend to drying and ventilation as given for base coat plasters, pages 28 to 31.

See specifications, pages 57 and 60.

Note. Freedom from sand troubles and insurance against lack of uniformity in color and texture are to be had by using Red Top (white or gray) Sand Float Finish, which is scientifically prepared at the factory and requires the admixture of water only at the job. Specifications, page 57.

SABINITE ACOUSTICAL PLASTER

Sabinite differs from other plaster finishes in that it absorbs sound. Since improper application may greatly reduce the sound absorption, Sabinite should be applied only under the personal supervision of the manufacturer's service representative. *Unless the material is applied under such supervision, the company will assume no responsibility for the result.* Please see that the nearest office of the company is notified as far in advance as possible of the exact day application is to start. This will save both time and money, for the service man can show you how to apply more yards per man-hour.

Success with Sabinite depends a great deal on proper mixing and application of the base coat to which Sabinite is to be applied. It should be true and straight to prevent wasting of the more expensive finish and should be raked deeply just before it sets. Under no circumstances should Sabinite be applied to a base coat that is not thoroughly dry.

The rules given in this book for the correction of quick set and slow set in gypsum base coat plasters also apply to Sabinite.

There is no charge for servicing Sabinite. Take advantage of it and it will save you money.

ORIENTAL INTERIOR

(COLORED FINISH PLASTER)

As this finish is colored with high-grade mineral colors at the factory and comes to the job ready for use with the addition of water, any trouble encountered must be due to job conditions.

HOW TO DETECT THE CAUSE OF TROUBLE. Oriental Interior is strong and contains nothing to cause cracking. Cracks are necessarily due to an inadequate plastering base, to general structural defects, or to an unsound base coat, or to misapplication of the finish, which also may result in discoloration.

HOW TO DETECT CAUSES OF COLOR VARIATION. Did the base coat dry out evenly?

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Was too much water used in the finish, so that the coloring matter was separated from the aggregate?

Was the mixing box perfectly clean? A dirty mixing box or unclean tools will produce a streaky appearance.

HOW TO PREVENT TROUBLE WITH ORIENTAL INTERIOR. Oriental Interior must not be applied over poor masonry construction and *positively must not* be applied on jobs where heat and ventilation have not been provided during slow-drying seasons or periods.

Inspect the condition of the base coat to see that it is firm and hard and dried out evenly. If the base coat is too dry, dampen it uniformly with clean water in order to cut the suction.

Provide proper heat and ventilation.

Mix with clean water only. Use a clean mixing box and perfectly clean tools.

Thoroughly scratch in a first coat, completely covering the base, thus forming a background of color and creating a uniform suction for the finishing coat.

Use water sparingly in floating; too much water will carry a portion of the color away from the aggregate.

Note. When the finish coat is textured, there may appear to be a variation in color owing to the effect of lights and shadows produced by the texture. A color in texture, therefore, may appear to be of a trifle different shade than the same color in a float finish.

See specifications, page 58.

ORIENTAL EXTERIOR (STUCCO)

Oriental Exterior Base Coat and Oriental Exterior Finish are factory-mixed materials, the finest ingredients obtainable in scientifically correct proportions being used in their manufacture. Since the material is of great strength and contains nothing to cause cracking, any trouble will necessarily be due to the plastering base, to general structural conditions, or to misapplication.

ORIENTAL EXTERIOR BASE COAT

HOW TO DETECT CAUSE OF TROUBLE. Large cracks are due to structural defects, to the stucco being applied too thin, or to the metal lath not being properly nailed or lapped. Corner cracks are due to the lath not being carried around corners. If applied in winter, the base coat may have been frozen. Broken bond would be due to structural defects, to an inadequate or improperly prepared base, or to a scratch coat not being troweled in before the application of the second coat.

Broken bond between successive coats would be due to failure to rake the undercoat or to freezing.

HOW TO PREVENT TROUBLE. Before starting work, report any structural defects or an improper bonding surface to the architect. See that water-table, flashings around openings, and drip on cornices, sills, etc., are installed. It is specially important to see *that provision has been made so that water can at no point get behind the stucco.* Masonry surfaces should not be oily, or smooth, or contain frost, and mortar joints should be raked.

Lathed surfaces should be of heavy expanded metal or heavy galvanized wire mesh (not wood lath), furred out and properly attached. Lap the sheets and carry around all corners. We recommend Red Top Stuccomesh applied with Economy Furring Nails, or 3.4 lb. copper bearing Diamond Mesh, self-furring, or Corrugated Metal Lath, the lath to be applied according to the manufacturer's directions.

Mix with water only. Water must be clean, free from impurities. Keep mortar box and tools clean.

Do not apply during freezing weather.

Apply the base coat to ¾-inch to 1-inch thickness. *A base coat of proper thickness is positively necessary for a satisfactory job.*

First trowel in a scratch coat ⅜ inch to ½ inch thick and let it dry three to five days before applying the second coat, which should be not less than ⅜ inch thick. From seven to ten days should be allowed to elapse before application of the finish.

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Thoroughly rake each coat to provide a bond for the succeeding coat. In hot weather wet down each coat daily; this will greatly increase its strength.

Follow specifications, page 61.

ORIENTAL EXTERIOR FINISH COAT

HOW TO DETECT CAUSE OF TROUBLE. Discolorations may be due to the presence of dirt in the mixing box. Or they may be due to application over a base coat that is too dry. A too-dry base coat may also cause the finish to crack, as also may application of the finish in too heavy coats.

Discolorations may also be due to dirty water running down the face of the stucco, due to neglect to provide proper flashings around openings or sufficient drip on cornices, sills, etc.

Broken bond is due to the base coat not being properly roughened.

HOW TO PREVENT TROUBLE. See that the water table is at least a foot above ground level, and that proper drip is provided here, at cornices and around openings, so that dirty water cannot run down the face of the stucco.

See that the mixing box and tools are clean. If more than one color of finish is being used on the job, it is extremely important to see that no particles of a different color remain in the box.

Do not apply during freezing or wet weather.

Have the base coat at the right stage of moisture; if it is too dry it will absorb water from the finish coat and result in color variation. Do not allow the finish to dry too rapidly; if the weather is extremely hot and dry, the walls should be kept damp until hardened by spraying after the finish is applied. *Do not use a heavy stream in spraying.*

Avoid variation in color by working the first coat of finish thoroughly into the base coat and by covering the base coat completely with this first coat.

Before applying the finish, provide a proper bond by thoroughly raking or dry floating the base coat so as to tear the surface. Merely scratching the base coat is not sufficient. A thorough troweling of the finish will also help to assure a good bond.

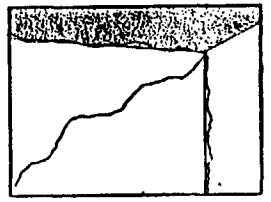
See specifications, page 61.

OTHER CAUSES OF PLASTER CRACKS
AND WHAT THE PLASTERER CAN DO TO PREVENT THEM

GYPSUM PLASTER WILL NOT CRACK OR LOOSEN OF ITSELF. Provided the plaster is properly mixed and applied, therefore, plaster cracks must of necessity be the result of weak or buckling lath or else of defects in the general construction. Structural defects may be caused by the shrinkage or slipping of large timbers, of settlement in the foundations, of strains due to wind pressure, of too light joists or of improperly distributed loads.

Ceiling cracks are often caused by the stretching of the ceiling plaster resulting from the deflection of the joists. Joists should be so designed that they will at no time be deflected more than 1/360th of their span, because this represents the elastic limit of plaster.

Settlement cracks usually occur in the corners of rooms or run diagonally across the walls. If both sides of a partition are cracked in the same general direction, the cracks are undoubtedly the result of settlement.



Cracks due to settlement usually appear at the corner angles or run diagonally across the room.

Vertical or horizontal cracks not caused by buckling of lath are usually the result of swelling or shrinkage of the frame, due to moisture or to temperature changes.

Since the plastering contractor is not responsible for general structural defects, he should avoid un-

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just blame by calling attention to such defects before starting work. He should also do his best to offset the effects of poor construction by selecting the best materials and insisting upon good workmanship and full coats of plaster.

He should see that re-entrant angles are reinforced with metal lath or Cornerite and that all corners are covered with corner bead. He should also use reinforcement above and below opening (factory-formed metal arches on arched openings) and at other points where there is liable to be undue vibration or uneven expansion.

A plastering system possessing the extra strength required to resist unusual strains is the Standard X Plastering System. This consists of Standard X (gypsum) Lath, Standard X Fabric for reinforcing joints between the lath, and Standard X Plaster, a prepared gypsum plaster of unusual strength. Insulating Lath can also be furnished with the metal joint reinforcement.

Another interesting development in lath and plaster construction is the U S G Resilient Plastering System. In this system the Rocklath is attached to studs and joists by a resilient spring clip, resulting in a "floating" construction which permits of considerable movement taking place in the structure without undue strain being transmitted to the walls and ceilings. Other advantages of this system are a high degree of sound insulation, and the elimination of ceiling streaks, due to the even density of the "floating" ceiling.

SPECIFICATIONS

These are "short-form" specifications. Complete detailed specifications on any U S G material will be supplied upon request.

The following general directions apply to cement plaster, wood fiber plaster and prepared plaster:

(1) Use a clean, tight mixing box.

(2) Use only clean water, free from alkali and impurities; keep tools clean. Never rinse tools in gauging water.

(3) Do not mix more material at a time than can be applied in one hour.

(4) Do not mix one gauging with another, and never retemper plaster after it has commenced to set. Clean the mixing box or mixer-hopper after the mixing of each batch.

(5) Keep plaster from freezing for 24 hours after application.

(6) In hot, dry weather, screen all openings to prevent material drying out before it is set. If plaster should dry out—indicated by soft, white areas in the walls—the condition can be righted by spraying with clean water until the material sets.

(7) After the plaster has set, provide proper ventilation to permit the walls to dry out as quickly as possible. In freezing weather also provide heat.

(8) Keep plaster in a dry place; storage on the bare ground makes plaster lumpy, quick setting and short working.

Grounds and Lathing

(1) *Grounds.* To be not less than ¾ inch for ¼-inch gypsum lath, wood, wire or expanded metal lath; ⅞ inch for ⅜-inch gypsum lath; 1 inch for ½-inch insulating lath; ⅓ inch for Pyrobar Gypsum tile; ⅝ inch for brick or clay tile; Bondcrete on concrete, ½ inch on walls, thin as possible on ceilings.

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(2) *Lathing.* Preferably Rocklath, Red Top Metal Lath, or Red Top Insulating Lath, applied according to manufacturer's specifications.

(3) *Application of Red Top Rocklath.* Stagger boards each course on studding and joists. Stagger at wall and ceiling intersections. Butt all edges; do not lap.

(4) Nail with 1⅛-inch, 13 gauge, 3/8-inch head, blued, long point, sterilized nails.

(5) Space nails 4 inches apart on every support, nailing to center support first, then outer edges. Each nailing edge must have a firm bearing on studs, joists or furring. Drive nails home.

(6) Reinforce all angles with Red Top Cornerite and all corners with Red Top Corner Bead. All arched openings shall have Red Top Metal Arches.

(7) *Application of Red Top Metal Lath.* Apply lath with long dimensions across the supports. Apply to ceiling first, carrying sheets down 6 inches on walls. If lath is not used on the ceilings, carry top of wall sheet 6 inches on joists, so that no joints occur at juncture of ceiling and walls. Also no joints shall occur at wall corners.

(8) Where 3/8-inch rib lath is used on ceilings or walls, it shall be butted into all joints, and strips of flat lath shall be bent into the shape of an "L" (Cornerite), 3 inches on each side, and be securely wired along each edge in all corners. Cornerite shall not be fastened at the corner, but only along each edge of the sheet.

(9) Lath shall be placed so that the lower sheet laps over the upper. Fastenings shall be so placed that they shall occur where sides of sheets lap at supports.

Expanded metal lath shall be lapped at sides not less than ½ inch and at ends not less than 1 inch. End laps shall occur only over supports.

Rib lath shall be lapped at sides by nesting outside ribs, and shall be lapped 1 inch at ends.

(10) Metal lath shall be attached to wood studs and joists by not less than 4d and 6d nails, respectively, driven to a penetration of not less than ⅞ inch and 1 inch, respectively; and spaced not to exceed 6 inches on centers; or by clips or devices with equivalent penetration and holding power. There shall be one tie on side laps, half way between supports.

(11) On metal supports wire at intervals not exceeding 6 inches with not less than No. 18 gauge galvanized soft annealed wire. A tie shall always occur where sides of sheets lap at channels. There shall be one tie on side laps half way between channels.

(12) All corners shall be protected by corner beads for their full height. Arched doorways shall be fitted with Red Top Metal Arches.

(13) *Application of Red Top Insulating Lath.* Apply to studs, joists, or rafters set not to exceed 16 inches on centers, hard-surface side of lath exposed. Stagger end joints.

(14) Space insulating lath ¼ inch apart at ends.

(15) Use 6d common, blued or box nails on 1-inch or ¾-inch lath; and 4d on ½-inch lath, spaced 5½ inches on center into each stud. On long sides of each board, nails should not be more than ¼ inch from the edge.

(16) Reinforce all angles with Red Top Cornerite and all corners with Red Top Corner Bead. All arched openings shall have Red Top Metal Arches.

(17) With Red Top Metal Reinforced Insulating Lath, see that joint reinforcement is in place; also that all corners are properly reinforced.

(18) Do not sprinkle or wet Red Top Insulating Lath before plastering.

(19) *Application of Wood Lath.* Wood lath shall be of white pine, cypress or spruce or other soft, non-staining wood, free from knots, sap and bark. Lath shall be thoroughly soaked in a barrel before applying.

(20) Lather shall break joints every eighth lath.

(21) Space lath not less than ¼ inch or more than ⅜ inch apart, and nail to each bearing with standard wood shingle nails (3d common), two to each end and one to intermediate bearings.

(22) All angles shall be reinforced with Cornerite, and all corners with Red Top Corner Bead. Arched openings shall be fitted with Red Top Metal Arches.

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Base Coat Plaster

(23) *Mortar.* To be Red Top Cement Plaster, Red Top Wood Fiber Plaster, or Red Top (sanded) Prepared Plaster (specification should state whether for application to lath or brick or tile), plaster to be mixed and applied according to manufacturer's specifications. For application to concrete surfaces use Bondcrete.

MIXING RED TOP CEMENT PLASTER

(24) *Directions for Mixing Red Top Cement Plaster.* In the raised end of box put in a layer of sand, then one of plaster. Hoe dry from one end of the box to the other, then back again, working sand and plaster thoroughly together to a uniform color.

Hoe plaster into the water, mixing thoroughly, to bring to the proper consistency for application. Do not mix sand and plaster until ready to add the water.

(25) When mixing in a machine, add water, then half amount of sand, then dry plaster, then remainder of sand, mix to the desired consistency. Do not prolong mixing after the mix is made.

(26) Use only dry, clean, sharp sand, free from loam and dirt. Screen through a six-mesh screen. Avoid quicksand.

(27) *For Scratch Coat Application to Rocklath, Metal Lath, Insulating Lath, Damp-Proofed Masonry Surfaces, and Wood Lath.* Mix two parts by weight of clean, sharp, dry sand with one part of plaster.

(28) *For Application to Brick, Pyrobar Tile, Clay Tile, and Second (Browning) Coat Over Above Bases.* Mix three parts by weight of clean, sharp, dry sand with one part of plaster by weight.

MIXING RED TOP WOOD FIBER PLASTER

(29) Red Top Wood Fiber Plaster is to be used without sand, or it may be mixed with not to exceed equal parts of sand by weight.

(30) For second coat, mix equal parts, by weight, of plaster and clean, sharp sand.

(31) If mix is to be sanded, put a layer of sand, then one of plaster in raised end of box. Hoe dry from one end of the box to the other, then back again, working sand and plaster thoroughly. Do not let sanded mix stand before adding the water.

(32) Hoe the plaster into the water and allow to soak at least 10 minutes and then mix to correct working consistency.

MIXING RED TOP PREPARED (SANDED) PLASTER AND BONDCRETE

(33) Only water is to be added to these materials to fit them for application, and under no circumstances will the contractor be allowed to mix in sand or other solid material.

(34) Mix same as paragraph 32.

APPLYING CEMENT PLASTER, WOOD FIBER PLASTER, AND PREPARED PLASTER

(35) *On Rocklath.* Do not wet the lath. Apply scratch coat. Then after first coat has set, apply brown coat to a true and even surface, filling out to grounds. Before the brown coat begins to set, cross rake the surface, ready to receive the finish coat.

Note. Wood Fiber Plaster is sometimes troweled smooth instead of finishing.

(36) *On Red Top Metal Lath.* Apply in three coats, scratch, brown and finish. Scratch coat shall be applied a little stiff, covering the lath and filling meshes. Cross rake first coat and allow it to set before applying brown coat. Apply to a true and even surface, filling out to grounds. Before the plaster begins to set, cross rake the surface, ready to receive the finish.

(37) *On Red Top Insulating Lath.* Do not wet or sprinkle lath. Apply same as on Rocklath, paragraph 35. As soon as plaster has set, provide ventilation to carry off the moisture.

(38) *On Wood Lath.* Soak lath thoroughly the day before and again an hour or so before plas-

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tering. Apply scratch coat with sufficient pressure to obtain a good key. Rake or scratch the surface. Apply brown coat to a true and even surface, filling out to grounds. Before the brown coat begins to set, cross rake the surface, ready to receive the finish coat.

Note. Wood Fiber Plaster is sometimes troweled smooth instead of finishing.

(39) *On Brick, Pyrobar Gypsum Tile or Clay Tile.* If necessary sprinkle porous masonry surfaces lightly to reduce suction. Apply in two coats, scratch and brown, filling out to grounds and to a true and even surface. Before the plaster begins to set, cross rake the surface, ready to receive the finish coat.

(40) *Bondcrete on Concrete Surfaces.* The concrete surface must be dry and free from dust, oils and efflorescence before Bondcrete is applied. If oil or grease is on the concrete surface, burn off with a torch. If there is any efflorescence, remove it with a wire brush, then wash with a one-to-five solution of muriatic acid. Wash thoroughly with clean water to remove acid. All ceilings must be hacked.

Apply scratch coat as thin as possible doubling back to straighten the concrete surface. Thickness must not exceed 3/8" on ceilings. Before the plaster begins to set, cross rake the surface, ready to receive the finish coat.

Note. Bondcrete may be troweled down to a smooth finish in lieu of a finish coat.

Note. Directions for using Red Top Keene's Cement for base coats will be furnished on request.

Prepared Finishes

Caution. Base coats must be in proper condition —set, free from frost, and sufficiently rough to assure a firm bond.

PREPARED GYPSUM TROWEL FINISHES

(41) *Brand.* To be Red Top Trowel Finish, or Red Top Adamant White Trowel Finish, or Red Top Universal White Trowel Finish, or Red Top

Adamant Gray Trowel Finish, or Red Top Universal Gray Trowel Finish, or Red Top Adamant Slate Colored Finish. Mix with water only. Mix and apply according to the directions of the United States Gypsum Company.

(42) *Mixing.* Use a small mixing box, about 2 feet 6 inches wide, 4 feet 6 inches long and 10 inches deep, or mix with a paddle in a clean pail.

(43) Hoe the finish into the water (using approximately one part of water to two parts of finish by volume). Allow the finish to soak and draw in the water without hoeing for at least ten minutes. Then mix thoroughly to a smooth, even, creamy consistency. Bring finally to a thin consistency. Carry in a bucket.

(44) *Application.* Base coat must be *dry* before finish is applied. If suction is too great, sprinkle lightly with clean water from a clean brush.

(45) Apply in three coats. The first time over, put on enough material to cover the surface completely, laying on material as thin as possible and working it thoroughly into the base coat. Allow this to draw a few moments to avoid blistering.

(46) The second time over, lay the material on level. The third time over, fill in cat faces and imperfections. After it has drawn a few moments, trowel to a smooth surface, applying water sparingly with a damp brush.

(47) Work top and bottom of the wall at the same time to avoid joinings.

PREPARED SAND FLOAT FINISHES

(48) *Brand.* To be Red Top Adamant White Sand Float Finish, or Adamant Gray Sand Float Finish, or Red Top White Silico Sand Float Finish, or Red Top Gray Silico Sand Float Finish.

(49) *Mixing Prepared Sand Float Finishes.* Put the finish in the upper end of mixing box and water in lower end. Hoe finish into water. Allow to soak and draw without hoeing for at least ten minutes. When the material has soaked, mix thoroughly and, with particular care, break down the mix to a smooth, even consistency.

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(50) *Application.* Apply after the base coat has set firm and hard, but while still green. First grind in a thin coat, after which lay on the final coat to an even surface.

Float with a cork, carpet or felt float, working the material to a true and even surface, free from float marks and cat faces. Use as little water as possible in floating to avoid killing the surface. Use damp brush only. Do not attempt to float after the material begins to set.

ORIENTAL INTERIOR

(COLORED FINISH PLASTER)

(51) *Brand.* To be Oriental Interior.

(52) *Mixing.* Mix with water only. Under no circumstances shall sand or other solid material be added.

Use a small mixing box about 2 feet 6 inches wide by 4 feet 6 inches long and 10 inches deep, raised 4 inches at one end. Keep mixing box, mortar board and tools perfectly clean.

Put material in raised end of box, with water in lower end. Hoe material into water and let it soak and draw in the water without hoeing for at least ten minutes. (Best results are obtained when allowed to soak over-night.) After it has soaked, mix it thoroughly to a thin creamy consistency.

(53) *Application.* Brown coat must be broomed or dry floated to receive finish.

To obtain best results, apply finish after base coat has set firm and is slightly green. If base coat is too dry, dampen uniformly with clean water to cut suction.

Remove all loose or projecting particles from base coat which may show through the finish coat (loose particles may prevent proper bond).

For both texturing and floating, lay on a thin coat, thoroughly covering the base before applying the finishing coat.

(54) For float finish use cork, carpet or felt float, working material to a true and even surface, free from float marks and cat faces. Do not use excess water in floating, as color streaks or slobbers may result.

(55) For texture work, after grinding in a thin coat, apply additional material, working the surface to the desired texture. (Detailed directions for producing textures will be furnished on request.)

(56) For tile effects, mark off with a straight-edge within 24 hours after application.

(57) Oriental Interior should be properly protected while in the warehouse and should not be placed on the ground or damp place at the job.

Job Mixed Finishes

RED TOP KEENE'S CEMENT FINISHES

Note. Information about the use of Red Top Keene's Cement for base coats or for casting or scagliola will be furnished upon request.

(58) *Brand.* To be Red Top Keene's Cement or Red Top Quick Troweling Keene's Cement.

Note. For casting work, use Red Top Casting Keene's. Lime to be Red Top Finish Lime.

(59) *Mixing for Smooth Finish.* Medium hard: Use 100 pounds Red Top Keene's Cement and 80 pounds lime putty (40 pounds Red Top Finish Lime). Hard, for bathroom and kitchen wainscots: Use 100 pounds Red Top Keene's Cement and 25 pounds lime putty (one 12-quart pail). Extra hard: Use Red Top Keene's Cement and add water only.

Soak hydrated finishing lime over-night. Form a ring of putty on the mixing board, add water, soak the Keene's until thoroughly wetted; then mix well with lime putty in the customary manner.

(60) *Application.* Reduce suction of base coat by wetting as required. Apply finish smoothly and evenly. Trowel well, using as little water as possible.

Where a highly polished surface is desired, dry trowel occasionally until it is set.

For a tile effect mark off with a straight-edge while the cement is "green"—preferably from four to five hours after application. Units shall be of uniform size and shape and joints clean cut and even.

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(61) *Mixing of Red Top Keene's Cement for Sand Float Finish.* Use 100 pounds of Red Top Keene's Cement, 100 pounds lime putty (1 50-pound bag Red Top Finishing Lime) and 400 pounds clean floating sand of proper size. Soak hydrated finishing lime to putty over-night.

(62) *Application.* Apply after the base coat has set firm and hard, but while still green. First grind in a thin coat, after which lay on the final coat to an even surface.

Float with a cork, carpet or felt float, working the material to a true and even surface, free from float marks and cat faces. Use as little water as possible in floating. Work top and bottom of walls together so as to avoid joinings.

LIME PUTTY FINISH

(63) *Brands.* To be Red Top Gauging Plaster and Red Top Finishing Lime.

(64) *Mixing.* First pour water into the box; then add finishing lime in proportion of one 50-pound bag to about six to seven gallons of water, distributing the lime uniformly. A good plan is to sift the dry lime through a ¼-inch mesh screen until the lime has taken up all the water. Allow the hydrated lime to soak over-night.

Do not hoe or screen after soaking unless lime is dirty or lumpy. If lumpy the lumps can be broken down by forcing the lime putty through a ¼-inch screen with the back of a shovel.

(65) *Gauging for Smooth Finish.* Mix three parts of lime putty by measure with one part of dry Gauging Plaster (equal to two parts of dry hydrated lime and one part of dry gauging plaster by weight).

Make a shallow ring of putty on the gauging board, add water, and sift gauging plaster into the water, allowing time for the plaster to soak and become thoroughly wetted. Mix thoroughly with the putty. See detailed directions on back of lime bags.

(66) *Application.* Same as directed for Red Top Trowel Finish, paragraph 42.

SAND FLOAT FINISH, JOB MIXED

(67) *Brand.* To be Red Top Unfibered Cement Plaster. (See also Red Top Keene's Cement Sand Float Finish, paragraphs 61 and 62.)

(68) *Mixing.* Use one part Unfibered Gypsum Cement Plaster to one part clean, sharp sand by weight. This is equal to seven to nine shovels of sand to each 100-pound bag. Screen sand through a No. 12 screen.

Mix dry to a uniform color. Put dry mix in upper end of box and water in lower end. Hoe material into water and mix thoroughly.

(69) *Application.* Same as for Prepared Sand Float Finish, paragraph 50.

ORIENTAL EXTERIOR STUCCO

(BASE COAT AND COLORED FINISH)

(70) *Brand.* To be Oriental Exterior Base Coat and Oriental Exterior Colored Finish, applied to Red Top Expanded Metal Stucco Mesh or to Red Top Self-Furring Diamond Mesh Lath (applied according to the United States Gypsum Company's specifications), or applied to properly prepared masonry surfaces.

(71) Success with stucco depends upon application to a substantial base and proper job conditions as well as to the use of the proper materials. See "Oriental Exterior," pages 47 and 48.

(72) *Application of Red Top Expanded Metal Stucco Mesh.* Apply the expanded metal across the studs. Secure with self-furring nails approximately 6 inches apart on studs, in accordance with the manufacturer's directions. Lap pieces of expanded metal 1 inch. Carry metal around all corners to the first support. Thoroughly secure the metal at all openings.

(73) *Application of Red Top Self-Furring Diamond Mesh Lath.* Apply lath across studs. Lap lath ½ inch on sides and 1 inch on ends. Carry metal around all corners to the first support, secure with 6d galvanized nails, not more than 16 inches on centers horizontally and 6 inches on centers vertically. Drive nails well in and bend to engage at least two lath strands.

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(81) *General.* See precautions 1, 2, 3, 4 and 8, on page 51. Do not permit stucco to freeze; it will cause disintegration as well as color difficulty. Sluggish drying or a rainstorm before the walls have hardened often results in color variation. Stucco should not be applied to a greasy surface. Integral waterproofing or anti-freeze solutions should not be used.

(82) *Mixing of Oriental Exterior Base and Finish.* Add only clean water to Oriental Exterior Base Coat and Finish. Mix to proper consistency. Allow finish to soak from 15 to 20 minutes.

(83) *Application of Oriental Exterior Base Coat.* Apply in two coats. The first coat shall be 3/8 inch to 1/2 inch thick and shall be roughened. After three to five days apply the second coat not less than 3/8 inch thick, properly rodded and floated to a true plane. Thoroughly rake each coat to provide a key for the succeeding coat. Allow the second coat to cure from seven to ten days. Wet down first and second coats daily in hot weather; this is an excellent rule to follow in all weather, because it will result in harder walls.

(84) *Application of Oriental Exterior Finish.* After the base coat is completely dry, spray the wall sufficiently to cut the suction (avoid drowning surface). Apply finish coat not less than 1/8 inch or more than 1/4 inch thick, according to the deepness of the texture specified.

(85) U S G Bulletin OS-3 describes in detail the methods used to obtain various textures.

SABINITE ACOUSTICAL PLASTER

The finish coat of plastered interior walls and ceilings, where indicated, shall be Sabinite Acoustical Plaster, mixed and applied under direction of the United States Gypsum Company, manufacturers.

The United States Gypsum Company shall be notified as far in advance as possible of the exact day when plastering will begin, so that the company's representative can personally supervise the application of Sabinite.

Proper preparation of the base coat to receive Sabinite is important. See "Sabinite Acoustical Plaster," page 45.

MEMORANDUM

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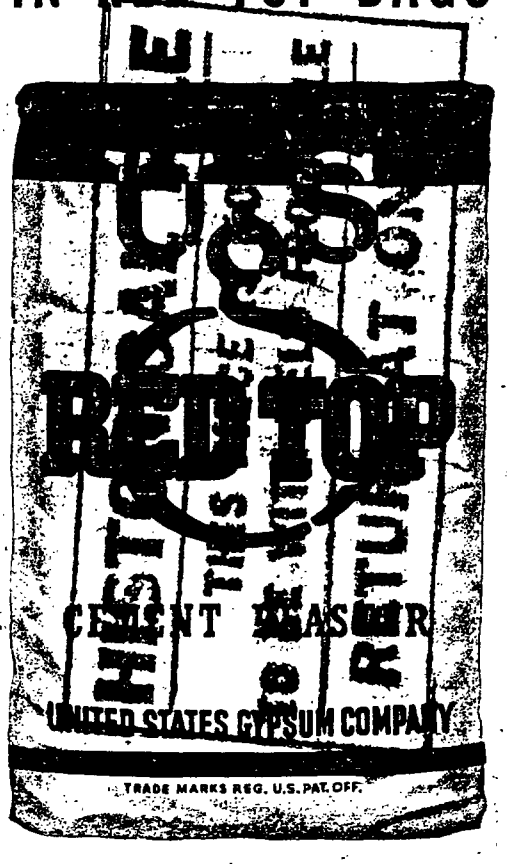
Chicago

INSIST ON PLASTER IN RED TOP BAGS



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