

THE CONCRETE AGE

REPRESENTING THE INTERESTS OF MODERN PERMANENT CONSTRUCTION

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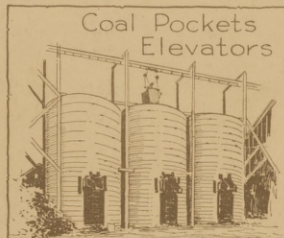
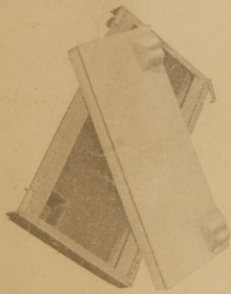
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DALTON and Atlanta, No v., 1921.

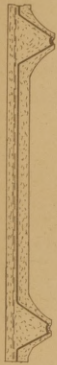
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Note the offset lug reinforced to receive the bearing of the binding hoop.

We are the sole manufacturers of the Hart Stave Molds. You can buy your molds and start operations at once. You need buy no rights nor pay royalties, your territory is not restricted. The mold cost is your only investment. Prices quoted on request. Write us for full particulars.

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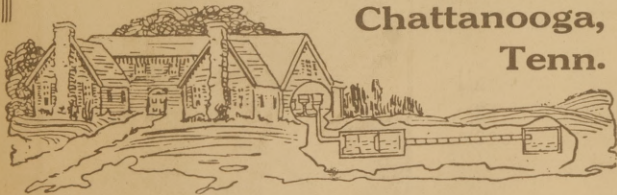
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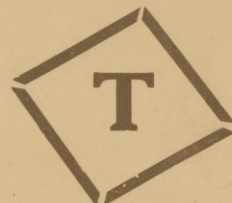
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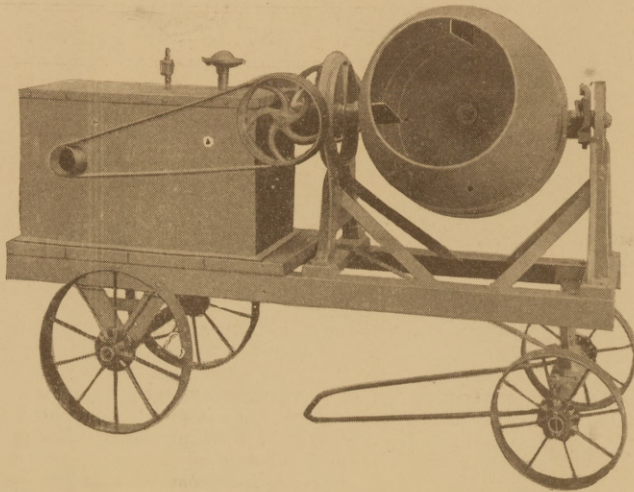
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Biggest Mixer Bargain Ever Offered



All Iron and Steel Construction with the EXCLUSIVE SIDE GEAR DRIVE, that adds 100% to its worth. Mixer loads or discharges from either side, the same side, or load on one side and discharge on the other. Always in gear, even when tilting. Strongly built—no wobbling.

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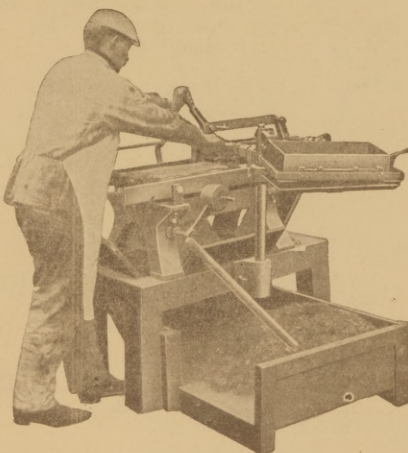
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AMBI- Cement Roofing Tile Machine

PATENTED IN ALL COUNTRIES

NOT just a MOULDER on a stand BUT a REAL MACHINE.
Tamps, colors, trowels Mechanically.



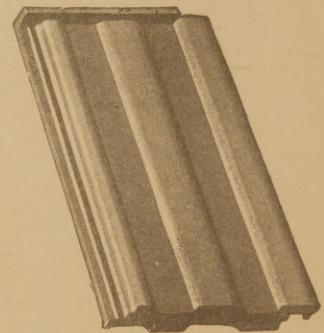
The Machine makes the tile, one man works the machine.

AMBI tile can be made in any color, are positively colorproof, waterproof and fireproof.

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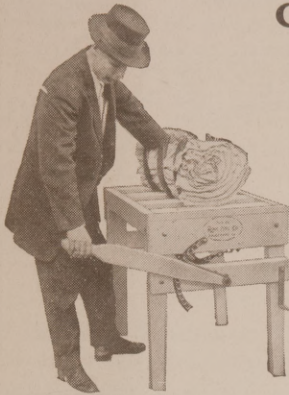
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Ambi FRENCH Tile.
One of four Ambi shapes.



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Cement Sacks
WITH A
ROWE SACK BALER**



Makes neatest, lightest bales; works fastest; takes up least space; nothing to get out or order.

Price Only
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WRITE FOR COPY OF "CONCRETE HIGHWAYS"
WE WILL SEND IT WITHOUT CHARGE

Dixie Portland Cement Company

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Handy Sack Baler Co.**

and bale them up right. We do it quick and easy.

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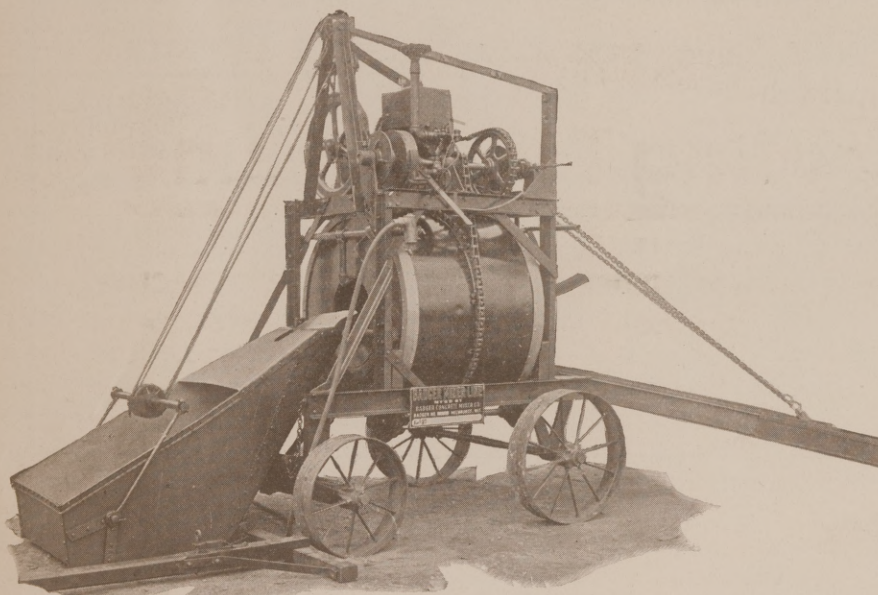
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AND BADGER PAVERS**

Badger No. 15 Overhead power short wheel base—only five ft. A perfect mixer for curbs, gutters, sidewalks, foundations, construction work, abutments, bridges, alley paving, street and highway paving. One Mixer for all jobs.

All steel construction, strong and durable. Nothing to break and little to wear out. Light weight. Always dependable. Eight years of service proves their success. The mixers for the successful contractors.

A complete line of mixers.

Some desirable agency territory still available



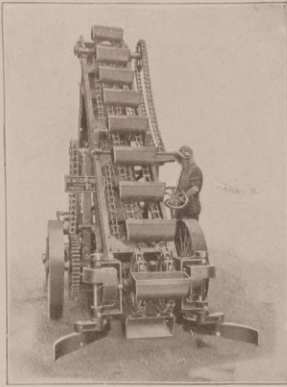
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BADGER CONCRETE MIXER CO., 221 Grand Ave., Milwaukee, Wis.

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Not a so-called self-feeding loader, but a real labor saver for rapid and efficient

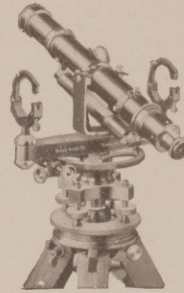
handling of material in concrete road and building construction, excavation work, quarry, storage and reclaiming plants and coal and material yards.

Note the steel feeding arms. In the view they are extended to outside radius of 6 ft. They dig into the material, gather it up and pull it into the elevator buckets. They cut a swath wide enough for the machine to pass through.

F. C. AUSTIN MACHINERY CO.

NEW YORK OFFICE
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No Up-to-Date Builder



can afford to be without a reliable Transit or Level. Our 1920 Model

"STERLING" CONVERTIBLE LEVEL

may cost a little more at the start, but its special features will save enough valuable time to more than repay the additional outlay. Free examination privilege. Easy payment plan.

Our Illustrated Pamphlet C contains valuable information on the selection of up-to-the-minute Leveling Equipment. Write today for your copy.

WARREN-KNIGHT CO., 136 N. Twelfth St, Philadelphia

Vest Pocket Manual of Adjustments Free.

Wet Mix Concrete Men, Attention!

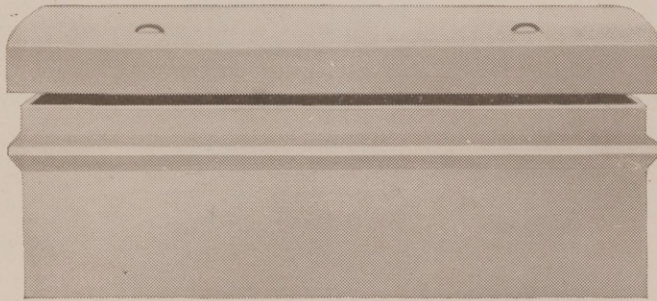
"McAdamite" is something new. Nothing like it on the market. Absolutely prevents cement from sticking to the forms and product comes out with a smooth, glossy surface, resembling the work of a trowel. Saves more than the price of other oils in labor. Gallon lots \$1.25 per gallon. Five gallons or more, \$1.90 per gallon. Money back if not satisfied.

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This Vault Mold Will Save You Hundreds of Dollars It Is Adjustable to Seven Sizes of Vault



You cannot make a success in the vault business, if you can furnish only one size of vault. The demand requires several sizes.

The adjustable feature of the Automatic Mold saves your buying a separate mold for every size vault you have to make—the saving amounts to hundreds of dollars. One Automatic Mold makes seven standard vault sizes.

Let us send you complete description of this mold and the vault it makes.

AUTOMATIC SEALING VAULT CO.

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Dustless—Non-Slippery—Always Serviceable—Lowest Maintenance

The use of concrete for road and street construction is increasing rapidly throughout the country.

The experience of those communities which have built concrete highways has proven beyond question that concrete not only gives the most substantial construction, but also solves the perplexing question of maintenance because

Concrete Practically Eliminates Maintenance.

With sand and gravel or crushed rock available locally throughout the South, and Portland Cement—manufactured here at home, the cost of Concrete roads is very low. Concrete roads are an INVESTMENT—not an EXPENDITURE.

Send for our Booklet, "CONCRETE HIGHWAYS." Free on request.

Standard Portland Cement Company

J. I. McCANTS, Sales Mgr.

Birmingham, Ala.

CONCRETE FOR PERMANENCE

THE CONCRETE AGE

Vol. XXXIV.

DALTON and Atlanta GEORGIA, November, 1921

No. 7

THE CONCRETE AGE

PUBLISHED MONTHLY

Devoted to Modern Permanent Construction.

CONCRETE AGE PUBLISHING CO.

SUBSCRIPTION RATES.

In the United States and Possessions (Hawaii, Phillipine Islands and Canal Zone), Mexico and Cuba, \$1.00 per year. Canada, \$1.50. All other foreign countries, \$2.00 per year.

Advertising rates given upon application.

Entered as second-class matter October 18, 1905, at the Post-office at Atlanta, Ga., under the Act of Congress of March 3, 1879.

The Editor solicits correspondence from readers on matters pertaining to the concrete industry. Descriptions of concrete work done anywhere that is of general interest accompanied by clear, sharp photographs and going into details as to methods employed will be published and paid for if found acceptable.

TO OUR ADVERTISERS.

Our advertisers are requested to have copy and cuts for changes for advertisements in this office not later than the 10th preceding the month for publication.

We cannot be responsible for changes not made, when copy and cuts are received later, or submit proof.

WHY THE BUILDER BOOSTS CONCRETE.

When a contractor has been operating in a city for a good many years the buildings which he has put up should stand as a monument to his work. There was probably never a contractor yet who didn't regret the destruction by fire of any building that he had built. For he likes, later in life, to point to what he has done. And what man would want to call attention to an ash heap or a blackened cellar hole filled with charred timber? Concrete construction is fireproof and when a builder puts cement, sand and stone together honestly and in a sincere endeavor to put up good work, he knows that he leaves behind him a monument that will outlive him, and one which can always be pointed out with pride. Sub-consciously, every builder turns to concrete as the ultimate material and uses it at every point possible.

KEEPING REINFORCEMENT IN POSITION.

The holding of reinforcing bars in proper position while concrete is being placed is a matter which merits the utmost attention. The labors of the best designer and detailer can be set at naught by the carelessness of those in charge

of the construction of reinforced concrete structures, while placing steel and concrete, says The Improvement Bulletin.

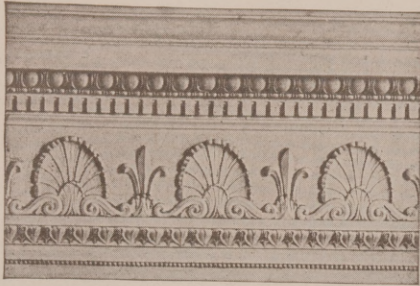
A designer spends many days designing and detailing a complicated structure, the strength of which can be greatly impaired by comparatively slight displacement of the reinforcement at critical sections. Much time is spent in designing and detailing the reinforcement for a structure and the all-important matter of getting and keeping the bars in correct position is disposed of by a single note such as the following: "All reinforcement to be bent and placed as shown on plans and to be securely fastened or tied to prevent improper position of reinforcement in the finished structure." It is left to the discretion of the construction foreman to devise a means of keeping the bars in position and as a result the strength of the structure may depend on whether the foreman thoroughly understands his business or not.

This is neither good practice nor economy. The method and means of supporting reinforced bars should be clearly indicated on the plans, since they are as important details as the location of bends of bars and stirrups. Where bars are bent up into the tops of slabs and beams they are best supported by cross bars resting on concrete blocks of a height to insure the exact location of bars. Bars in the bottoms of slabs can be kept at the proper height by small Z-shaped clips and spacing bars to which the main bars are wired.

It is just as important to show the supporting bars, supporting blocks and clips, and the spacing bars as it is to show the main reinforcement in detail. Before the structure can be built it is necessary for some one to devise a means for keeping bars in position during construction, and as a general rule, a good designer is more capable of handling these details to good advantage than anyone else. If it is left to the contractor, the owners pay dearly for this "designing service" rendered by the contractor if he is wide awake; and if he is not, he pays the bill. It can be seen at once that this is neither fair nor economical, and is very likely to lead to "wild" and "unbalanced" bids.

If a contractor is to bid intelligently and if all contractors are to enter their bids on the same basis, it is imperative that these details be shown on the plans when the work is at all complicated or important.

REFINEMENT IN DETAIL



As here shown, will be found in all of our moldings and ornaments. Let us estimate on all your plastic relief and composition work. Let us lay before you more clearly the character of our work.

NATIONAL PLASTIC RELIEF CO.
330 Main Street, CINCINNATI, OHIO

Pipe Couplings

We will buy your couplings in any quantity, large or small. Write us what you have.

A. & J. Manufacturing Co.

557 West Lake Street,
Chicago, Ill.

SNEAD ARCHITECTURAL IRON WORKS
LOUISVILLE, KY.

Structural Steel and Ornamental Iron. Large Stock of Standard and Bethlehem Shapes. Immediate Shipments Plain or Fabricated Materials.

National Cement Company

MANUFACTURERS OF

High Grade Portland Cement

Output 50,000 barrels monthly. No old contracts on our books, hence prompt shipments.

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PLANT

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It's easy to sell a farmer an

IREY Stave Corn Crib

It doesn't take very much argument to convince a farmer that with an IREY concrete stave corn crib he can save enough corn in a short time to pay for the crib, and forever after he will have on his place a permanent, fireproof, vermin-proof, storm-proof crib.

There is a demand for these cribs whenever one has been erected in a community, other farmers want them right away.

They Are Easily Made

The manufacture of the staves is a simple matter. They are made much like silo staves in metal molds and the erection problem is not at all difficult.

We supply you with the metal equipment that you need for making the staves. We give you complete instructions for the erection of the cribs, and we assist you in getting the business started in your locality.

No matter whether you are contractor or a concrete products manufacturer here is a side line well worth your investigation.

Concrete Products Corp.

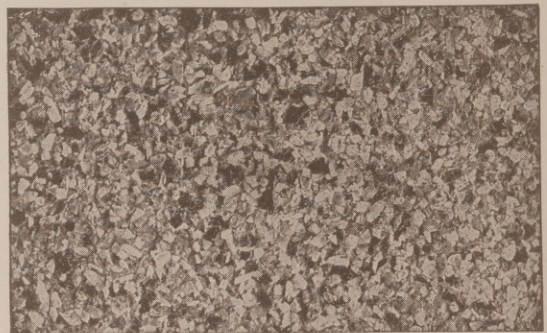
West Liberty, Ia.

CONCRETE

Blocks, Bricks, Building Trim, Posts, Ornamental Work, etc.

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MICASPAR CRYSTALS



IS CHANGED INTO

SPARKLING GRANITE

BEAUTIFUL, ARTISTIC and EVERLASTING

Adds to your product a selling value five times greater than the facing cost.

Made in six scientifically milled sizes, extremely hard, sharp and free from dust. Insures strength and beauty. Booklet, "Micaspar and How to Use It," with free samples, mailed on request.

Crown Point Spar Company, Inc.

101 Park Avenue, New York

SAND AND COARSE MATERIAL AND PROPORTIONING CONCRETE.*

In correctly made concrete the amount of sand should be just sufficient to fill the voids in the coarse material, and the amount of cement just sufficient to fill the voids in the mixture of sand and coarse material and to coat all the particles with very thin jointing layers. It is a rational assumption that such concrete will give a maximum strength with the minimum of cost, and if such assumption be justified by experimental results it follows at once that the proportioning of concrete-forming materials is of the utmost importance. Greater strengths can be obtained by the use of excess of cement as in the case of the ordinary mix of 1:2:4, but the increase in strength is less than the increase of cost of materials, and is therefore only justified in particular cases.

The strength of any concrete will depend not only upon the materials and their proportions, but also upon the method of using those materials. Any void in a mass of 3-4-in. coarse material may be filled in many ways. First, it may be filled with cement and sand mortar as in the 1:2:4 concrete; secondly, it may be filled with a piece of stone which practically fills the whole space; and thirdly, it may be filled with a number of stones which vary in size with a minimum amount of cement and sand mortar shown in black. The first filling is composed almost wholly of joints, and on that account is weak; the second filling is strong, owing to the absence of joints, but it is impracticable; but the third is a compromise which is not only impracticable but also strong. It will be seen that the amount of the variations in size or the grading will depend upon the nature and quality of the work required. On the one hand, there will be good but costly filling, and on the other, a cheap but still good filling, and whether the graduation be large or small the filling will be better than one of cement and sand mortar only.

With a view to testing the effect of "proportioning" upon the strength and other properties, and also the cost of concrete, the authors drew up a series of experiments, the intention being to test compressive strength, modulus of rupture, specific gravity, water resistance, and fire resistance. Various difficulties arose in the course of the work which not only prevented the paper being presented on the original date, but prevented also the inclusion of specific gravity, water resistance, and fire resistance tests. The series in-

volve 216 test pieces, to which must be added others prepared for water and fire resistance and specific gravity tests, but which could not be tested in the time available. The voids were measured in a patent apparatus designed by Mr. Davenport, which gives results to one-fifth of 1 per cent, and which was found to be independent of the observer. The preliminary data comprised tests on Portland cement, size of granite chips, volume of chips per batch, percentage volume of voids in chips, sizes of river sand used, volume of sand used per batch, percentage volume of voids in sand, and the volume of cement used per batch. Regarding the latter item, it must be noted that no allowance was made for the excess cement required for jointing, only the amount required to fill the voids being used. Had time permitted it, the correct allowance in each case would have been ascertained and additional tests made therewith. The limited time made it impossible to test the cement before using it for the concreted test pieces, the brand only suggesting its probable good qualities.

The batches were hand mixed by engineering (senior honors) students, and as no special means of testing the thoroughness of the mix were adopted the resulting concrete will probably compare with machine-mixed so far as uniformity of results go. Every care was exercised, however, in the mixing to get all the materials thoroughly intermixed and apparently uniform. This proved to be the case when the specimens were tested. The moulds were made of planed boards, bolted together with gangs, damped before using, and lined with paper on the underside to facilitate removal. In spite of this, several pieces were damaged in removal, due more particularly to the relatively small sections used. Immediately after mixing, the moulds were filled and left in a tool shed till required for testing. They were wetted regularly every three or four days.

It was found that the ratio of compressive to tensile strength varied more in the one-month than the three-month tests, and is not sufficiently uniform to base any conclusions upon beyond the fact that such ratio is not constant. It is considered by the authors, however, that this ratio should be more or less constant, as the failure, whether compressive or tensile, depends upon the adhesive strength of the cement.

The ratios strength at three months to strengthen at one month were more or less uniform, more particularly in the case of compressive strengths. In the case of 1:2:4 concrete the

(Continued on Page 16.)

*Summary of paper read before the Concrete Institute of Great Britain, by John A. Davenport, M.Sc., and S. W. Perrott, M. A. I.

Use of Cement as an Exterior for Buildings

Preparation of Surface.

THE loose form scale removed from the surface of the entire surface to be examined and all (i. e., the scale is caused by cement adhering to forms. When the form is not entirely filled in the one day's operations, a film of cement adheres to the form in places and sets when pour is made. This film invariably forms a scale surface on the face of the concrete when the forms are removed); the entire surface to be gone over with a hand pick or an axe to roughen the surface; if brick, rake out joints. This is for the purpose of forming key for stucco. The surface to be brushed clean and thoroughly soaked, ready for application of stucco.

Proportions: Straightening Coat.

The proportions of this shall consist of four parts of Portland Cement of approved brand, to twelve parts of sand and two parts of hydrated lime. The above material to be thoroughly mixed dry, then temper the mortar with water, to which has been added one part of Concentrated Waterproof Paste to every twenty-five parts of water.

Finish Coat:

The proportions of this coat shall consist of five parts of Portland Cement to twelve parts of sand, and two parts of hydrated lime. (If white color is desired, use Medusa White Cement and local White Sand). The above materials to be well mixed dry, then temper with water to which has been added one part of Concentrated Waterproofing Paste to every eighteen parts of water.

Application of Stucco: Straighten Coat.

Care has to be taken that the surface is thoroughly saturated with water to insure perfect bond, then apply straightening coat. Bring the surface to a true and straight condition, using a traversing rod (no Darby Float to be used on first coat), then scratch the surface with a wire or nail scratch.

Application of Finish Coat for Floor Surface.

If stipple, use same process, only stipple before set. If rough dash the finish material with a broom. Thoroughly saturate the first coat surface with water until it presents a glaze appearance; when this glaze disappears, which will be in a few minutes, apply the finish mortar which should not be too soft and bring the surface to a true condition with Darby Float. When the mortar will permit, go over the surface with hand float, bringing to a true finish free of cat-faces or voids; the entire surface to be gone over with burlap or hand float and patted to take out float marks. No joint to be allowed in the work

where they can be seen. The entire surface to present a uniform appearance in color and texture. Mortar should be applied as quickly as possible and at all times protected from the sun.

Protection.

Special care should be taken to avoid too rapid drying; if in the direct rays of the sun, it shall be protected with burlap or wet canvas, and when sufficiently resistive, should be sprinkled with water for at least six days.

Stucco on Metal Lath.

If stucco on metal lath, specify three coat work with good fibre in first and second coats, waterproof in second and third coats.

From Moulding.

Cores from moulding shall be formed of concrete by concrete contractor, allowing about 1 in. for finish. All moulding to be run and finished with hand float to give same texture as rest of surface and to help bind the surface. When a condition arises where a heavy coat of mortar is necessary a key for the mortar shall be formed by driving galvanized nails into the cores.

Having thus given specifications for stucco work, it would be well to go over them for the benefit of the craftsman desiring to follow this method of procedure.

The cement, sand, et cetera, should be well mixed in its dry state and then tempered with water, to which the required amount of waterproofing material has been added. Following this the mixture should be worked to a good plastic condition. In making application, good pressure should be used in order to insure a good bond. In applying the straightening coat, do not use the Darby Float because the working of this tool is liable to drag the material and interfere with the bond. Rather use the straight edge. Use the rod with an up and down slanting motion to cut off the excessive material and leave a rough surface, then scratch with a wire, being careful to scratch before the work is too hard.

After the straightening coat has been applied, the moulded and ornamental members should then be worked out. It is common practice with many plasterers to add plaster of Paris or some of the patent hard wall gypsum plasters to the material used for ornamental and run work. This is for the purpose of making the material set quickly, but is wrong policy, and should be avoided. The mechanic who has pride in the execution of his work will not adopt these methods if he knows that bad results will follow by his so doing. Plaster of Paris and patent hard wall plaster is diametrically the opposite to Portland cement. The result is easy to foresee. The

work blisters, scales and falls off, the set of the cement is killed, and the material becomes like powder.

The reason that some mechanics use these methods is to gain speed in finishing the work. If, however, the moulding and projections are worked together with a little system it will be found that finished results can be obtained with very little more time than through the use of foreign materials. All the mouldings and other run work should have running strips set so that the craftsman can build up the various mouldings gradually by giving each one as big a coat as will hand, doing the same to the others, and so on. By the time he has gotten to the last piece, he will find the first piece is ready to receive another coat. The running moulds should be muffled, allowing one-eighth of an inch for finish. After the mouldings and run work are brought out to a complete finish, they should be gone over with floats, so as to insure the surface having the same texture as the rest of the wall.

In applying the finish coat all splashes and pieces of projecting cement should be scraped off the straightening surface. The whole surface should then be saturated with clean water, and it is at this point that the waterproofing plays such an important part. If the undercoat is waterproofed, it will hold the moisture of the finish coat and will allow the cement its own time to set. The ultimate adhesion, also the uniform working and strength of the finish coat depends on this. If the moisture or "blood" of the cement is absorbed by the suction of the undercoat, the cement will become inert and will crack, peel or scale.

In working the finish coat, bring it to a true, straight surface by use of a straight edge and Darby float. This material should not be mixed too soft. A good method is to have one set of plasterers lay on the material and then have another set follow with rod and Darby, working it carefully in all directions until it is brought to a full and straight surface. After the moisture has disappeared from the surface, gently pour it with a good crossgrain wood float. Care must be taken if dry spots should develop in floating not to throw water on the wall, but to dampen the float until the desired moisture is showing. Never stop the cement where the joint can be seen. Make all joinings at mouldings or projections.

Next, after floating, the object is to be rid of the float marks. This is done by gently patting the surface with a float or by using a pad made of burlap. If the finish is accomplished by this method, good results will always be obtained.

When the work is in the direct rays of the sun, it should be protected with burlap or oil duck

hung up in the form of a shade. When the work is sufficiently resistive, it should be kept moist for at least six days.

Preservation of Stucco Buildings.

We have on the market several forms of dampproof cement paint which make a good preservative stucco. As I stated earlier in this article, I advise the use of this material on commercial and public buildings, especially where these are in a large manufacturing center. Such dampproof coatings protect stucco from the atmospheric chemical action caused by smoke, et cetera, and at the same time dampproof and protect the surface from hair cracks.

Wash Methods.

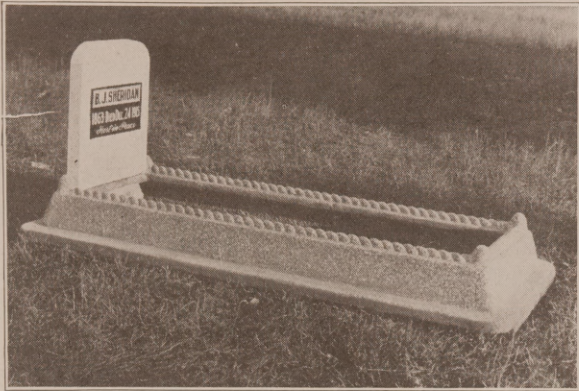
For residential work, I advocate this method, as it is cheap and can be renewed at very little expense. It artistically weathers with age. It has many more advantages. Among these are the ease with which it can be applied and the wide scope of the colors that can be used. It serves as a good dampproofing mix and gives the opportunity for many artistic effects. It is the method I use to obtain the Italian and antique effects on stucco. This wash is composed of waterproofing, good mineral colors, cement, and lime with a binder and hardener added. This material has to be used carefully, and the stucco coat surface must be left in a condition that will form a good bond between the materials.

The Concrete Home.

THROUGHOUT the year it is our purpose to lay unusual stress on the concrete residence, the permanent structure for human occupancy. In fact, we might go so far as to say that we intend to specialize on it for some months. It is very evident that the building public is looking to concrete more and more every day. Throughout the country there are high spots and low spots, some towns and cities where the intending home-builder can get anything he wants in concrete and vastly more places where his effort to get anything desirable meets with defeat. It will be our purpose to show architects what their enterprising fellows elsewhere are doing in concrete, to show contractors in the way of designs for concrete homes, and, incidentally, to show the home-builder himself the best and the most attractive examples of permanent concrete homes.

If a paper can show a few photographs and some floor plans of an exceedingly good concrete home and a reader is just about what you have been looking for; I can get these plans or can have this architect modify them to suit your requirements," that paper has served a very useful purpose. The Concrete Age knows of some in-

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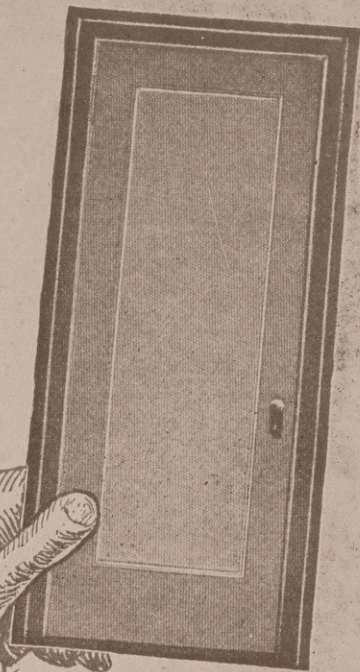
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stances where it has accomplished this very result, not only in the warehouses and even in sidewalks and silos and dipping tanks and miscellaneous minor work. Such instances, here and there, indicate that in this way the concrete papers supply a service to their readers for which they do not always get full credit.

Amount of Water in Concrete Mixtures.

Although the tendency is now to use wetter mixtures for concrete than prevailed in general some years ago, there is still controversy among self-styled authorities, engineers and contractors as to the proper consistency for concrete mixtures. In most cases, the amount of water used has represented the arbitrary opinion of the engineer or person in responsible charge of the construction.

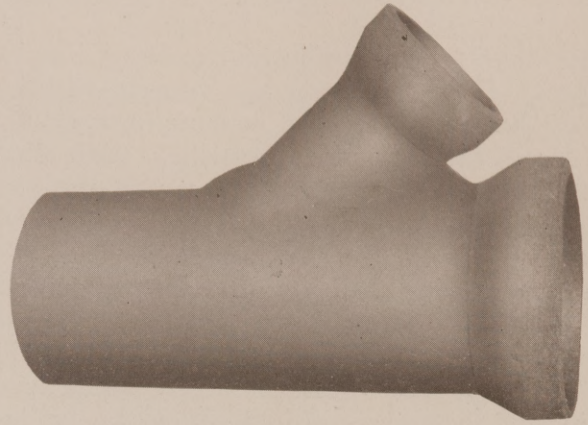
In reinforced concrete work, there is no question but that wet mixtures facilitate placing the concrete in intimate contact with the reinforcement, but in reinforced work there is a possibility that too much water will be used, so that after the process of crystallization has been completed in the cement, an examination of the concrete would show pockets or voids along the reinforcement.

The average contractor, simply for his own convenience, will frequently use more water in his concrete than necessary, because a wet mixture facilitates spouting, and consequently saves time and money in placing expense.

As in all things, there must be a happy medium, so in concrete it is evident that the advocates of dry mixtures and the advocates of wet ones cannot both be correct. Tests have been recorded of experiments made in the Engineering Testing Laboratory of the Sheffield Scientific School, Yale University, involving experiments based on 1:2:4 mixtures, used with varying percentages of water. Conclusions based on these tests showed that concrete mixed with 27½ per cent of water developed at the end of thirty days a maximum resistance, both to tension and to compression, in comparison with mixtures made with other percentages of water.

Another interesting point brought out by the tests referred to was that to attain corresponding strength in mixtures using 30 per cent and more of water, an increase from 5 per cent upward in materials was required to equal the results shown by the mixtures containing 27½ per cent water.

This means that for concrete to meet certain test requirements, the contractor may give himself a margin of 5 per cent or more for profit by adhering to the 27½ per cent content of water.—Scientific American.



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See report of American Society for Testing Materials adopted 1920. These specifications are based on Zeidler quality pipe.

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Concerning Artistic Stucco Work

John B. Orr, Miami, Fla., before Chicago Cement Show.

THAT great possibilities can be conjured up in these two words. Stucco which is amongst the oldest in some form or other of man's early attempt at artistic. With all the possibilities and despite the fact that there can be found to this day portions of stucco in a good state of preservation after standing the wear of many centuries, there is no other form of building material that has fallen more into disrepute than stucco. This is especially so in the United States. The causes can be largely traced to the slip shod methods of procedure that has gradually crept into our building industry. Today, the main point of view or achievement that is looked for is whether a contractor can complete in sixty days what should take three or four times longer. Short cuts are taken wherever they can; things that appear small in the successful completion of the work are sacrificed for time. The boy learning the business does not learn how good to do it, but how fast to do it. The view he sees as a successful craftsman is not to do better and try to improve on the specifications for the work, but just how much he can scamp and get the results so often noticeable in modern construction, competition in price instead of competition in value or good work. The good contractor who tries to figure at a price that will permit good work, in many cases is forced out of business leaving the field open to the cheaper man and the cheaper methods. The old school of craftsmen had a different view; they tried to make their work masterpieces just as much as the artist did his on canvas. They wanted to look at it years afterward and be able to say "I did that," or "I worked on that," and feel the pride that comes from viewing a masterpiece. I never will forget an early lesson I got during my apprentice which I served under two master craftsmen, John Forbes, of Glasgow, Scotland, and his general manager, John Monroe, both of whom I look up to to this day as experts in their line of business. I was doing a piece of ornamental work in cement and was worried because an older apprentice was doing faster. I commenced to scamp my work to gain speed; Mr. Monroe came on the scene and his sharp eye took in the situation. His cure was drastic; he took a hammer and smashed my work, then proceeded to administer a lecture; namely, first to learn just how good I could do it and then speed in manipulation would follow. I took his advice to heart and found it to be good. I believe every form of encouragement and instruction should be given the craft to encourage

good work. Your body which sits in convention is an exemplary method for the betterment of the work.

We find that stucco was used in building almost as soon as buildings were found to be necessary. It grew from the crude mud huts to the artistic treatment of exteriors to be found in the old world today. Stucco is an Italian term usually applied in Italy to an exterior plastering, although we can trace it further back under a different name. The old Egyptians and the classical Greeks used a form of exterior plastering extensively; however, I have always looked upon Italy as the mother of the plastic art and responsible to a great extent for the artistic effects of exterior plastering generally known in this country as stucco. In Great Britain stucco is a somewhat indefinite term for various plastic mixtures. The great Robert Adam is due credit for the advancement of exterior stucco in Great Britain. He adopted it as a covering over houses built of brick and cobblestone and it was used extensively during his period.

In going over the several books in my collection I find that the Temple of Appollo at Dellos and even the first Parthenon under Aegis, of Pallas, was plastered with stucco. Virtruvius calls the exterior plastering Tectorum Opus. This was composed of three coats of lime and sand and three coats of lime and marble, the united thickness not being more than one inch. The first coat was of common but very old lime and sand (that had been 'soured' three or more years); when it was nearly dry a second and third coat was applied and left fairly straight. The work was then laid over with another two coats of lime and marble and finished with a coat of fine marble powder, this finish of marble powder being troweled into it before it was dry. The marble mortar was beaten to render it tough and plastic. The successive coats of marble mortar were troweled into each other before they were dry. The Tectorum was then painted in brilliant colors while it was still fresh. In certain conditions the surface was then rubbed with wax and pure oil for the purpose of adding to the brilliancy and endurance of the colors. Slabs of this tectorum have been found preserved from the ruins of Pompeii and Herculaneum and are in the museum of Portici; specimens also from the same place are in the South Kensington Museum, London. It was found that some of this work was colored integrally while in others it was colored by the use of a wash which was applied over the

surface while it was still fresh. The early workers in stucco had each his different formulas for treating the stucco to make it weather-proof. Pliny mentions fig juice as being used in exterior plaster; elm bark and hot barley water was mixed with the stucco used on Justinian's church of the Baptist, Constantinople. Bullocks blood was employed for this purpose in the mortar for Rochester Cathedral, England. White of eggs and strong mort of malt was used in the lime for Queen Eleanor's Cross. Charring Cross, London, in the year 1300. It is a historic fact that during the building of the Duke of Devonshire's house at Chiswick, the exterior of which was plastered with stucco, the surrounding district was improvised for eggs and buttermilk to mix with the stucco. My mention of these different methods and treatments is to show the care and wide range of methods and mixtures that was used to endeavor to make the stucco weather-proof, and the difficulty that the old craftsman had to contend with in getting these results. Modern manufacture has overcome this to a large extent and has made the path of the stucco workers easier. It is a curious fact that the fountain of possibilities in modern stucco has hardly been tapped. I give for the reasons, first, fear of the permanency of the material; second, neglect by the architects in not studying the possibilities; third, the difficulties in getting the work executed, owing to the ignorance of the craftsman in this branch of the plastic art. In reply to the first, anyone who has traveled or has gone into stucco historically can prove the permanency of the material before and after the introduction of Portland Cement and waterproofing compound much has been done to simplify and make permanent the mixture. The danger in most cases to be overcome is the manipulation of same. My greatest obstacle to overcome has been crasing or check cracking. This I have cured by what I believe to be the only sure method. The richer you get the mix, the more danger there is in check cracking; rapid drying heat in cement, soft sand, these all help to cause check cracks. I have taken precautions against these dangers and have done what I could with the local materials that are obtainable here. I had good results in some cases and in some others check cracks did appear despite the fact that I had made every effort to avoid them; I never yet had any to scale or fall off. My next attempt I made using a wash of liquid stucco. This last method has proven very satisfactory and I have jobs that are two years old on which there has been no appearance of crasing. In Florida we have several obstacles to overcome, although we do not have the freezing weather. We get a very poor sand, that is impregnated to a certain extent

with salt. The sand is not sharp enough. We have quick drying weather and strong sun heat, and I believe this to have been a severe enough test to show that the stuff would not crase. To the architect and designer, as a layman, I offer a few suggestions and criticisms. As a general rule they do not give enough study to the possibilities in color effect such as are to be seen in Europe, Cuba and other Latin countries. Then, in ornamentation they seem to forget that they are working in a very plastic material that lends itself to the fullest extent in obtaining lights and shadows. I believe that to get the full effects, relief work in stucco should have the appearance of being modeled in place with this material. It should not have hard lines and in no case should it have the appearance of carvings as in stone. The work should retain all the touches of the modeling, these touches that give the sketchy effect which is lost in the carving in stone. In the preparing of the models the modeler should accentuate the detail and not attempt to smooth up the model. These markings, when brought out, all serve to make the work plastic and alive. It also helps in obtaining light and shade. Even when the work is colored integrally these markings of the toll all stand out and bring out the work better to the eye when the buildings weather; in other words, he should not attempt to get in the clay any smoother work than he could get if he was modeling with stucco right in place instead of modeling in clay.

By proper manipulation of colors and attention to the above details, great beauty can be obtained from work in low relief. Several jobs which I have under way at present I am using this method on and am getting what I believe good results. I am not attempting to confine the relief work to panels but am using the walls as the background, getting an effect as if the work was actually modeled in stucco and keeping the relief work very low and plastic. These are the touches that give the sketchy effect that is lost in the carving of stone. As a general rule it seems to be the practice of designers in stucco to copy; this, in my opinion, is entirely wrong. Stucco is a distinctive material and should be used as such. In my ornamental moulding and relief work I use a combination of several colors (which match with the general color scheme of the exterior of the house) to bring out the effect and give light and shade. I use the darker tints in the background and work out the lighter tints by rubbing the one color into the other; by doing this you bring out all the plastic beauty of the modeling and give an artistic appearance to the whole scheme. My colors on stucco I bring out by the use of a wash of liquid stucco as before mention-

ed. I am quite enthusiastic on this color work and I think it wonderful the effects that can be obtained with its intelligent use.

A study in colors for the stucco of buildings is the work of an artist and should be given this care with due consideration to the surroundings in which the house is to be built. I possibly might be treading on the toes of manufacturers of cement paints when I say that I only use this method when actually called for in some public buildings where the effect is to get something that will always look new and clean; in some cases, of course, this is very necessary but for residential work we cannot do better than try to copy the early Italian stucco effect; this is to get the results like stucco and not paint. There is something about the technical paints that give to the stucco an artificial appearance. I never like to see a residence that looks like it had come out of a machine-made mould; I look to see the sketchy effect and also like to see the building weather properly, not stay one solid color but get the soft effect that only a stucco can take on; a blend of several shades which come by age and this is my objection to cement paint on residences; it looks artificial. Its use, in my opinion, as before stated, is limited to certain types of public buildings where the surroundings, buildings, street and sidewalk have the tendency to harden the effect. Conditions like this call for an entirely different treatment than the residence that sits in grounds where one gets the benefits of the color effect of flowers and foliage. My idea in getting effect and tone to a residence is that a study of the whole scheme, including the landscape work, should be taken into consideration and let the residence become a part of the landscape on which it sits and not make it look like an obstacle that has been put in the way of the beauty of nature. In public buildings there is a big field for the stucco worker in producing the effects that are obtained by the use of terra cotta. Stucco can be made a formidable competitor of this material. It can be made permanent and has as wide a range of colors as polochrome terra cotta. When this is the result that is required, this is the method I use and into which I use cement manufactured paints as a background applied over stucco surface for the color effect. I apply the stucco according to the methods and specifications given later. When the stucco is thoroughly dry I then apply a priming coat of a good cement paint, using the material thin and working it into the stucco surface with the brush, being careful not to use the material too thick so that it will not spoil the texture of the surface, the texture of which should be a smooth sand finish. If the effect wanted is in a blend of sev-

eral colors my system is to cover the surface of the stucco with two coats of cement paint as mentioned above. I then mix up my blending materials in the form of a stain, using good mineral colors ground in oil which I thin down with raw linseed oil. I apply this stain over my relief and ornamental work in the various tints desired. I then rub off the high lights and in general blend in the colors to give it the soft effects. On the plain surfaces I apply the stain in the color desired, then rub off as much as possible; this gives a very pleasing mottled effect that blends in with the under coating of cement paint and takes away the hard appearance. I have just completed a building in which I used on my relief work, blue, golden buff and cream and got a beautiful effect that resembles old Bisque China. On some of my work I get these effects by coloring integrally which I rub over with an oil preparation. On residential work my methods are entirely different. I apply the stucco as specified, getting the texture desired preferably, a medium rough coat. In some cases, I color the work integrally, a liquid form of the stucco of the same colors with a binder and hardener and waterproof added. This material, when properly applied over a fairly rough texture makes a fine finish and when one gets familiar with the working of same, fine color effects are obtained. This liquid stucco is applied with a brush, same as paint. The stucco surface when finished does not look like paint but retains the softness of the stucco with an unlimited range of color effects. On the ornaments and trim I use color effects with this wash in very much the same method as I specify for my treatment on public buildings except that the material is a stucco composition. To get the shading great care and taste must be used. This liquid stucco coat should be applied before the stucco surface is dry, usually, wherever possible, a day after the stucco is finished. It then dries and sets along with the stucco and makes a good bond. Spraying with water helps to make the surface bind, use a very fine spray. It gets harder with age and being of practically the same composition as stucco it retains all the soft tints and makes a house very attractive especially when the house has good surroundings. It seems to catch all the shadows and to change with different positions of the sun, reflecting the color of the surrounding foliage. It is this soft color effect that has made the homes of Italy and the south of France the mecca of the student of art. To me, the difference between this treatment and a surface that has been treated with some technical cement paint is like the difference between a cheap colored lithographic print and a painting.



An Interesting Bungalow of the Middle West. Tallmadge & Watson Architects.

(Continued from Page 7.)

modulus of rupture appears to increase more rapidly than the compressive strength, while in the other series with cement accurately proportioned the compressive strength increases more rapidly than the modulus of rupture, as out of six series only one runs the other way, probably due to rather dry mixing of those three-month test pieces.

Although the cement tests are unsatisfactory, it will be possible to compare the strengths and costs of the concrete in the different series, as they will probably all be affected to the same extent. The most important point brought out by such comparison is the fact that for accurate proportions the ratio $\frac{\text{cost of cement}}{\text{total cost}}$ is practically

constant for all gradings taken in the tests, so that when the graded coarse materials is used the total cost need only be further considered. Of course, the total cost is always the final criterion as regards economy, and it may be suggested that the ratio cost of cement to total cost need not

be considered. But the relative values of total cost obtained may be altered when additional tests are made at other ages, and it is difficult to say whether they will be affected by the ratio, so that if it can be shown conclusively that this ratio is constant or nearly so the total cost, age, and proportions need only be dealt with.

The pneumatic method of placing concrete, in which the concrete is prepared in a pneumatic mixer and blown through a large pipe into position, was successfully used in the recent lining of the St. Louis water tunnel. The forms used were 36 feet long. The discharge pipe was first extended 18 feet into the form, and the far end and the greater portion of the side walls were filled. The discharge pipe was then withdrawn to the end of the form and the remainder of the space filled with concrete from this point. There was no spading or tampering whatever, the entire section, except the invert, being filled from the center of the crown. When one section was completed and set the discharge pipe was shortened, and the work of blowing the concrete into place continued.



Concrete Residence of J. W. Goldsmith, Atlanta, Ga.

Bridges and Culverts

Bridges and culverts mark the locations where man in his highway construction surrenders undisputed right of way to one of the forces of nature, and provides an artificial support to carry his roads over the streams, being unable to obtain traffic cops with the power of Moses to hold back the waters to give traffic a chance.

A study of the types of construction that have been used in the past shows that the art of bridge building has developed as new materials have become available.

First came the wood pile bent bridges and the wood trusses, which were succeeded by the combination trusses and wrought iron construction. Then followed a long period in which the steel bridges were used to a great extent and still more recently the concrete bridges have come into use.

The recent great advance in the price of steel has resulted in an increased demand for concrete bridges, as the comparison of first costs of steel and concrete construction is very favorable to the latter and this type should prove much more permanent. It appears, however, that the concrete bridge requires considerable improvement, for the present types are so heavy that in even as short a span as a twenty-three foot slab design the bending moment due to the dead load figures seventy per cent of the total bending moment. In this connection it is interesting to note that lumber at thirty-five dollars per thousand board feet costs \$11.30 per cubic yard, but on account of its lighter weight, the dead load is only a small percentage of the total cost, so that much less material is required to support the same live load.

In constructing concrete bridges, a wooden bridge must first be built, for false-work and forms, and made stronger than would be required to carry the live load that the bridge is built for and then this temporary structure has to be wrecked and is practically a total loss.

Another serious consideration in building with a material as permanent as concrete is claimed to be, is the matter of foundations. Many streams are continually cutting deeper or drainage ditches are dug under the bridges and foundations, which were carried well below the bed stream at the time of construction, are undermined, and even though piles have been used they rot off because the low water level is lowered.

It appears to the writer that a complete cycle in the construction of bridges has been made and that we must come back to the old pile bent bridge in a little different form and made of concrete instead of wood.

The economical length of span figures about twenty feet center of center bents carried by three piles per bent each driven to a bearing by twenty tons.

Should it be determined, after one pile has been driven, that a twenty-ton bearing is not obtained with the length of pile provided, four or even five piles can be driven per bent where necessary to give the required support.

A concrete cap is cast embedding the tops of the piles and serving to carry the ends of the spans. No abutments are used and the bridge is made long enough to provide sufficient waterway after allowing the fill at each end to run through the end bent on a one to one slope with a riprap protection.

For the superstructure the Minnesota highway commission has designed a cellular slab bridge, in which type the under side is cored out by means of corrugated arch forms resulting in a saving of one-third the volume of concrete that would be used in a solid slab.

In the spans twenty feet over all in length, the metal forms are semi-circular in shape with a radius of one foot and the beams formed between them are thirteen inches wide at the bottom. There are also cross beams at the middle of the span and at the quarter points. The concrete is four inches thick at the crown of the arch, making a total depth of beam of sixteen inches. A half size model of a super-structure of this type was tested out as part of the Minnesota commission exhibit at the state fair and proved very satisfactory.

Concrete pile trestle bridges can be built using a multiple number of spans of a standard length, making it possible to make economical use of metal forms and metal falsework, used repeatedly with no need for intermediate wood piles, which are so essential for falsework under present conditions. This fact, taken altogether with the absence of cofferdam work for piers and abutments, makes it possible to construct this type of bridge even when the water level is above normal, or when freshets are likely to occur, so that the working season will be lengthened considerably.

Where a long center span is necessary, it can be supported on a double row of concrete piles with a large concrete cap and the approach spans built with concrete trestles. This type of structure used for the entire bridge or for the approaches makes it possible to conveniently lengthen the bridge at any time this proves necessary, such as in the cases where new drainage projects increase the volume of water to be car-

ried, as there are no end abutments to be replaced by piers before additional spans can be added.

Concrete pile structures, of course, are not suitable to locations where rocks or extra solid foundations exist but in these cases the excavation work is not expensive.

With sand foundations and in swamp locations, the present cofferdam excavations are very expensive and it is in situations of this nature that the greatest economy will result.

For driving concrete piles more machinery and less hand labor is necessary than for constructing ordinary substructures, which is a decided advantage with the present unsatisfactory labor conditions and the labor that is employed will necessarily be higher paid and more reliable. Much less time will be necessary to construct these bridges as the excavation work will be eliminated and the standard set of forms and falsework can be put in place ready for concrete, in a shorter time than for the present types of concrete bridges. This will cause less inconvenience to traffic which is either detoured or carried over a temporary bridge with the approaches barely passable.

The grade elevation of most bridges is determined by highway elevation and, by using a combination of short spans which have the least depth, the floor of the bridge can be placed a minimum distance above high water elevation resulting in less height of approach fills.

In the past there has been a continued increase in width of roadway and there is likely to be a demand for still greater widths on main trunk lines as traffic increases in volume and concrete girder bridges cannot be widened, but the type above referred to, can conveniently have the hand rail and curb removed and an additional width added.

There is a decided trend toward the construction of bridges by bond issues; for instance, in Minnesota one county plans to rebuild sixty bridges next year and there are several other counties that will rebuild about fifteen bridges in one year, and for such cases this type of construction is especially adapted.

One of the biggest advantages is that protection will be obtained against the lowering of the bed of the stream for drainage and projects.

We believe that these bridges can be built with a saving of from twenty to forty per cent under the cost of the present types and that they will prove far more satisfactory in the long run, and so are preparing plans for bridges of this type for next year's construction.—Paper read before the Northwestern Road Congress at Chicago, Ill., Dec. 7, 1916, by C. E. Nazel.

A "Snail-Shell" Stair.

The only spiral concrete staircase of its kind in the world has just been placed in the tower of the Southwest Museum in Los Angeles. Similar stairways exist elsewhere, as in the tower of St. Paul's and the tower of the Cathedral in the City of Mexico, but they were built before the age of concrete. When viewed from above, its resemblance to the shell of a snail at once gave it a name. Says Frank Reed of that city, writing in "The Engineering Record.:"

"It is, for its purpose here, an improvement over Sir Christopher Wren's masterpiece—the spiral stairway ascending the interior wall in the tower of St. Paul's Cathedral, London. The Southwest Museum helical staircase is built inside a well in the center of the tower, thus not only preserving for shelves or mounted objects the entire interior wall-space of the tower, but also supplying on its own exterior wall additional space which may be employed for museum purposes. . . The tower containing the stairway is seven stories in height, with three mezzanine balconies in the three upper stories, giving the equivalent of ten stories.

"The tower is 35 feet square, and is supported by twelve columns and external walls 8 inches thick, reinforced with steel. It rests on a solid concrete slab or raft 3 feet 6 inches thick. The total height is 125 feet and the weight is 1,000 tons. The construction was carried on continuously, a story being poured at a time. The staircase well is 9 feet 2 inches in external diameter and is supported by four corner columns with 8-inch walls between them, with light and ventilation openings at each story. The stair is known as a caracole, on account of the likeness to a snail shell presented by a vertical view, as shown in one of the photographs.

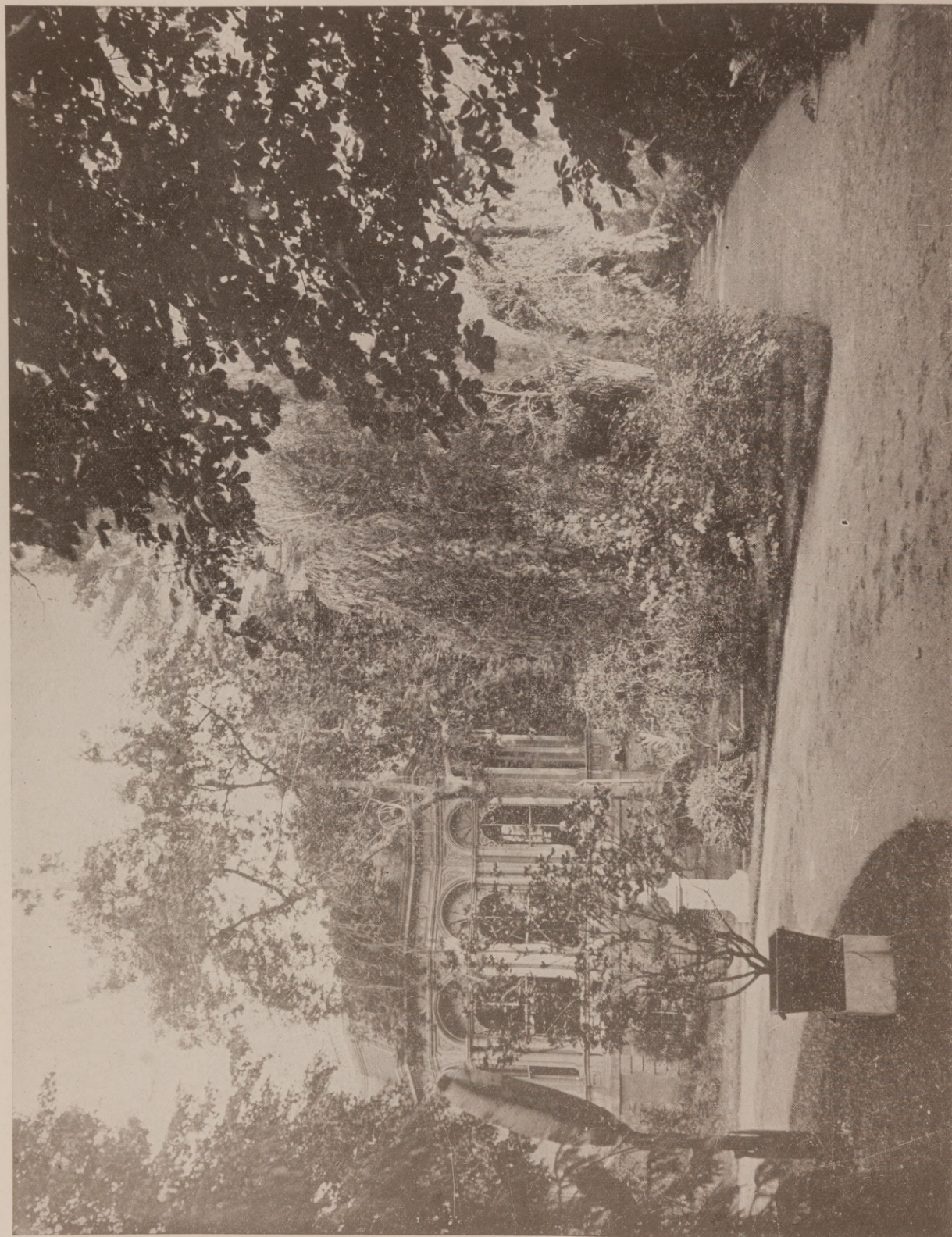
"With one exception it is the only helical staircase in America having a hollow center, the other one being an ancient stone staircase in the tower of the cathedral in the City of Mexico. The stairway contains 160 steps with 7 1-2-inch rise each, and was built around a galvanized iron form in the shape of a pipe, while wooden forms were placed for the stairs. Material was placed at a special rock crushing and sand plant located about one mile from the building, in a dry river bed."

July Permits in Pensacola, Fla., Amount to \$94,000.

A total of 87 permits were issued during the month of July with an aggregate cost of \$94,703, according to E. E. Wolfe, building inspector.



Another Pergola Effect with Garden and Grotto Beyond.



An Approach, in which Garden and Home Vie with Each Other.

A Review of the Building Situation.

By M. C. Tuttle.

FROM time to time reports are current that a building boom is in progress. These reports are read somewhat wistfully by the building trade, which trade is concerning itself largely with the problem of getting business enough to hold organizations together or studying methods for reducing overhead costs.

The building business is so far scattered, so broken up into various trades and into varying activities ranging from railroad right of way construction to the building of residences, that it is the biggest unclassified element of American business. It is common to hear appraisals of the total volume involved in the building business varying as far as from two billion to four billion dollars a year. About the only thing certain is that it is a huge part of the activity of this country, which is not at all understood. It competes with transportation and compares in volume with agriculture as one of the big single elements in American business. It certainly involves millions of dollars, stimulates business in steel, in cement, in lumber, in quarrying, and in the scores of subsidiary activities. It employs hundreds of thousands of men and it transports freight varying from the highest to the lowest classifications.

"Building Business" Explained.

It is so desirable that the building business should become active that there is always a temptation to try to stimulate its activity. Remember, that the term "building business" is a loose classification covering everything from the construction of water powers and railroad right of ways to the building of hospitals and schoolhouses. And remember that any one of the classifications only covers one division of this huge business.

With this in mind, it is clear that the observation that schoolhouses and dwelling house construction is very active, or that some few cities are building large numbers of hotels or office buildings, very naturally leads the inexperienced observer to the conclusion that the building business as a whole is enjoying a boom, when, as a matter of fact, it only means that some locality is actively engaged in building in some few lines. The fact that the firms which build schoolhouses are quite busy is no indication that the railroad contractors, with their millions of dollars' worth of equipment, are anything but idle. It does not follow that because Los Angeles is short of bricklayers there is not an oversupply of bricklayers in Springfield, Mass.

We are very likely to reason that because a

thing ought to occur, it is occurring. It perfectly easy to reason about the building business as follows: During the war, building work was limited sharply to war necessities. Factories, dwelling houses, wharves, and railroad sidings were built principally where the immediate necessity of the war seemed to require. Much of this work is useless in peace time.

Building Boom.

The building boom which began in 1918 and ran through part of 1920 was limited largely to the production of industrial development, including production and mill villages, with some residence work, a few hotels, and a large amount of city office building construction. During this period the railroads bought mighty little construction. Municipalities, counties, and States came into the market very little because the cost of all construction rose generally beyond the appropriations which had been laid down for the various public works. This rapid rise in cost also deterred the State and counties from building many million dollars' worth of proposed road construction. Then followed last year the depression of the building business.

The rise in cost stopped a large amount of work. Now notice how a fall in cost has done the same. If, in 1914, the cost of building a manufacturing plant was \$100,000, about the middle of 1920 it would have been \$265,000. Today the same plant would cost \$173,000. This means that for the last year there has been a rapid fall in the building market and, like all other business, it is difficult to sell on a falling market. Buildings, or engineering work, which could be deferred, have been laid aside during this period, waiting some approach to a stable price basis. Up to the last few months buyers have expressed no opinion regarding the level at which building and engineering prices are likely to stabilize. They have simply said that prices were to be lower, and that until they are convinced that the bottom is approached they will not buy.

Of late, careful observers believe that a new element has come into the building situation. That is, that prospective buyers are beginning to philosophize about the future price level, and today there is a surprisingly common acceptance of the statement that building prices, now at 173, are likely to settle between 155 and 175 the common statement being that probably 160 represents something like bottom. These comparisons are based on 1914 as 100. This means that those people believe there is a possible drop of 13 out

of 173 parts, or $7\frac{1}{2}$ per cent only remains to be deflated.

Pre-War Levels Not Expected.

There remains very little belief that prices of buildings are likely to return to pre-war levels. In the first place, building labor in the cities is strongly unionized and their organization enables them to resist wage cuts. It has taken a three months' strike in Boston to reduce wages of skilled labor 10 per cent. Some other cities have made a year's agreement with the building trades involving the old rates. As skilled labor represents, roughly, 50 per cent of the direct labor cost on building construction, it is probable that this element will not be deflated to anything like pre-war levels. Common labor being the pool into which the unemployed skilled labor sinks, and into which immigration moves, it is subject to deflation, but is not likely to return to pre-war levels for a long time.

Freight, direct and indirect, represents at least one-eighth of the cost of a building. This element is surely not likely to go to anything like pre-war levels. Of course, the matter of building costs, like every other cost, is expressed in the purchasing power of the dollar. It is either an optimist or a pessimist, depending on the point of view, who believes that the dollar is soon to reach anything like its pre-war purchasing power.

Unsufficient but general thinking of this sort is gradually leading the buyers, by narrowing variation, to the conclusion that at present-day prices a building which is needed or which shows an investment is either now, or will be pretty soon, a good thing to buy.

From time to time a man who has refused to consider building operations, steps over into the ranks of those "by and by" or "pretty soon" are likely to be interested. The appearance of these new prospective buyers tends to create the impression that a building boom is either under way or imminent, depending upon the experience and point of view of the observer.

Construction Demand.

It has seemed to me that the frequent report of a revival of building activities come from the knowledge that the conditions I have described have acted as a dam to the flow of business in the building trades; that behind this dam is the accumulation of building requirements in dwelling houses, in roads, in public works, hospitals, schools, churches and waterfront construction.

Assuming what seems to me to be a perilous thing to assume, that the pre-war standards of housing, of transportation, of general living luxury, are to be maintained, then you are led to the conclusion that there is an accumulated flood of

building operations only waiting to top the dam and start a secondary building boom.

Even assuming a more pessimistic view, it is clear that the war activities and the expansion of industry have offered the state, counties, and cities additional taxable property which has produced larger income. The citizens want good roads. They know that the towns and cities need more schoolhouses, and they believe that additional hospital space is desirable, and the city governments wish a miscellaneous line of public improvements always required by cities. The movement to the cities has crowded these centers. Once business starts up, most cities will find themselves fairly short of office space. The higher freight rates make water powers doubly valuable, and water power projects are coming more frequently to the front. Manufacturing concerns that have made and saved money during the war have in mind changes to the plants which will prove economical.

Building Costs Down.

Meanwhile, the cost of building operations has dropped perhaps not to the bottom, but many think well toward it, and once the buyers are convinced that the bottom is in sight, they will begin to buy in an effort to anticipate a bulge which might follow the resumption of building activities.

For the reason I have attempted to outline, and perhaps for others, it seems so reasonable to expect eventually an increase in building activities with the resulting benefits to its allied industries and to transportation, that the wish that these activities might developed leads to statements that a building boom is actually under way. To those engaged in the building business, it looks far more likely that we are seeing the accumulation of wants which may, with an improvement in business, produce a large volume of activity.

As long as there is unemployment in the building trade and until the reports of building activities cover the whole range from water-power and water-front construction to housing and factory building, it is safe to believe that we are not yet in the presence of a building boom, or anything like it. It is equally unsafe to assume that the building business will remain inactive for long. The accumulative requirements for building which are the accumulative requirements for one of the prime necessities of life, namely, shelter, or too great to be long deferred. A huge volume of the building work only waits the return of the confidence which men have in their own business and personal affairs, followed by the ability to back their revived beliefs with money obtained through credits.—The Bulletin.

Color and Texture of Concrete Products.

By Adolph Schilling, Philadelphia.

WHEN, then years ago, the speaker started to make concrete attractive and pleasing, he accepted as definitely settled its claim for strength and endurance, so thoroughly demonstrated by the engineers of the time and the examples of ancient concrete work still in existence.

His researches and experiments have been devoted entirely to producing in concrete those artistic effects which would make it interesting to the architect and decorator as a medium for the embellishment of their work. If for this reason these remarks are of less interest to engineers and contractors in concrete construction than more technical matters are, their indulgence is asked, to consider for a few minutes concrete as something which is as pleasing from the esthetic as from the utility point of view.

Twenty years' practical experience with the natural stones used in monumental and building work enabled the speaker to appreciate the conditions that must be met to give concrete a place beside the limestones, marble, granites and metals, the almost exclusive medium by which architects have expressed their thoughts.

After once thoroughly understanding the qualities of cement as a binder or matrix, one can learn to use the many mineral and metal products as readily as the better known sand, gravel and crushed stone are used.

To produce color effects, the gray and white Portland cements may be used, either by themselves or mixed in certain proportions; adding suitable pigments; in many cases, the natural colored aggregates, sand, silica, pebble grits, marble and granite will give excellent and more uniform results; it requires great skill and care to properly mix cement and color pigments, so as to retain the strength of the cement and obtain uniform color effects. The importance of mixing the pigment thoroughly with the cement before adding the aggregates should be recognized by anybody attempting to make concrete in colors.

As a very simple method of testing the proper amalgamation of the pigment with the cement, take a handful of the mixture and press it under a sheet of stiff paper, this will produce an even surface of the material, and as long as this surface does not show absolute uniformity in color, the mixing is incomplete. The small specks of unassimilated pigment that show in this test surface will also appear in the concrete.

Some excellent work of modeling in cement has been done recently by artists who attained their efficiency abroad; the most important work of this kind, to my knowledge, is a group of the

crucifixion of heroic size at Lynn, Mass. The artist builds up his design in cement from a sketch model or cartoon, and is able by using a mixture of quick-setting and slow-setting cement, to regulate the setting of his medium; in this way he can give the work all the freedom and spirit of work modeled in clay, producing any texture desired; color effects can be obtained by using colored cements of various shades; for instance a garland of flowers can be modeled in the natural colors; there is no difficulty in producing the well-known Della Robbia effects in cement, as is done in terra cotta. This method is particularly interesting and valuable where only one piece of a large ornamental design is to be used, as it eliminates the expense of molds and erection in place; and prevents unauthorized replicas of original designs.

A very important factor that can be readily utilized to give color to concrete or cement has been given little or no attention; while very simple in its primary action, its successful application requires thorough understanding of the principle and medium employed. The absorptive qualities of concrete during its stage of curing and seasoning offer opportunities for coloring its products through this capillary action. The color is deposited in the pores of the surface amalgamating permanently with the concrete. The possibilities of this treatment are unlimited, a knowledge of the coloring values and judgment in its use so as not to injuriously impair the strength of the concrete being essential to success. A coloring solution can be made to penetrate the surface of concrete 6 in. or more, if the object is placed in the solution in a very green state; it is rarely necessary to penetrate more than from 1-32 to 1-8 in.; this thoroughly fills all pores, gives the desired color effect and is less expensive. Every atom of coloring absorbed by the concrete reduces the strength of the solution; and as some of the colors used are quite expensive, the use of good judgment in allowing only the necessary absorption of coloring matter is advisable from an economic point of view. Solutions of aniline and the sulphates of copper and iron are the most suitable for coloring concrete by the capillary method. The concrete products requiring considerable strength should not be subjected to the coloring bath until they are sufficiently hardened, since the filling of pores stops the action of curing by the usual methods.

Coloring by absorption is effective on surfaces of concrete immediately after it is removed from the mold, or after treatment with acid or tooling.

Surfaces colored through the absorption of mineral or metallic colors become waterproof, and the action of weather on metallic color is the same as on metals, increasing the beauty of the coloring by the same oxidation that occurs on bronze and copper. The surfaces of concrete treated by this method become so hard and dense that they will take a uniform dull or high gloss polish. The speaker has treated such surfaces with polishing and buffing machines, the same as marble, granite and metal are treated.

Products made by the speaker's methods, such as flower pots, vases and boxes, will hold water the second day after casting, and become so hard that when struck with a hammer they ring like a bell; he does not consider the use of waterproofing compounds essential to obtain this result, but considers the proper amount of water and thorough grading of aggregates as all-important.

The speaker has made extensive tests during the past three years with waterproof paints, and has obtained excellent results. Concrete can be made very attractive with one or two coats, and if applied by the stipple method, it will not impair the grain or texture and avoids the undesirable effect of painted stone. This method is especially recommended for dry or semi-dry process concrete work, as its porous surface readily absorbs the waterproof liquid and allows the pigment particles to fill the pores. The color effect obtained in this manner is the most economical, but it is a flat color and does not give the richness and depth of shading that result from the immersion treatment in an aniline or metallic color bath. It can be used to advantage, however, where immersion is not practicable.

The speaker has obtained excellent two- and three-color effects by painting certain parts of an object before subjecting same to the coloring bath, the parts so colored not being affected by the color in the bath. The artistic possibilities of such treatment are only limited by the color sense and taste of the craftsman.

By using certain non-absorptive aggregates, their natural color can be retained, while the absorptive part will assume the desired color. In this treatment precaution must be taken not to use certain acids in washing before immersion in color bath, as the chemical action of the acids is liable to counteract the color value of the bath.

Practice and testing will give the experience necessary for gaining the full benefit of this process; the speaker has been ten years in obtaining his present results.

In the matter of surface finishes, considerable headway has been made, and most of the methods are well known to the progressive users of concrete.

Concrete of proper age can be treated like any natural stone, using the same tools and machinery to dress its surfaces; it is the speaker's strong conviction that the success of concrete stone for building purposes rests with a close affiliation of the stone caster and the stone cutter; only in this way will we be able to give concrete proper texture and the necessary qualities of dimension stone so essential to the architect and builder.

For six years the speaker's concrete stone and natural stone plants were under one roof, and these conditions were found to be ideal in procuring first-class composite stone of proper size, quality and finish.

The addition of a skilled stone cutter and setter to every concrete products plant would be a source of profit and result in better work; he knows what it means to have dimension stone true to size and shape; the average worker in cement or concrete does not appreciate this essential point which is all-important to the architect and general contractor. The services of a stone setter will enable the concrete products plant to set its own work, which is very necessary for good final results.

The brick or natural stone mason, for reason of his own, does not give composition stone the required care when setting it. But once give this fraternity to understand that concrete stone means employment to stone cutters and setters, and its antagonism will vanish. Whenever the opportunity affords, the speaker strongly recommends closer affiliation of the composite and natural stone trades. The enormous increase in high-class building operations and the constant effort for betterment in the moderate-priced homes give abundant fields in both trades for work of a better class and at a more satisfactory profit.

The speaker has found that every machine, tool and implement now used in finishing natural stone, can be employed to good advantage in dressing concrete products. It has taken many years to perfect the business of dressing natural stone; the progressive concrete products man whose product he must equal or better to win the approval of the architect.

The speaker further recommends to the manufacturer or worker of concrete products, the adoption of such methods as are employed in other lines of manufacture; to treat the surfaces of their product, for instance, instead of applying paint with a brush immerse it in the paint; this immersion is specially adapted for acid washing. It should not be a vital matter to construct tanks of sufficient size in a concrete plant, and the soaking of the surface of concrete in acid will not only prove a great saving in acid, but

will produce a class of work that can not be obtained with the scrubbing brush; a very weak solution is required, the treatment preserves the edges and details of the design, and makes the surface uniform. Any of the hard spots not sufficiently affected by the acid bath can be treated separately after the article has been flushed with clear water. Care must be taken that the aggregates of the surface are of nearly uniform hardness, or the acid will eat the softer portions before the harder particles have been cleaned of the coating. For instance, the speaker had some very fine work spoiled by this treatment; to obtain a certain effect, a mixture of black marble (a limestone) with crushed granite was used; the acid bath left void places where the black marble had been, while the granite showed a very fine texture and natural color.

As a closing word, while not assuming to instruct the architects present or elsewhere, the speaker wishes to advocate the most extensive use of properly made concrete stone.

The use of crushed marble and granite, with Portland cement as a binder, producing a reconstructed stone of natural components, is not an "imitation" of natural stone or a "misuse of

concrete;" but it gives us a staple building material, combining the beauty of color and texture of the natural stones with the strength and economy of concrete.

The speaker's object in presenting this paper to the concrete fraternity is not altogether unselfish; he expects that with many heads working along similar lines, new features and betterments will result; an exchange of ideas is solicited by him.

To Build Factory in Chattanooga, Tenn.

WHEN, ten years ago, the speaker started to the Chattanooga Pipe and Fitting Company, Chattanooga, Tenn., is having plans prepared for the construction of a plant in which to manufacture flexible metallic pipe and pipe joints. The company was recently incorporated by W. L. Mitchell and J. V. Brandon with a capital of \$400,000.

Miamia, Fla., to Have \$200,000 Store and Office Building.

The Central Properties, Inc., plan the erection of a \$200,000 store and office building at an early date. The structure will be 130 by 150 feet of steel frame construction.



Tile Roofed Residence and Outhouse at Dallas, Texas.

Building Encouragement.

There are indications that good, sound common sense is being employed by those engaged in building construction, and all along the line, including material men, contractors, artisans and mechanics and laborers. These indications are to be noted on newspaper pages that tell of reductions being made, whereby the cost of building construction will be lowered very materially, whereby is encouragement for more building than has been done in several years past.

Millions of dollars are waiting to be put into new and badly needed buildings just as soon as costs of material and labor make possible the employment of money for construction work or investment. This is true the country over. Chicago alone is said to be in need of new buildings to the value of \$50,000,000. Other large cities are similarly situated and thousands of smaller ones in proportion to population.

There is nothing to be gained by idleness. Very much is lost thereby, and this seems to be appreciated. Stagnation in the building business has prevailed so long that something practical had to be done. It is encouraging to learn that the disposition to make more building work possible is being manifested in a practical way—by reasonable reduction in building costs. The public will be quick to respond. Where unreasonable

demands continue stagnation, idleness and insufficiency of houses will prevail.

There are good reasons to believe that the situation is changing for the better because reasonableness in coming into action. This better condition needs all the helping along that can be given for making it general.

Building Activities in Waco, Tex., on the Boom.

During the month of July there were issued permits to the amount of \$244,844 which was an increase of \$125,000 over the previous month.

Columbus, Ga., Building Reaches Highest Total in Year.

Construction work which is now under way and which will be started shortly exceeds in volume any previous period in this section of the country. A 6-story fireproof office building to cost \$100,000 will soon be under construction. Many residences and other buildings are being rushed to completion.

Home Building at Savannah, Ga., on Big Scale.

During the first thirteen days of August, 36 building permits were issued. Since June the first building has increased very rapidly. The increase in one- and two-story dwellings indicate that many families which were compelled to seek lodgings wherever they could are now beginning to erect individual homes.

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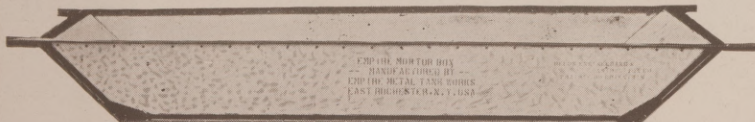


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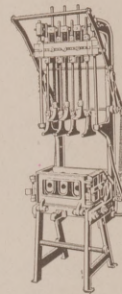
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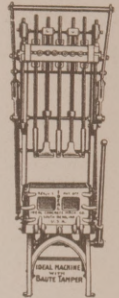
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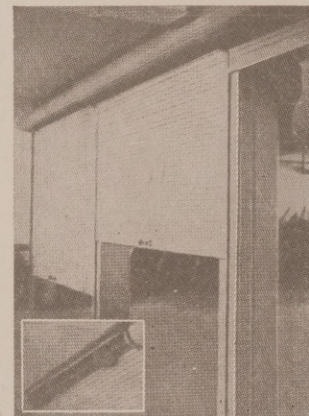
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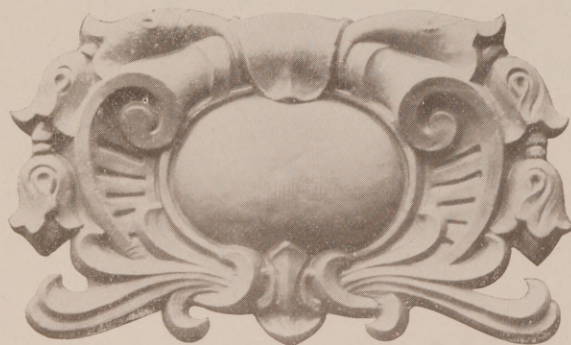
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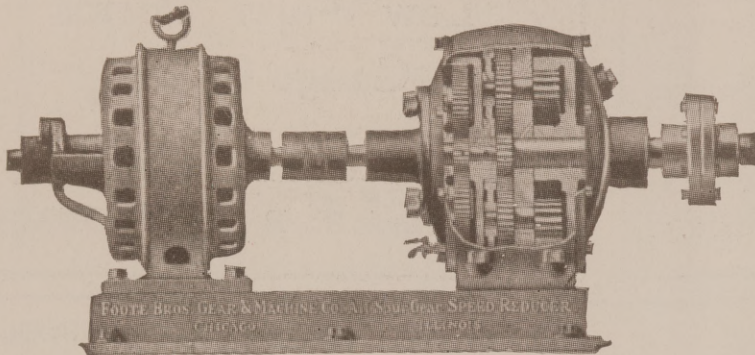
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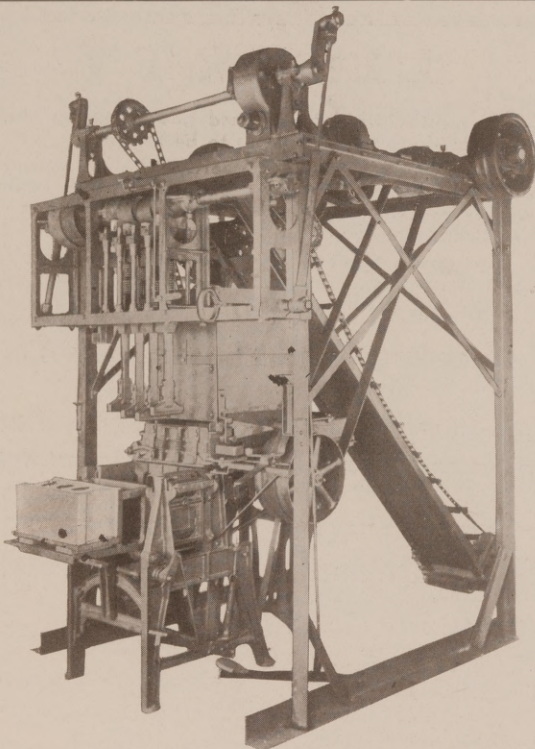
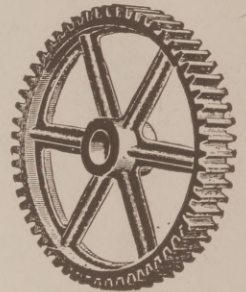
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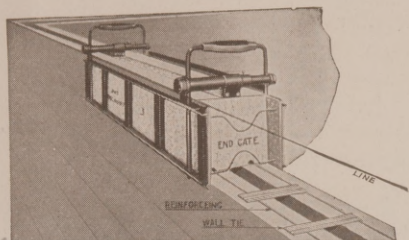
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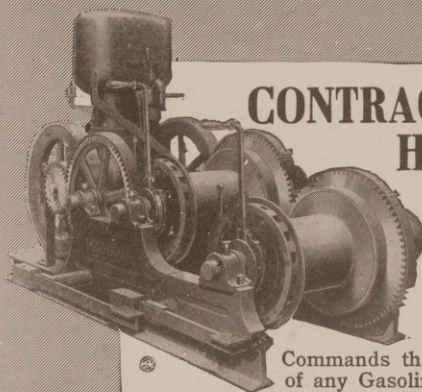
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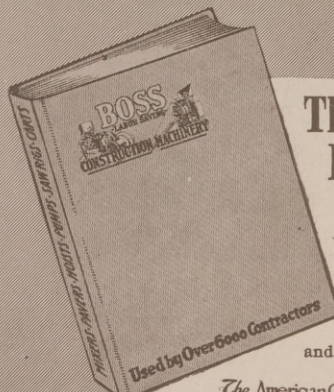
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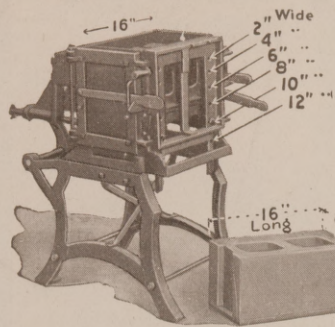
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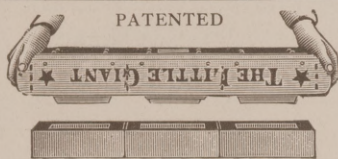
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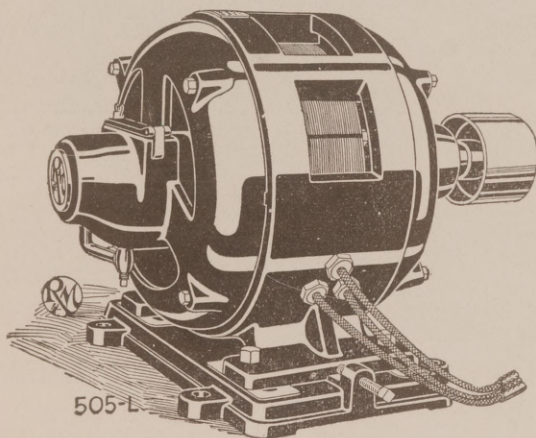
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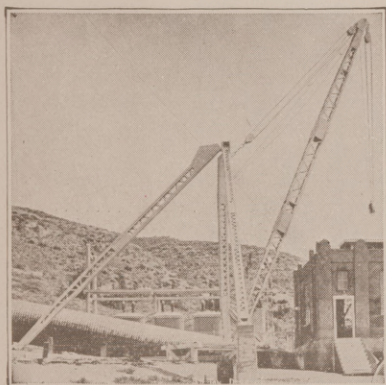
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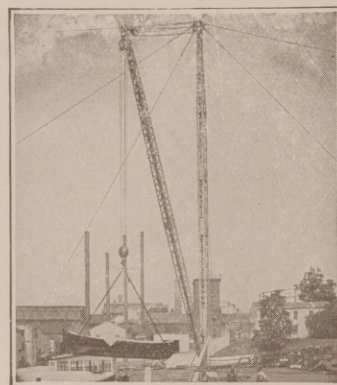
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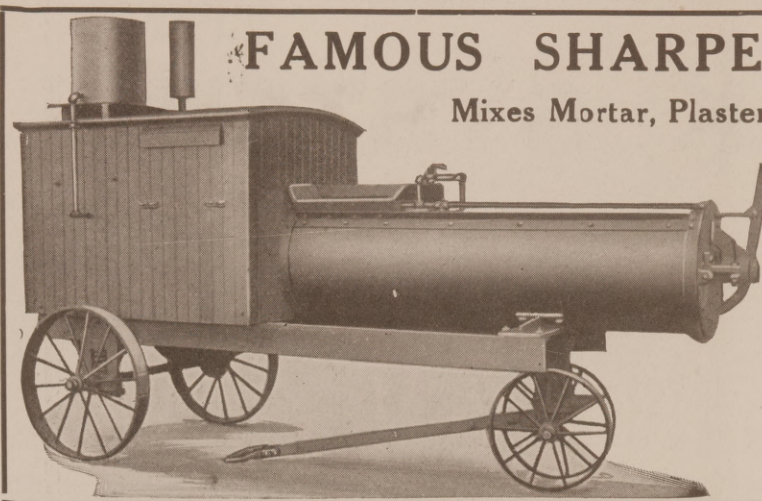
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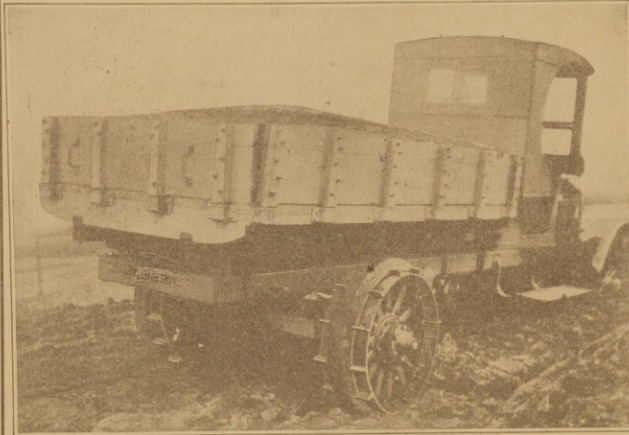
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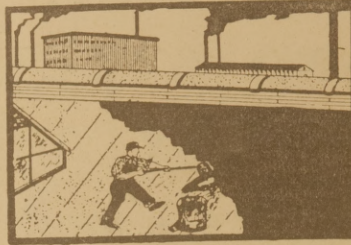


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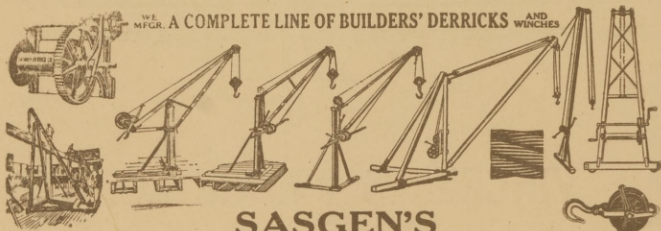
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