itecture

THE CONCRETE AGE

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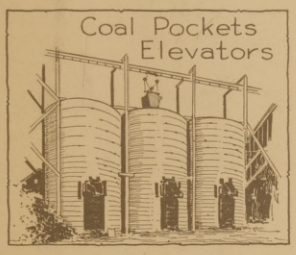
REPRESENTING THE INTERESTS OF MODERN PERMANENT CONSTRUCTION

Entered as second-class matter October 10, 1919, at the Post-office at Dalton, Ga., under the Act of Congress of March 3, 1879.

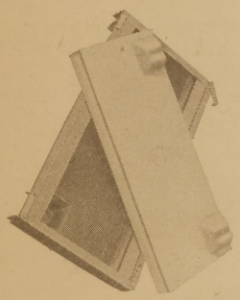
VOL. XXXIV. MONTHLY DALTON and Atlanta, Dec., 1921. $1.00 Per Year. No. 9

Hart Building Staves

Coal Pocket Demand is Your Opportunity



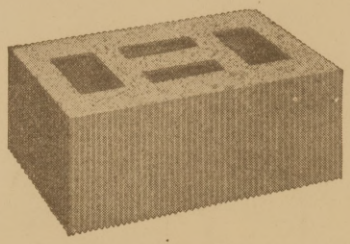
The field is new and growing rapidly. Manufacturers and dealers want them. Get into it now. Make Hart staves. They are the strongest because they are built to stay put, being a sloppy mixed reinforced vibrated stave.



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.

Forrest S. Hart & Son

Offices: Batavia, N. Y.



Your customers want

DRI-LITE Building Tile

Light concrete tile are sweeping the country—architects, builders and owners are recognizing the right kind of tile as the most economical building unit.. Dri-Lite Tile are light, easily handled, amazingly strong. Solid web runs the entire height of tile—use either wet or semi-dry mix in manufacture. Dri-Lite Tile are made on machines of three types, embodying varying degrees of automatic operation. We have a machine to fit your plant—ask for particulars.

Write for circular describing and pricing our tile machines,

THE BENFER CONCRETE MACHINERY CO.

Cleveland - Ohio

Dealers Wanted in Open Territory.

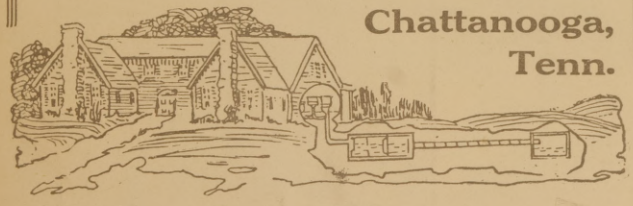
SEPTIC TANKS

Scientifically Designed for Suburban Sanitation.

Write for Circular.

E. J. NOBLETT MFG. CO.

Chattanooga, Tenn.



Alabama Hewn Oak Timber

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THE S. K. TAYLOR LUMBER COMPANY

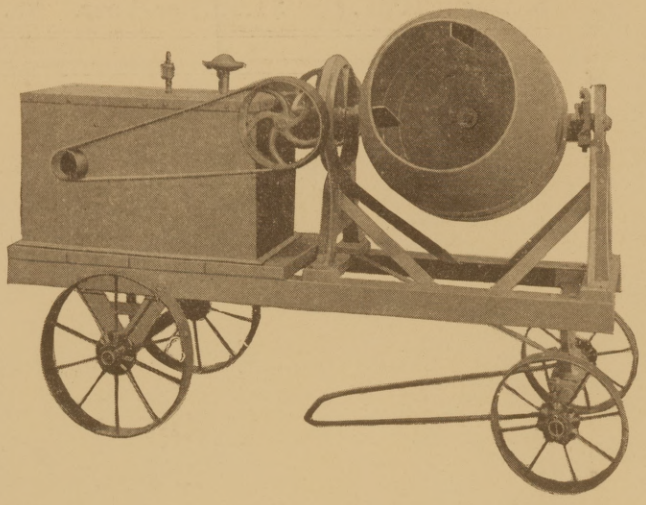
MOBILE, ALA.

IRON PIPE RAILINGS

When in the market for Pipe Railing for Stairs, Bridges or Retaining Walls, send us your drawings. We can quote you prices that will be worth considering.

PIPE RAILING CONSTRUCTION CO., Long Island City, Dept. R. New York

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.

The Popular concrete mixer for mason, carpenter and concrete contractors—Capacity 3 to 4 cu. ft. of wet material. Easily operated with 1¾ h. p. engine. Furnished with or without engine attached.

Sold under our Iron-Clad Guarantee.

Write for complete specifications and rescriptive circulars. Dealers wanted everywhere.

Remmel Manufacturing Company

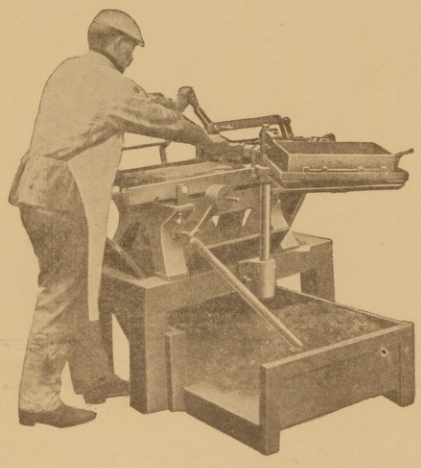
Dept. CA **Kewaskum, Wis., U. S. A.**

AMBI-Cement Roofing Tile Machine

PATENTED IN ALL COUNTRIES

NOT just a MOULDER on a stand BUT a REAL MACHINE.

Tamps, colors, trowels Mechanically.



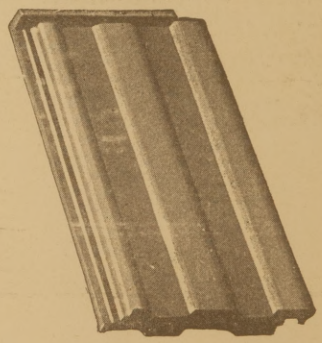
The Machine makes the tile, one man works the machine.

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

You can start with a small investment in a one-machine AMBI outfit, then grow with your business.

Write us today for Full Information.

Ambi FRENCH Tile. One of four Ambi shapes.

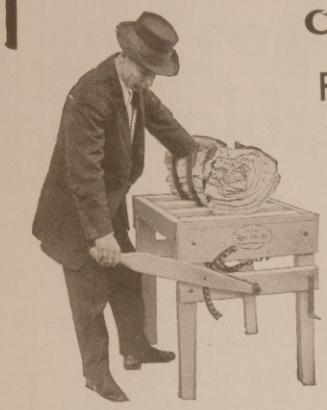


AMBI INDUSTRIAL WORKS, 90 West St., NEW YORK CITY

Bale Your Empty 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

F. O. B. Galesburg. Order direct from this advertisement.

ROWE MFG. CO.
Galesburg, Ill., U. S. A.

Clean Your Sacks

Handy Sack Baler Co.

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

Write Us

HANDY SACK BALER CO.

600 S. Second St. E.
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A TYPICAL CONCRETE HIGHWAY

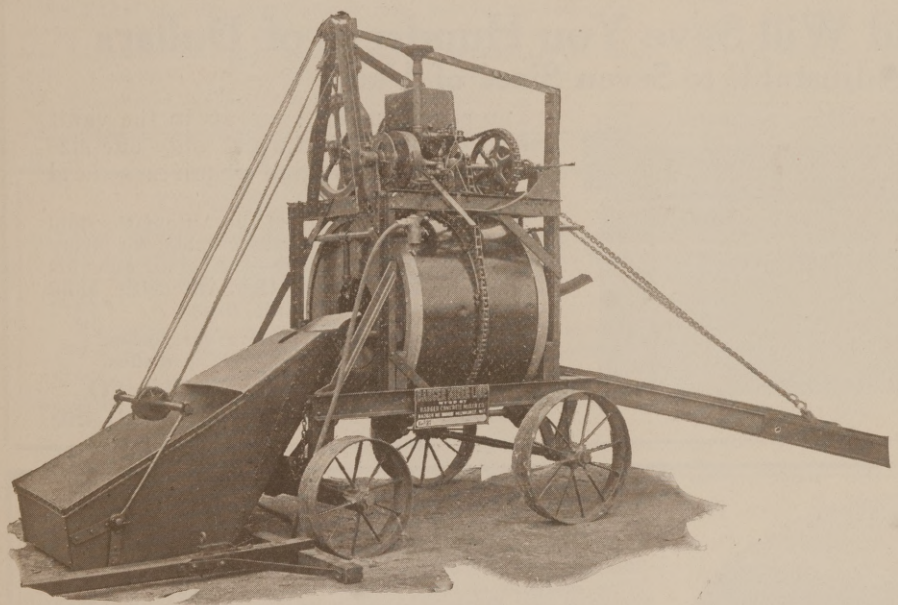
The Concrete road will be giving good service when the bond issue matures—and for years thereafter. Every mile of Concrete road is a permanent link in a completed county highway system. In no other way can any county hope to complete its road-building scheme. Maintenance of existing roads of other types will soon absorb all possible revenue. Concrete roads mean no mud, no dust, low cost of maintenance and permanence.

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

Dixie Portland Cement Company

James Building, Chattanooga, Tenn.

CONCRETE FOR PERMANENCE.



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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

The ~ Badger ~ Mixer Line

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

Fox Bros. & Co., New York City. *Our Export and New York Agents*

—a machine that makes an endless stream of building blocks one every 5 seconds—5,760 a day?

The Debay Completely Automatic Machine is a piece of equipment that can turn a struggling block plant into a prosperous manufacturing enterprise.

It is the only concrete block molding machine in the world that has rotating mold members with stationary core bars.

Hand labor is reduced to the minimum.

Keep the material hopper full and the finished 8 x 8 x16″ blocks flow from the machine on an endless belt in an endless stream at the rate of 72 every minute, 720 an hour, 5,760 a day.

The product includes standard 8 x 8 x 16″ back-up, corner and end blocks in a wide variety of faces.

See it in the movies!

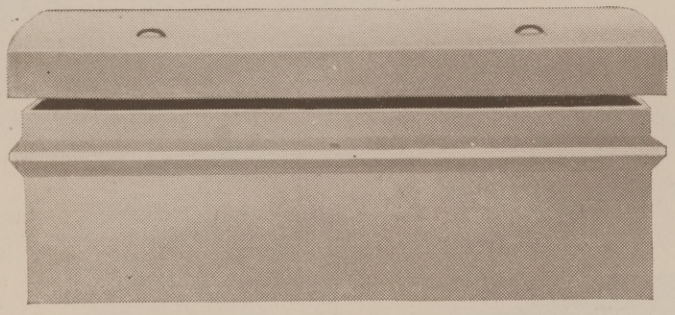
You can see the machine operating in a plant at Springdale, Pa., or we will show moving pictures of its operation in any community where interest is manifested in the proposition.

Write for full details.

Debay Research & Mfg. Co., Springdale, Pa.

This Vault Mold Will Save You Hundreds of Dollars

It Is Adjustable to Seven Sizes of Vault

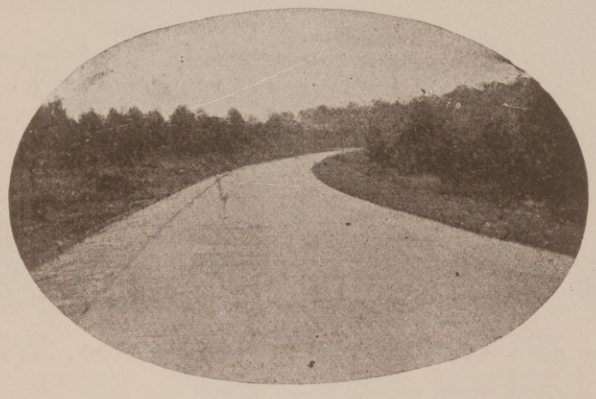


You cannot make a success in the vault business, if you can furnish only one size of vault. The demand requires several sizes.

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.
26 East River St., PERU, IND



Dustless—Non-Slippery—Always Serviceable—Lowes Maintenance

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

The expeience 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, December, 1921 No. 9

THE CONCRETE AGE

PUBLISHED MONTHLY

Devoted to Modern Permanent Construction.

CONCRETE AGE PUBLISHING CO.

SUBSCRIPTION RATES.

In the United States and Possessions (Hawaii, Phillippine 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.

New Kind of Artificial Stone.

Consul General Leo J. Keena reports from Zurich, Switzerland, that the Gyr-Guyer Bank for Financing (Gyr-Guyer Banque pour Financements) of Zurich states that they are the holders of a Swiss patent for the manufacture of a kind of artificial stone which can be made at one-third the cost of ordinary artificial stone. A description of this stone and a report of an examination of it made by the Examining Board of the Federal Laboratory for Material Analysis, at Zurich, may be inspected at the Bureau of Foreign and Domestic Commerce on referring to file No. 8492.

The Concrete Home.

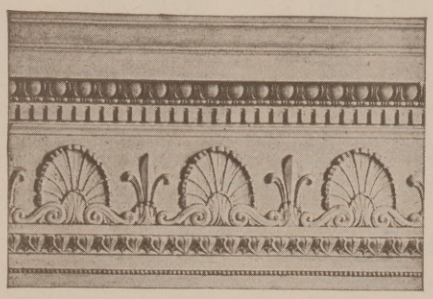
Throughout the year it is the purpose of The Concrete Age to lay unusual stress on the concrete residence, the permanent structure for human occupancy. In fact, we might go so far as to say that we intend to specialize on it for some months. It is very evident that the building public is looking to concrete 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 what is being done for the clients of other contractors in the way of designs for concrete homes, and, incidentally, to show the home-builder himself the best and 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 can take it to a prospective home-builder and say, "This 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 instances where it has accomplished this very result, not only in the case of the residence, but also in the way of bridges and warehouses and even in silos and dipping tanks and miscellaneous minor work. Some 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.

New Cement Factory in Baluchistan.

Consul E. Verne Richardson, Karachi, India, reports that a new cement factory, capitalized at $650,000, is to be erected at Beleli, a station on the Northwestern Railway, which is 8 miles from Quetta, the capital city of Baluchistan.

REFINEMENT IN DETAIL



As here shown, will be found in all of our moudings 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.

SALES DEPARTMENT

Empire Bldg. - Biringham, Ala.

PLANT

Ragland - - - Alabama

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 wherever 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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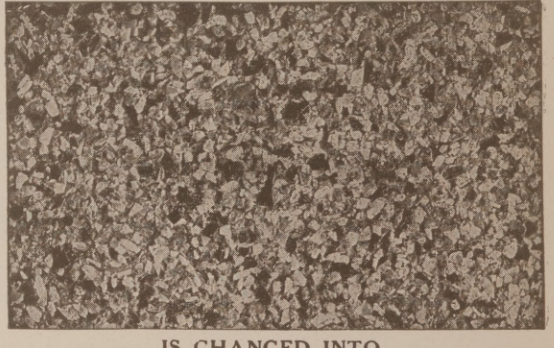
MICASPAR CRYSTALS



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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

The Concrete Age And Its Promotion Work.

Every month, for fifteen years, The Concrete Age has been the sole missionary in the South, preaching the gospel of concrete fireproof construction. It has printed thousands of pages of text, and thousands of illustrations to drive home its arguments.

Every month, for fifteen years, The Concrete Age has likewise been relentless in advocating the building of concrete roads. It has devoted a vast amount of space and thousands of pictures to this subject and today this work is bearing fruit in the assured building of the Dixie Highway and other great road systems.

For fifteen years, The Concrete Age has had its leading articles copied by the big papers of the South, where they reached millions of readers and in this way doubled its power and influence in pleading for concrete fireproof buildings and concrete roads.

For fifteen years the paper has not only covered the fourteen Southern States, but the Middle-West as well. It has been a power in its particular field and has contributed millions worth of new business to those who seek trade from the concrete industry.

Mr. Advertiser, have you fully appreciated the ceaseless efforts and influence of this paper? We are rendering missionary work which creates new business for your products every month, and The Concrete Age deserves your patronage and support. Give us this, in full measure, and enable us, through your help, to largely increase the practical influence the paper is exerting in your behalf.

CONCRETE AGE PUBLISHING CO.
ATLANTA, GA.

Pretty Concrete Residence at Cartersville, Ga.

How to Reduce Risks in Earthworks

Halbert P. Gillette in "Successful Methods."

FEW classes of construction are so difficult to control economically as earth excavation. Rainy or freezing weather may completely upset the best laid plans and cause a severe financial loss. Usually most of the working gangs are common laborers, quite irresponsible, quitting at the slightest provocation, often with no provocation.

The character of the earth itself may vary greatly from week to week or even from hour to hour. The length of haul is seldom constant even for one day. Small wonder, then, that no ordinary class of contracting is more hazardous than earthwork.

Experience and Work Necessary in Estimating.

The first great risk is taken when the estimate is made as to the classification of the excavation. Here it is that experience counts so much in favor of an older man, and lack of experience hits a younger man so hard. But a young contractor is not necessarily without means of self protection. He can employ an experienced superintendent, he can dig test pits and make earth soundings.

When I first went into the contracting business, I soon learned never to bid on excavation until I had "prospected" the job pretty thoroughly. It is surprising how much can be accomplished in a short time in this manner.

Sounding with rods is an expeditious way of ascertaining the depth to ledge rock or to hardpan, and it will also disclose the existence of boulders. But in an unfamiliar country, it often is necessary to dig test pits or small wells, so that the toughness of the earth can be judged by observing the resistance to a pick.

Often there is insufficient time to prospect the ground thoroughly. Then, if the work is in a section where your experience has been limited, don't bid at all if the earthwork is extensive.

Prospecting for Facts.

Some years ago, a firm of young contractors in New York City asked me to assist them in estimating the cost of a large job of excavation in New York State. The cuts and fills were heavy, and the engineers had made no soundings. The engineers had estimated that the excavation would be 75 per cent solid rock and 25 per cent earth. After walking over the line, I asked one of the contractors what he thought of the "three to one" classification the engineers had made. He replied that it seemed to be "any man's guess," but that he presumed the engineers were approximately right as they had been engaged for months on the surveys and in planning the construction. Had he known more about common engineering practice, he would have had little faith in that guess as to the classification. I explained to him that about the last thing that the average engineer does on such a survey is to estimate the classification, and that then he usually guesses, often wildly. "Well," said the contractor," we want to bid on the job, and it's too late now for us to do more than guess also." He was surprised when I assured him that in the two days remaining before the bids would be opened, we should be able to estimate pretty accurately what percentage of the excavation was solid rock. Since many of the cuts were 50 to 60 feet deep, and quite long, it looked like an impossible job to do much sounding in two days; as for adequate test pit sinking, that was impossible.

Jutting from the surface of the earth at frequent intervals was rock (gneiss) that appeared to be ledge rock, and it was this appearance that had led the engineers to estimate 75 per cent solid rock. I pointed out to the contractor that ledge rock in Southern New York State is usually grooved in a north and south direction as a result of the grinding action of ancient glaciers; but that none of the outcropping rocks that we had seen on that job were grooved or scratched in that regular manner. Hence they probably were boulders. There were other geological facts that led me to the same conclusion, but it remained to prove the inference beyond doubt.

I had noticed along the line several wells that supplied water to farmers, and these, I believed, would be rather deep dug wells—real test pits for our purpose. We were able to find the men who had dug some of these wells, and to learn from them that they had dug 50 to 80 feet without striking solid rock, and that they had encountered few boulders.

In order to confirm this testimony, we put several small gangs of laborers at work sounding with rods. The results of that sounding showed that there was no ledge rock at all in any of the cuts. The subsequent excavation proved this conclusion to be substantially correct.

Naturally these contractors bid a fairly stiff price on earth and very low on rock, and were the lowest bidders.

Adequate Plant Reduces Weather Risk.

In estimating both the classification of excavation and the toughness of the materials, any nearby cuts should be examined; and local men

who have done any excavation should be interviewed.

Having secured the job, it is important to reduce the bad weather risk by starting excavation as quickly as possible, and by using enough plant to rush it through before the autumn rains start. Here it is that the inexperienced contractor is apt to err. He may not order all his plant until he signs the contract; then he usually orders neither enough plant nor spare parts. Delays occur in getting the plant on the job, and several weeks of good weather may be lost before the work is going "full swing." Even then the "swing" is not "full" enough because of pennywise attempts to save money on plant investment.

I recall that a certain contractor on the deepening of the old Erie Canal in 1896 made a profit where his neighbor contractors lost money, simply because he bought, begged and borrowed a lot of equipment so that he was able to finish before the ground froze.

Have a liberal surplus of plant capacity, for surplus plant is the best investment on an earth moving job.

Fit the Plant to the Job.

The next important risk to eliminate is the risk of using a relatively uneconomic method or machine. There is no better way of reducing this risk than by having daily, weekly and monthly reports of the yardage moved by each gang. This is often not so easy of accomplishment as it sounds. Usually the only practical way of estimating the daily yardage is by counting the loads; but loads may vary considerably in size, and it may not be easy to keep tabs on the number of loads.

Carloads and wagonloads vary because of differences in the kind of earth, differences in the resistance to traction, difference in attention given to the loading, etc. Study every cause of variation in the size of loads with a view to learning haw to estimate the "place measure" size of a load under given conditions.

Estimate Yardage Accurately.

Your own estimate of yardage based on the count of loads should be compared with monthly cross-section estimates made by engineers. Do not think the engineer is necessarily wrong because his monthly estimate is far below your estimate. Perhaps your "tally" is wrong. More probably you have estimated too liberally as to the size of the average load. Buy 2 mechanical counters or "tally machines" for use at the pit and dump.

My brother, W. A. Gillette, has devised a satisfactory method of estimating the daily yardage handled by drags, fresnos and wheelers. A timekeeper on horseback rides from gang to gang, spending about 20 minutes at each gang, during which time he counts the number of scraper loads moved by the gang. Three or more such counts are made every day for each gang, and upon these counts is based an estimate of the yardage excavated each day by every gang. The accuracy of this intermittent timing method of estimating yardage is astonishing. The engineers' monthly estimate seldom differs more than 5 per cent from the estimate thus made by the timekeeper. The great merit of such daily estimates of yardage consists in showing at once the relative efficiency of different methods, machines and men.

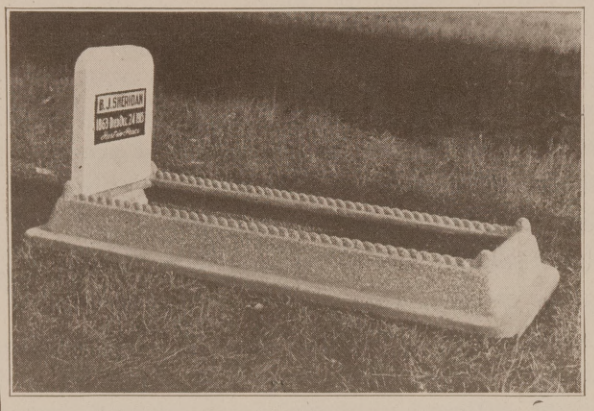
Compare Labor Costs with Machine Costs.

I have mentioned the unreliability of most common laborers on grading work. This unreliability, coupled with the high wages now paid to common laborers, is leading to a greater use of machinery than ever before, even on small jobs. In China, with wages at 15 cents a day, machinery could seldom compete with hand work, for the interest, repairs and depreciation on the plant alone exceeded the cost of doing the work by hand, in most cases. That is one extreme. At the other extreme we now have American unskilled labor getting 30 to 60 cents an hour, the average being 40 cents. Skilled labor has risen about 60 per cent in price as compared with a rise of about 100 per cent for unskilled labor. Machinery has not risen in price as much as skilled labor, and excavating machinery grows better every year. Hence it is that nearly all of us must revise our pre-war ideas about the use of machinery.

High wages lead inevitably to a greater use of machinery. This has long been evident on the Pacific Coast where contractors found it profitable, long before the war, to use more machinery than was customary in the Central, Southern and Eastern states. Wages o nthe Pacific Coast averaged about $2.50 a day for common labor prior to the war, whereas about $1.75 was the average in the East. That difference alone justified the greater use of machinery in the far West. Is it not clear, then, that with common labor wages double what they were five years ago, there must be a greatly increased use of machinery in construction work?

Hereafter the slogan of the far-sighted contractor will be: More power and less muscle; fewer men and greater hustle.

Grave Marker and Coping Molds



Patent Pending.

Our molds make money fast for concrete products manufacturers. The products sell readily and give excellent satisfaction.

Central Cemetery Co., Cook Co., Ill.: "Your base protection is a splend'd idea."

Mrs. L. Truska, Blue Island, Ill.: "The concrete monument and 5 copings are more than satisfactory."

Write for catalog of molds for making tombstones, grave-coping and other ornamental products.

KEMPER GRANITE MOLD CO.

865 Transportation Bldg. Chicago, Ill.

THE WICKES
Continuous Electric Blue Printing Machine

CONTRAST

Blue prints up to and including 48 inches in width and of unlimited length.

A most significant word with reference to blue prints. It means legibility which is the only real value of a blue print.

THE WICKES SYSTEM was designed with that particular value foremost.

Prices and details promptly.

WICKES BROTHERS

360 Water Street Saginaw, Michigan

STOCK FIRE PROOF DOORS

Metal Covered

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Standard Sizes in Stock of all Designs, with Frames and Trim

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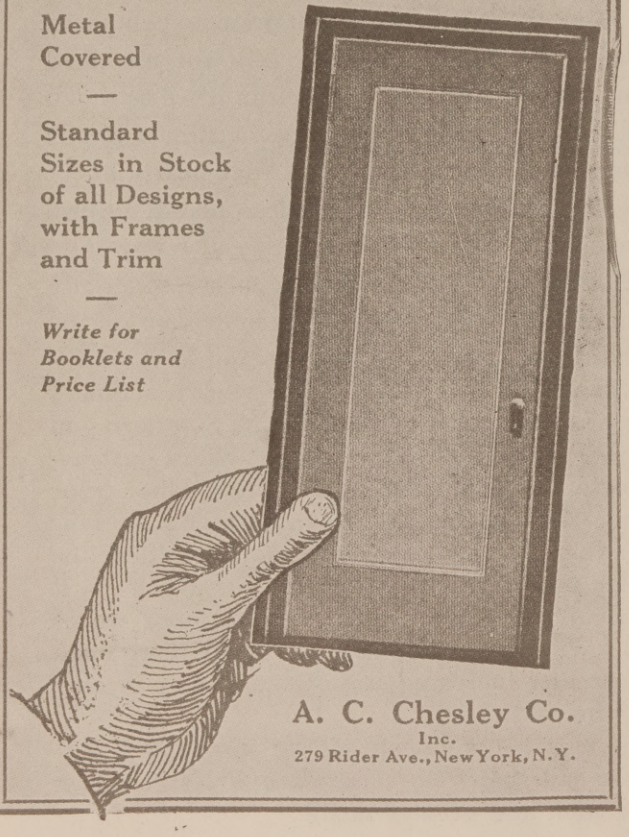
Write for Booklets and Price List



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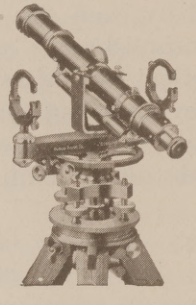

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Tower for Chuting Concrete.

An ingenious method for keeping a tower for chuting concrete where it would be least in the way was adopted by The Texas Company recently. The plans for the building, a four-story and basement affair, included a small elevator shaft, so the tower was put up in it.

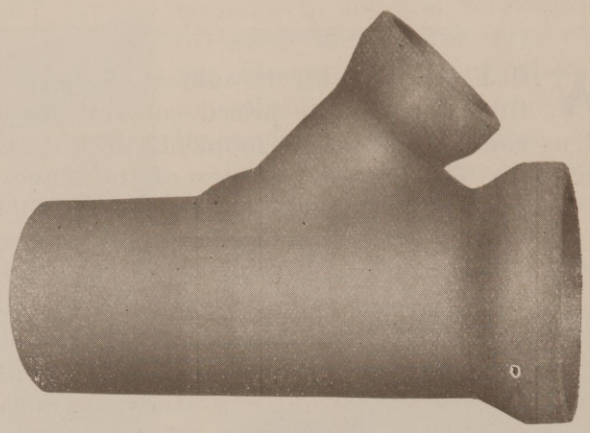
The place selected by the architects for the elevator was close to one wall of the building and equidistant from the ends. Its proximity to the side of the building made it easy to get at the mixer without going inside the structure. The material piles were close enough to the mixer to be transferred with little difficulty. Every effort was made to do the job with a sgreat an economy of effort as possible and the entire layout was planned with this end in view. A more detailed description of the method of chuting and placing the concrete follows:

The mixer was set in the basement, so as to discharge into the elevator bucket and yet be low enough so that the material could be dumped into a loading hopper from the ground level. The hoist engine was set clear of the building so that the engineer had full view of the bucket.

Sand and stone were dumped to within 10 to 100 ft. of the mixer. When using material within 40 ft. of the mixer, wheelborrows were found best. As soon as a greater distance had to be covered, dump cars of 18 cu. ft. capacity, running on industrial track, were found to be more economical.

The largest day's work was 120 cu. yd. of concrete placed in 8 hr. The average 8-day run was 100 cu. yd. Most of the concrete was placed with the 60 ft. radius plant consisting of a 30 ft. boom section with a 30 ft. plain chute section attached. In some parts of the work it was necessary to put a horse under the end of the 60 ft. plant and run 10 to 20 ft. lengths of light chute out from this point, to the outer parts of the building. At several times the concrete was chuted to the floor hopper and carted to the far ends of the building. These slight changes in method made necessary by the distance between the tower and the furthermost parts of the structure were accomplished with little difficulty. The building contains about 2,200 cu. yd. of concrete.

The mixer, cars, chute, tower equipment and concrete carts used on this job were also used successfully on the construction of two other buildings for the Texas Company.



SEWER PIPE

of concrete made according to Zeidler Specifications and on a Pioneer Bell End Sewer Pipe Machine are now recognized and accepted by all engineers as equal to or better than No. 1 Vitrified Pipe.

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

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Concrete Chimneys for the Bungalow

By Albert Marple.

WHILE dealing with the subject of construction of moderate priced concrete homes let us consider for a few moments the exterior chimney. The outside chimney of the home is of necessity of such a conspicuous character that it may with profit be given a little more than the ordinary amount of attention and study. As in case of the porches, pillars and other portions of the home, the chimney should not be neglected, but an effort should be made to make of it much more than a mere heap of bricks or concrete. In southern California, where the Swiss chalet and Mission style bungalows abound, the prominent exterior chimney is considered one of the leading features of the dwelling. However, this condition has not existed a great while. Up to a very short time ago the chimney was more of a "fixture" than anything else. Of course, very few home builders would think of erecting a bungalow without an exterior chimney, that is a part of that type of architecture, but until a comparatively recent date no effort was made to ornament the chimney or make it attractive. The same old plain structure seemed to be good enough an dthat was all there was to it. But things have changed. Since the ornamented chimney was first introduced the general cry has been for something "different and unusual." The demand of the home buyers, which in a great measure regulates the popularity of any new and unusual feature, has been for the ornamented chimney—nothing else would do.

For a few moments let us consider the exterior concrete chimney. In Southern California the styles introduced in the way of the concrete chimney are many and varied. For this reason we will confine ourselves to this form of structure, telling of the different styles, shapes, finishes, improvements, etc., endeavoring to satisfactorily illustrate our points by photographs of chimneys already constructed and doing service.

As a general thing where these low, squatty homes, called bungalows, are constructed, the object is to make the chimney as prominent as possible, and this being the case, thought and study should be given the subject so that the chimney might harmonize with the remaining portions of the home and fit in well with the general architectural scheme. This idea being kept in mind, the prospecive builder will surely not make the mistake of placing a narrow, slender chimney at the side of a very flat home, nor a wide, massive structure beside the home having two stories or

A Semi-Plain Chimney for Low Building.

even what is known as an "aeroplane" bungalow, this being a dwelling of the bungalow type

An Unusual Type of Strong Outlines.

with but one room on the second floor, this being directly in the center of the home. This latter style of home is not old and is growing rapidly in favor.

The first step toward the beautifying of the chimney was the introducing of the indented work, this consisting of depressions of various sizes and shapes left in the sides of the chimneys so as to break the flat, straight sides and otherwise ornament the structure. This intented work is left in the chimney during its construction, in some cases the same finish being used for the entire chimney, while in others the raised work is given one of the rough finishes, while the sunken work is given the plaster effect or even smoother. Sometimes the sunken work is treated with a dark finish, with the remainder of the chimney left in the original light color. These indentures may be made in any size and shape to match the general form of the chimney. Some very pleasing effects may be secured by the employment of the idea.

Then came the raised work, this consisting of raised figure work of many shapes and sizes so included in the construction work of the chimney as to have the appearance of being placed in position after the main portion of the chimney is completed. This raised work may be a strip several inches in height that circles the chimney at any point, or it may be a secure diamond shape or oblong figure placed at any desired location. The raised work is generally used in connection with the indented work on the same chimney, creating a pretty combination, although at times it is seen alone.

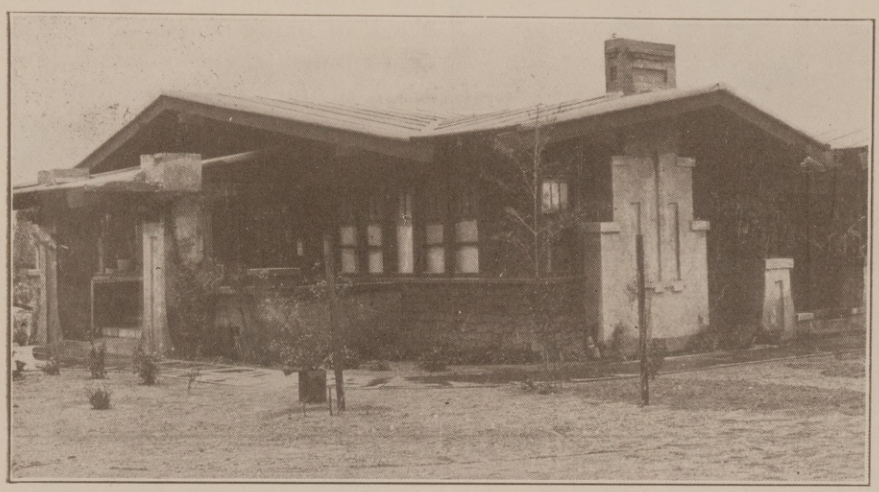
Plain Lines Make This Attractive.

The Flower-Holder Chimney.

A pretty effect is secured by having certain portions of the chimney free of the finish coating. This can be done where brick has been used in the construction of the main portion of the chimney. As a general thing the section that is to be left uncovered is raised an inch or so above the remainder of the chimney so that it has a "standing out" appearance.

The latest improvement, however, in this ornamenting of the chimney is the flower

holder chimney. This effect is obtained by leavin an indentation of at least six inches in the side of the chimney, this being of any desired shape and size, and the construction of a shelf of concrete along the lower edge of this depression. This will leave a surface of ten inches upon which to place the flower box, jardiniere, or the like. The chimney shown in the accompanying illustrations was the only one of this kind thus far constructed in the territory covered by the writer, although the idea has been snatched up and several are now in course of construction. This flower holder idea is greatly enhanced when trailing graceful vines are permitted to fall carelessly before the lower portion of the chimney.

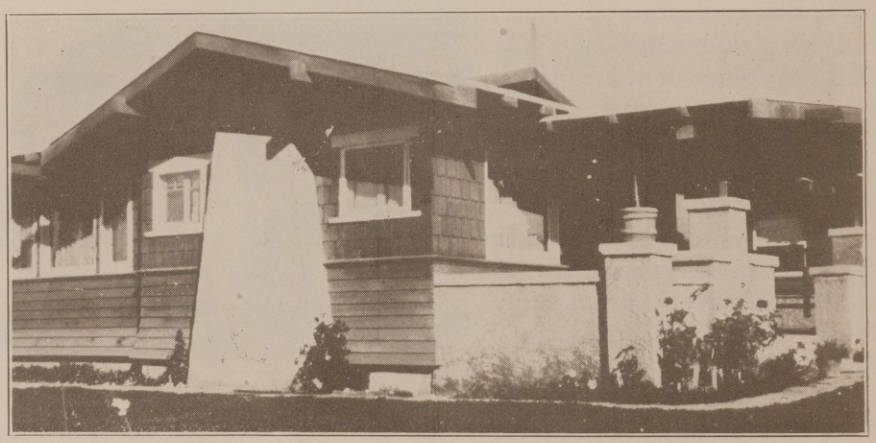


Square Base Chimney Effect.

The question of shape should also be considered. In the southern portion of the Golden State there are hundreds of different shaped chimneys, several of which are here reproduced. These are offered merely as suggestions and may be altered at the will of the builder. The general form of the proposed home should be carefully matched.

Just a word about the finish. As in the case of the modern pillars, the up-to-date chimney is, generally speaking, given one of three finishes. There is the "plaster" finish, such as is given the interior walls of the home where tinting is to be done; the stucco, which is a very rough surface, and which is ideal for the very rough or rustic type of home; and the splatterdash, a finish which comes between the two just mentioned. This finish is used on the general run of chimneys and makes a favorable impression wherever used.

In this article we hope we have presented ideas and suggestions that will interest the man of moderate means. By this we mean the man who is financially able to erect himself a home ranging from $1,500 to $3,500. Doubtless more of this class of homes are being constructed at this time than any other. It is possible, also, that the man of greater means has also gleaned somehim. It may be the pleasure of the writer to later treat the brick and cobblestone chimney through the columns of this thing that will be of value to publication.



Massive Concrete Chimney and Flower Boxes.

But whatever is done the question of the chimney should not be neglected. It is one of the most conspicuous features of the home and for the sake of the general appearance of the bungalow, should be given careful study. The thought and study given to the chimney will many times repay the builder, and if proper attention is given to this detail it will always be a source of gratification and pride to the home owner.

Concrete Ships for Salvaging.

Concrete ships of extraordinary design are being built for the British Admiralty to be used in raising merchant vessels sunk by the Germans near the coast of the United Kingdom. On a broad foundation, shaped like the hull of a ship, are placed a series of towers, constructed of hollow blocks, and reinforced in such a manner as to be able to withstand great internal pressure. The towers are provided with water-tight doors and pumps. These unusual vessels, illustrated in the September Popular Mechanics Magazine, are to be towed to the location of the sunken ship, and lowered on either side of the wreck. Divers will then attach them to the wreck. When they are pumped out, the are expected to rise to the surface, carrying the wreck with them.

The Best Surface On a Concrete Road

By A. H. Hunter.*

IN SPITE of the excellent riding qualities of pneumatic tires, together with all the experience and skill incorporated in the design of body, springs and wheel base of automobiles, the automobile public is demanding improvement in the surface conditions of our concrete pavements. This is not because previously constructed pavements were so decidedly inferior, but rather that with the coming of long stretches of improved surface, the novelty of riding on concrete diminishes. The traveler traversing longer units than before becomes more weary and with the accompanying fatigue comes criticism of surface imperfections hitherto unnoticed.

Any road surface, however durable, can scarcely hope to be ultimately successful for use in our through highways unless this wearing surface presents a minimum of jar and vibration. In a properly mixed concrete, such as is used in concrete road work, we have a plastic material susceptible of being molded into a nearly perfect surface. How closely we are to approach this theoretical plane surface depends upon the care and effort put forth by the workman in finishing. Upon workmanship depends largely the riding quality of surface secured.

The impression is not to be gained, however, that proper design is not essential. It would be utter folly to neglect drainage, crown, or both horizontal and vertical alignment, but fortunately, practice is becoming so standardized that most highway engineers recognize these important features in design. It is most infrequent to find a concrete pavement the poor riding qualities of which may be attributed to poor engineering.

If we are to avert the repetition of past errors, certain construction features must be carefully watched. These features to be considered from their significance as outlined in the specification as well as their application by the layman.

Forms Must Be Rigid.

Too often the layman looks upon the side forms as merely a necessary convenience for holding the concrete, thus losing sight of the fact that the proper grade and alignment of these forms are highly essential if a smooth surface is to result. Not infrequently I have visited construction work and found adjacent form boards out of both grade and line. It is probable that in so far as line is concerned, the earth shoulder will later absorb a fair amount of irregularities, but it generally follows that a form setter who does not take enough pride in his work to properly align the boards is equally careless in setting the edge to the proper grade.

In early concrete pavements, wood forms were used exclusively. These when properly used and well taken care of, have given excellent results. When in the hands of careless workmen, they soon warp, split and when not properly cleaned, cause frequent damage to the edge of the green pavement. When placed to accurate grade and alignment they must be thoroughly staked. Too few stakes is fatal. If these forms are not rigid, waves, bumps and depressions inevitably occur in the completed surface.

Once I heard criticism of the large vibratory finishing machines from the standpoint that they impose a larger load upon side forms than was thought advisable. Personally I do not take it as a criticism of the machine but rather of the forms. Make them rigid and the template properly used will cut the surface to the desired shape.

Steel forms are coming into general use. It is probable that specifications in the near future will express a decided preference for them. Many contractors, in an effort to save, purchase too light a weight, with the result that they are soon bent, twisted and unfit for use. In spite of preference for steel forms, they are not to be recommended for short, vertical curves or transverse curves of any character. They are too rigid to adapt themselves to the smooth outline necessary in a properly staked curve.

If we are to appreciably improve the surface of our concrete roads, it becomes necessary for the engineer to see that the forms are accurately set to grade and alignment and maintained there. They are as essential as the formwork of a building. They are the guide lines of the pavement.

Templates Need Constant Watching.

After the concrete is placed within the forms, it should be struck off with a template having a length slightly greater than the width of the pavement. An excess length of possibly 18 inches will suffice for average highway work on pavement 15 to 18 feet in width. This template to be moved by a combined longitudinal and crosswise motion.

Do not make the common error of cutting the arc of the template to the same dimensions as indicated on the cross-section. It should be cut ¾ inch to ⅜ inch deeper than the theoretical crown: otherwise, the resulting surface will be flat. This correction should vary as the width of the pavement as well as general conditions

*District Engineer, Division of Highways, Department of Public Works and Buildings, State of Illinois, Before the American Concrete Institute.

surrounding the job. The amount of water generally employed would be a factor for it is apparent that soft, mushy concrete would flatten out more readily than that containing a lesser amount of water. This template should be shod with a steel edge, using countersunk screws.

Templates may be made from either one or two boards. If two boards are used, they are held apart some distance by small struts. This style insures a more uniform bearing on the forms but is usually heavy, hard to handle and has a tendency to leave bumps or depressions, as the workmen are reluctant to move it back and restrike the surface.

The writer has seen good results obtained by using a heavy, double-edged steel template drawn by a cable, operated by a drum connected with the engine of the mixer. Thene is a general tendency to supplant man power wherever possible.

In moving the template along the forms, a slight excess of material must be in advance of the cutting edge at all times. Failure to do this will result in depression or holes. Do not permit the template to ride on stone or gravel on top of the side-forms. In working on grades even as low as 3 per cent, repeated striking must be done if a smooth surface is to result. The concrete being plastic and of more or less non-uniform water content, will flow down the grade. This flow is not uniform but is given to taking the form of alternate humps and depressions which can only be prevented by repeated and continued striking until initial set takes place. Keeping the amount of water in the mix as low as possible assists materially.

Satisfactory results are obtained only after pains are taken. The men operating the striker have to have an interest in their work or surface defects will occur. Watch the template! Check it up every few days, making sure that it has not warped or gone out of shape.

This matter of crown of pavement was forcefully impressed upon me several years ago, in connection with the construction of my first concrete road. The template was composed of two striking edges, several inches apart, covered with a plain board on top. At night, after work, it was washed off and placed on the forms behind the mixer. This afforded the night watchman (who, unfortunately for us, was of liberal proportions), or his visitors, a convenient seat. Continued use for this purpose resulted in a reduction in the crown of pavement by approximately ¾ inch. This is no large amount, but it is apparent on pavements designed with a minimum of curvature. Frequently too a template, properly designed and cut to the desired arc, develops a sag due to its own weight when placed in position on the forms. In general, templates —home-made devices especially—are not to be trusted. Good surfaces may be obtained, but it is only by exercising care and judgment that satisfaction is secured.

Expansion Joints.

In the first concrete road construction expansion joints were used in varying designs. Many otherwise good pavements had their riding qualities much impaired by these poorly placed joints. Unfortunately, highway engineers have not yet agreed among themselves as to what device is best suited to serve the purpose. Until standard practice develops some uniformity, we must expect to have continued experiments with occasional pieces of pavements unsatisfactory.

Generally speaking, any joint or holding device which does not permit the free use of the template is to be condemned. Not that excellent surfaces cannot be secured, but rather that it necessitates special care for the finisher. The elimination of expansion joints altogether or possible acceptance of blind joints, will do much to improve the riding qualities of our concrete surface.

Finishing Surfaces as Recently Developed.

Naturally enough, concrete pavements were first finished with the same tools as sidewalks or building floors. The public approval of a wood surface led to the general use of a small wood float, 12 to 18 inches long, operated by hand. It was possible, for the contractor, at small cost, to finish by hand in a most satisfactory manner. It was a tiresome job for the finisher, operating from a cross plank or bridge. Too frequently the work was intrusted to unskilled men who probably slighted much of the surface, at the same time probably working holes, depressions or flat places at the more accessible portions of the surface. Many excellent surfaces have been obtained in this manner, but substitution of unskilled labor by the contractor in an effort to effect a small saving, together with the drudgery involved, led to the development of easier and better methods.

Following the hand float came the easier but unquestionably poorer experiment of placing a small wood float at the end of a long handle. This being operated from sides of the road, permitted the omission of a bridge. It was applicable to narrow pavements, being used with some success on roads up to 12 feet i nwidth. In general, the surface secured was much inferior to the hand method. The central portions of the pavement were nelected with the result that too frequent evidence of laitance, dirt or surface defects occurred near the center.

Engineers had recognized the importance of keeping the quantity of water required in the mix to a minimum but under working conditions

a small excess had been permitted for the reason that concrete of proper consistency was difficult to work. Incidentally, the mixer with spout delivery required an excess of water. Several years back, experimenters in the state of Oregon and Michigan perfected mechanical devices for striking, compacting and finishing concrete, but these, while possessing merit, were heavy, costly and unsuited to operation on short, isolated sections.

To an engineer of Macon, Ga., we are indebted for promoting the use of a small hand roller, some 8 inches in diameter and about 6 feet long. This was operated transversely across the pavement by a handle. The old adage that "necessity is the mother of invention" certainly holds true to the method developed for smoothing concrete surfaces. It is told that a contractor in Michigan, during the summer of 1916 was inconvenienced by a strike which occurred among his gang after considerable concrete had been placed, struck off but not finished. It seems that in desperation, he ripped strips of canvas from his tent, dragged them over the surface in a desperate attempt to place the concrete in a condition satisfactory to the engineer and prevent possible loss. The results were astonishing; so much so that hand finishing was afterward dispensed with and a canvas belt substituted.

During the construction season of 1917, the engineering organization of the state of Illinois, Department of Public Works and Buildings, Division of Highways, used their influence with contractors and secured their co-operation in experiments sufficient to warrant the department in incorporating this belt-roller finish in the specifications for concrete highways, edition of March, 1918. These specifications representing the consensus of opinion of the entire organization, are based upon experience gained throughout the state of Illinois, with different aggregate, different workmen and varying general conditions encountered in actual practice.

How to Use the Roller and Belt.

The entire operation of finishing specified to consist of three beltings and two rollings, beginning with a belting and alternating until the final belting, the belts to be of a canvas or rubber composition, about 2 feet longer than the width of the pavement. For the first two operations, a width of at least 10 inches is recommended. This belt also should be fairly heavy but pliable enough to conform to the crown of the pavement. No irreglarities should be permitted in the edges, for these will cause ridges or depressions in the plastic surface. In both the first and second belting, the operation should consist of long, traverse strokes combined with a relatively slow, longitudinal movement. After the second rolling, the concrete is to be given a final finish, just previous to the initial set of the concrete. The time interval between placing the concrete to final finish is variable, depending somewhat upon the amount of water in the mix but largely on weather conditions. In other words, a highly satgisfactory surface can be secured by final belting when the film of surface water has just disappeared. In the last operation, a light canvas belt about 6 to 8 inches in width, used with short, transverse strokes but with a sweeping, longitudinal motion, will porduce a uniformly gritty surface.

A satisfactory roller can be made with diameter of 8 to 12 inches and a length of 4 to 6 feet, having a total weight of ¾ pound to 1 pound per linear inch of roller. For roads up to 15 feet in width, it may be operated by a long, light handle. Pavement of greater width requires the use of ropes in place of the handle, operated by a man on either side of the pavement. The first belting following immediately after the strike board, is in turn followed by the roller. The roller being advanced to the opposite side from the operator, is returned in the same track then moved forward for half its length and operated as before. The roller is thus advanced along the length of the road.

The surface should again be belted and, after a lapse of 15 to 20 minutes, again rolled. The time limit must be somewhat variable and left to the option of the resident engineer. Very wet mixing or cool weather encountered may make it desirable to recommend an additional rolling before final belting. In explanation of the foregoing idea incorporated in specifications, a word of caution in regard to belting is necessary. The first belting is done to smooth up the surface only, remove slight irregularities and facilitate the removal of the surface water in advance of the roller. In general, belting should be a minimum for continued working of the surface in an excess of mortar. Present practice favors the wear coming upon the large aggregate with only enough mortar present to securely bond the stones and prevent voids.

Possibly the foregoing description of finishing may seem complicated but in reality the physical labor involved is relatively small—much less than required in the old wooden float method. The cost per unit of surface is materially reduced. Surface imperfections are a minimum. The roller eliminates many bumps, by pushing them into the depressions or placing them parallel to the line of traffic where they are unnoticed. Each unit of area receives the same amount of attention and in the end a uniformly gritty surface is obtained, for surpassing i ntexture, uniformity and riding qualities, the original hand methods.

Pretty Stucco House for Tracy Dows, Esq. Albro and Lindeberg, Architects.

Rhinebeck, N. Y.

Effects of Grading of Sands

AN interesting paper was read by Mr. L. N. Edwards, supervising engineer of bridges for the city of Toronto, at the recent convention of the American Society for Testing Materials, held in Atlantic City, June 26 to 29. The subject of Mr. Edwards' paper was "The Effects of Grading of Sands and Consistency of Mix Upon the Strength of Plain and Reinforced concrete." The paper presented the results of three series of tests made by the Department of Works of the city of Toronto under the direct supervision of Mr. Edwards. These tests were undertaken with the object of securing information relating to (1) the influence of the grading of sand; (2) the effect of the consistency of mix upon the strength and physical characteristics of the concrete properties, and (3) the effect of varying the time of mix.

The author described the methods used and the results obtained, in considerable detail, and drew the following conclusions:

Common Practices Unreliable.

1. The commonly practiced "visual examination" test of sand aggregate for concrete is generally unreliable, since it gives at best only a superficial knowledge of the cleanliness of a given sand. Its adaptation to the determination of grading could be of value to the observer only after long experience in the granulometric analysis of sand.

2. The generally accepted practice of proportioning a concrete mix by volume, as, for example, 1 part cement, 2 parts sand and 4 parts broken stone, is impracticable and unscientific, since it does not take into account the adaptability of the grading of a given sand to the production of a dense, strong and reliable concrete. Proportioning by volume, as commonly used, gives no guarantee of the production of a concrete having a desired strength, hardness, or other physical properties.

3. The strength, toughness and durability of the concrete to be secured from the use of a given sand can be determined only by an actual test of that sand in a properly prepared concrete.

4. In field operations incident to spading, slicing, or otherwise compacting the concrete, the movement of the water content of the mass is intensified, wherever the sand aggregate contains insufficient fine material to hold the cement in suspension by the formation of an adequate amount of sandy paste. The free movement of the water tends to produce an improper distribution of the cement.

Amount of Water.

5. The use of a quantity of water sufficient to produce a concrete, the mortar component of whch is of a saturated, sticky, semi-plastic consistency, is for most practical purposes required, in order to facilitate economical and efficient placing. This quantity of water is ample for the development of the proper functions of the cement. An increase in the quantity of water used results in a proportionate decrease in the strength of the concrete. The decrease is in no sense a function of the proportions of the mix.

6. The excess water in an over-saturated concrete necessarily occupies space and thereby bulks up the mass. By reason of its high surface tension, it forms water globules which, although somewhat affected by the weight of the concrete, are, nevertheless, distributed throughgout the mortar component and are accumulated underneath the particles of the sand and stone aggregates and the reinforcing steel. By evaporation, this excess water ultimately disappears, leaving a considerable volume of water voids and cavities which constitute an extremely important factor in the strength and reliability of the concrete.

Bond Between Concrete and Reinforcing.

7. The critical failure of reinforced concrete depends upon the intensity of the bond existing between the concrete and the steel reinforcement. Concrete containing an excess of water not only develops less surface contact with the steel on account of the resulting increase in the volume of water voids and cavities, but, in addition, the excessive laitance produced by the water tends to accumulate around the reinforcement, thus contributing materially to a decrease in strength. This condition becomes further aggravated by reason of the tendency of the laitance to become less resistant with age.

8. For the various grades of concrete, the minimum ultimate strengths assumed in the modern practice of plain and reinforced concrete design are not assured by the commonly specified requirements for sand and stone aggregates, and by the present lack of uniformity and of efficiency in field methods and operations.

9. The results obtained show no definte relation between the compressive strengths of 1:3 mortar cubes, and the compressive strengths of the concretes produced from the same sands.

In the course of the paper the author took occasion to submit the following specifications for a cement to be used for general concrete purposes. These specifications assume that provision is made for the proper proportioning of the cement content of the mix in cases where cements failing to meet the strength requirements are used. They also assume that proper provision is made for the limiting of the water content of the mix to that required to produce a saturated, sticky, semi-plastic mortar.

Antebellum House on a Mississippi Plantation.

Future and Present of Concrete Pipe

ONE of the most important and timely contributions to current literature in the concrete field was the splendid paper by Mr. C. M. Wood of the Cement Products Bureau, of the Association of American Portland Cement Manufacturers, Chicago, Ill., delivered before the Eleventh Annual Convention of the Mid-West Cement Users' Association recently. On that occasion, Mr. Wood said:

It is a matter of historical interest as well as of considerable economic importance that the development of the use of concrete in the manufacture of pipe and tile has been concurrent with the advancement made in matters affecting drainage and irrigation.

That the development is founded upon certain economic and physical conditions is obviously true, it is but necessary to consult the history of our own country to establish the fact.

We find that in the early days the pioneers and early settlers located their homes on what naturally appeared to be the most desirable sites from the viewpoint of water supply and soil fertility. In the natural order of events and as our pioneers penetrated to the then unknown westward lying lands, advantage was taken of the natural geographic features provided by nature which gave primary consideration to drainage. No one can wonder, therefore, that the gently rolling prairies were the choice selections of these hardy settlers to the exclusion of the low lying river bottom lands and swamps.

History records the hardships and the trials borne by these people in the maintaining of their homes and from isolated settlements there gradually grew into being towns and hamlets with their adjacent more thickly settled environs. The call of the West was as strong in those past years as exists today in order to accommodate the immigration continually responding to this call recourse was made to lands less desirable from a physical standpoint. The swamps and bottom lands, though of a high degree of fertility, were inaccessible for immediate cultivation until the engineer and drainage contractor had been given the opportunity of using their efforts and skill.

It is at this point that we can begin to discern the influence of an economic condition fathering a new industry—drainage. A parallel sequence of conditions we find affecting the various arid territories of our country.

Sewer pipe and drain tile can scarcely be placed in the same general class, notwithstanding that there are certain fundamental attributes in common with both. It is neither the object nor the intention of this article to attempt to draw fine distinctions with reference to these two products but rather to treat the subject from a more liberal aspect as a vital factor in the utilization of concrete.

It is a matter of record that concrete was used in Brooklyn, N. Y., for sewers as early as 1861. Quoting from an article by Mr. Gustave Kaufman of Brooklyn, he states: "In 1877 when Julius W. Adams, past president of the American Society of Engineers, was chief engineer of the city of Brooklyn a proposal was made that the use of earthenware pipe should be resumed. This proposal was adversely reported upon by Mr. Adams."

The following is quoted from Mr. Adams' report made in 1877: "Last winter there were careful inspections made of our pipe sewers. In one subdivision the grades of certain streets are over two and one-half to the one hundred and an especial examination was made of the pipe in this subdivision. There is no sign of disintegration nor wearing away of the cement pipe. These pipes have been laid over five years. On the 25th of March, 1873, this department took up a cement pipe that had been laid in Fleet Street in the year of 1861 and the pipe was found in every particular as good as when laid. The fact remains, however, that the renewals of sewer pipe in Brooklyn, on account of breakage or collapse, have been relatively less in the case of concrete than in that of earthenware pipe."

Up to 1890, concrete sewer pipe in Brooklyn was made by hand with its attendant difficulties of securing a homogeneous product and one of unusual density throughout.

There was introduced in 1890 a machine made pipe and the resulting product fulfilled all the requirements of perfect homogenity and great density throughout. The proportions used by this company in later years consisted of one and one-half parts cement, one part sand, three parts trap rock screening containing 20 per cent stone dust. The percentage of water used varied from ten to fifteen per cent of the entire bulk of material. The mixture when dumped on the floor was apparently dry but with a little pressure would ball in the hands.

It can be pertinently stated at this time that in Europe concrete pipe has been used for many years. Prof. Max. Gary, chief of the Royal Testing Station for Building Materials, Berlin, reports the results of some official investigation with the destructive action of sewerage acids upon cement concrete pipe. From this report it is clearly indicated that there are a number of towns in Germany where the existence of con-

crete sewer pipe forty years of age wer still efficiently performing the functions for which they were originally built.

In Paris, France, a section of concrete sewer pipe was recently placed on exhibition which had been in use about twenty years and which unmistakably shows the value of this type of material.

Returnng again to our own particular development of this industry, you will find that Duluth, Minn., has had concrete sewers for twenty-five years. Milwaukee, Wis., has used concrete sewers for thirty-five years and with a length of installation considerably greater than two hundred miles. Oshkosh, Wis., has concrete sewers in excellent condition today that were laid in the '80's. Pawtucket, R. I., has been installing concrete sewers since 1904. Time and space prohibit my detailing the many installations of concrete sewer pipe in this country.

These items are of historical interest to the cement pipe do not include the many installalations of concrete sewers of monolithic construction.

Before leaving this interesting feature of early installations of concrete sewer pipe let us look for a minute upon the first developments of concrete as a material for drain tile.

As a commercial proposition the manufacture of concrete drainage tile by machinery appears to have had its inception in 1905 at Graettinger, La., where a small power actuated machine was installed and placed in operation. Cement tile, hand made by tamping damp concrete or by pouring wet concrete into moulds have been found which were used at Farmer City, Ill., in 1872; at Ames, La., in 1879, and at points in Minnesota and Indiana as early as 1883.

It must not be for a moment imagined that the present state of developments of concrete pipe machinery was in existence in the early days of this industry. The machinery manufacturer has, I believe, been giving of his time and capital generous amounts to perfect his particular machine and to meet the requirements for improvements when such improvements have been brought to his attention through the development of this industry.

There are today many efficient as well as varied types of concrete pipe and drain tile machines on the market each deserving of careful study and consideration of their manifold classifications and merits. To the prospective as well as established operator of a concrete pipe and tile plant a thorough study of his own requirements should be made before purchasing and installing new and additional plant equipment.

Of first importance is the question of power or hand operation. This is, of course, easily decided when the plant is already in operation and additional machinery is contemplated. To the man, however, preparing to establish a concrete pipe and tile plant, consideration of capital available, source of materials, prospective value of territory, shipping facilities and arrangement of site must be carefully investigated and compared. From the result of such investigations can be determined the advisability and adaptability of utilizing power or hand actuated equipment. The prospective output of the plant both as relates to amount as well as variety of sizes will be a governing factor in the selection of a proper machine.

It is impractical to attempt to formulate any definite methods of procedure for the establishment of a concrete products plant. The foregoing are subjects for careful consideration and can only be given the proper value combined with sound business judgment are prime factors in the establishment of the manufacturing plant for concrete pipe and tile.

It is advisable, indeed, extremely so, to inspect plants already in operation and thereby endeavor to profit by their successful operations and drew conclusions of efficiency arrangement and outlay.

Were I asked what I considered the most vital and most important detail of the concrete pipe and tile industry of the plant arrangement and equipment, I would unhesitatingly say the manufacturing methods and process. Upon no one feature does the extension of this industry rest so completely as upon the nature and continued uniformity of the product. As in all manufacturing opegrations, the use to which the product is to be put will control the quantity and quality of the constituent materials.

Concrete pipe for sewer installations will be subjected to different service conditions than either irrigation pipe or drain tile. It is obvious, therefore, that this fact must be duly taken into consideration depending upon the particular product to be manufactured.

Sewer pipe, no doubt, is called upon to withstand the most severe ramifications of service. It must be impermeable, and the relatively greater depths at which is usually imbedded under the ground surface will necessitate a somewhat stronger mixture than is customarily used in the manufacture of drain tile and irrigation pipe. The factor of sufficient strength is often given greater consideration than the question of impermeability, in the making of sewer pipe. Impermeability, however, must be primarily considered for many self-evident reasons and depends upon the degree to which raids in the sand and aggregate are filled with cement paste, and upon the use of the proper amount of water in mix-

ing. The determination of these factors are by no means haphazard but lend themselves to definite scientific analysis.

During the construction of that giganic piece of engineering built to provide New York City with its water supply the engineer, Mr. W. B. Fuller, devised and put into daily practice a method by which daily determinations were made resulting in his being permitted to construct thin water proof walls and effected a saving of many thousands of dollars. I mention this instance to prove the value, financial and otherwise, of the advisability of correctly studying the material available for the manufacturing process.

We can only hope to receive universal and favorable recognition of concrete pipe and tile when we can go before the engineer and contractor and the buying public with a product of uniform and high standard. To maintain such a standard rests individually with each and every concrete worker and tendencies to lessen the manufacturing costs at the expense of a reduced standard of quality can only results in effects harmful to an alarming degree. It is imperative, therefore, that a proper understanding of the properties of concrete is essential to its intelligent use and application.

Too much stress cannot be laid on the necessity of careful studying and investigating the materials available for use and the utilization of them in a manner to produce a product of high standard and quality. General theories are not appreciable to each individual locality and thought must be extended in the judicious and proper selection of the materials at hand in order that the manufactured product may be equal to a predetermined standard. It is the height of folly to attempt to say that the proportioning today used at Salt Lake City, Utah, in the manufacture of concrete drain tile will give equally satisfactory results if followed at Lynden, Ill., without first learning the nature of material ingredients to these localities. Such theories are useful indeed when used with prudence and judgment but likely to bring remorse and anguish when employed promiscuously.

There are, however, several practical methods easily applied that will enable those using them to definitely determine the correct proportioning of the various materials entering into the manufacture of other concrete products. It is not my intention at this time to endeavor to prescribe definite proportions nor manufacturing methods. These are questions in my estimation that can only be treated individually and specifically, each problem presenting certain peculiarities of its own and requiring treatment accordingly.

The use of concrete for the monolithic construction of sewers is and has been for a long time considered the best of engineering practice. Yet we find considerable opposition developing to the use of pre-cast cement pipe as an auxiliary to a concrete trunk line or storm sewer and for no apparent tangible reason.

Precast concrete pipe possesses many advantages over sewer pipe of other materials. It is a uniform product, true as to form, concrete pipe preserves the section upon hardening in which it was cast—it is free from warping—it permits of complete inspection tests during manufacture. It is stronger than pipe of other material, size for size. Giving good aggregate and proper proportioning the pipe is more impermeable than any vitrified pipe. On installation of sufficient magnitude the pipe may be manufactured upon the site of the work thereby eliminating transportation costs and finally permanence of construction.

These advantages are pretty generally accepted as facts. It rests, however, within the province and ability of each and every concrete pipe and tile manufacturer to bring his product to that high degree of quality whereby the above claims for superiority may be substantiated.

I have attempted in a general way to present a few facts relating to the concrete pipe and the tile industry as it exists today.

What the future of this industry means, what the future holds, no one at this time can truthfully predict. I venture the assertion without fear of being considerd a prophet that the industry is on the dawn or a remarkable era. The widespread demand for drainage and its attendant benefit—the increasing activities in sanitation mean enlarged markets for pipe and tile with a product made of a material as substantial as concrete its universal use and approval can only be retarded by lack of proper appreciation on the part of the makers.

The association which I represent realizes the wonderful possibilities of this product and its capacity. They have appropriated a considerable sum of money to further this work and to promote the general use and knowledge of concrete for drainage and sewerage matters. This association wants to work with you, to help you in your problems and in turn, asks your co-operation and with our combined efforts, and, I may be pardoned for my extreme optimism, can not but result in benefits of wonderful value to all.

A New Cement Plant.

At Pine Hill, Ky., the Rockcastle Cement & Lime Co. organized: Prest., J. Roger McSherry, V.P. of Train Central Securities Co., 615 Riggs Bldg., Washington, D. C. Mr. McSherry writes: Not in position to make known our plans; will advise later in detail.

Construction of Concrete Fords

THROUGHOUT a great section of country between the Mississippi river and the Rocky mountains all sorts of waterways, and the continuation of highways over them makes necessary the expenditure of great sums of money, writes F. A. Good of Cowles, Nebraska, in Concrete Cement Age .

The short-lived piling bridge gives way to steel spans, and these are in turn being replaced by concrete structures whose permanence and flood-resisting qualities are now well established.

In this territory are many narrow sand bottomed waterways which, except for the drainage of water after an unusual heavy rainfall, are absolutely dry the year around, and there are probably more creeks christened "Dry" than all others combined.

This article is not intended in any way to disparage the erection of concrete bridges and the writer is actively engaged in their construction, but there is no excuse for building a bridge at a site where another form of crossing—a concrete ford—at less expense is as good or better.

The fording of a creek or river implies the use of the natural bottom as a roadway.

This crossing at a ford when the water is a turbulent flood is fraught with danger, largely through the certainty of finding an unceratin bottom, nevertheless there are advantages in crossing a sandy bottomed, running river or creek which are lost when we attempt crossing any of the thousands of dry creek beds which have been bridged over. The loose shifting nature of the dry sand bed makes it impossible to haul heavy loads over its surface, the wheels sinking in, to a considerable depth, and the horses floundering through on an unstable footing—the size of the load always limited by what can be pulled through the sand and not by the hills en route.

Now, while these dry creek beds offer obstastacles to the hauling of loads by horses the obstacle offered to an automobile is even more serious. When an auto traveling at a fair rate of speed strikes a bed of loose sand it becomes almost unsteerable and many accidents have occurred both to automobiles and motorcycles through this cause.

The seriousness of these sand beds is increased by the fact that one must drive his car into the sand with enough speed so that he may be carried across and up the opposite side without stalling his engines, for to stop usually means getting a team to haul the machine out.

Wet sand as found under running water usually makes a good wheel base, and were it not for the uncertainty of the hidden bottom it is to be preferred to the dry sand.

We do not advise a ford as herein described if the banks were high, but there are thousands of places where excellent crossings may be built of concrete and require a minimum of upkeep.

Construction—In building concrete fords it is probable that any system of a good concrete road construction would be equally effective, always taking proper precautions that water is not to be allowed to undercut the concrete work.

We believe that the best practice for one having no experience with roads of concrete would be to lay the concrete in blocks of not more than 100 sq. ft. in each section—we usually put in our reinforcing so it will allow us to cut each block 8′ x 8′. We have used triangular mesh but think that equally good results may be obtained with ⅜-inch twisted bars laid so that a space of not more than 4 sq. ft. is left between rods. The reinforcing should be placed on top of a light layer of concrete and the remainder of a 6-inch thickness placed on top and well tamped, the concrete to be of such consistency that water will come to the surface when tamping is vigorously done. A mixture of 1:6 where sand is gravelly and clean makes a good base and 1:2 mix on top left roughened by a broken or corrugated roller, makes a surface that supplies a hold for horses and automobiles.

We have never noticed any appreciable wear on these roadways.

In construction, we usually use two by sixes for side forms and drag guides. These we stake, being careful to make top of form near the exact level with sand bed of creek. After the sand has been taken out from between the forms so an even thickness of six inches will be maintained we dig (immediately before placing concrete) a trench in the sand just inside the staked forms, using a tiling spade and trying to get a little more depth on the down stream side, which is more liable to wash. Although the middle of the ford is level we incline the ends up the adjoining banks, if there are any, and we always carry our baffle wall across the ends for protection the same as at the sides.

The dirt is graded down over a concrete ford and there is no bump experienced in getting on or off the ends.

Cost—We have found that these fords may be built with a reasonable profit at a price of about $2.50 to $3.00 per lin. ft. for plain work 16′ wide.

Where circumstances necessitate apron construction or a tube for live stream or fiuard rails the cost is of course greater.

If someone will devise a means of injecting grout into sand, or some form of gun that will shoot sand full of dry cement, then the problem of building fords will be easier.

Splendid Coatings for Concrete

CONCRETE for building purposes, whether in solid, reinforced, hollow block, tile, brickette, or whatever form, is not consummate, writes G. D. White in The Decorator. He further says that unless extreme care is exercised in the preparation and workmanship for solid or reinforced work, the resultant concrete is not impermeable, or at least not uniformly impermeable, to water and moisture.

The fact that dry walls are essential to health and comfort is generally known and so well appreciated that the question of dampness has been a restraining agent to a much larger and more extensive use of concrete. The tendency to strain, the frequence of efflorescence, the difference in color due to difference in materials and to intermissions in concrete, are defects of a less serious nature.

If to strength, cheapness, durability, and fire-resisting properties of concrete can be added impermeability to moisture and decoration, we will have a building material as nearly perfect as the world has ever seen, and this within the means of every builder.

For the sake of convenience, I will divide these into four classes. In my investigation of the various treatments and materials included in these classes, I have endeavored to be unprejudiced and to give to each its true worth and true value.

First—Waterproofing compounds in liquid or powder form, mixed, with the concrete in its preparation.

This is a help in that it lessens and retards, in a measure, the moisture-absorption tendency of concrete. It fails in the desired attainment for the following reasons:

Improper distribution, which is difficult of regulation.

When properly distributed, it does not render concrete entirely impervious to moisture.

It has a tendency to weaken the tensile strength of concrete.

It does not decorate. The increase in value is not proportionate with the increase in cost.

It deteriorates with age; that is, a concrete block containing the waterproofing compound on the first application of water will absorb certain varying quantities. On subsequent applications, allowing the block to dry in each instance, large quantities are absorbed.

Second—Treatments preparatory to the use of linseed oil paints.

Naturally, I would be prejudiced in favor of this process if it offered even a partial solution to the problem.

Treatments in various forms have been advanced and recommended by some of our leading master painters and endorsed by most able research chemists.

For the sake of brevity I have included in my paper but three of these treatments:

(a) Hydrochloric or muriatic acid wash.

(b) A wash consisting of a solution of zinc sulphate and water.

(c) A wash consisting of ammonium carbonate and water.

From a chemical standpoint, muriatic acid no matter in what strength, nor what the character of the concrete, is not only less useless as a remedy, but detrimental in its action. Master painters who have endeavored to put it in practice have discovered to their sorrow a confirmation or a demonstration of the chemical theory.

In the manufacture of chemicals and chemical colors, we can standardize our solutions by the use of molecular formulae, and these produce the product sought without a waste of any single ingredient, except, perhaps, water. Unfortunately, in preparing concrete surfaces to receive paint, we have no way to determine what strength of solution should be employed. Were such a determination possible, we should have to make it for every different piece of concrete, and in case of blocks for every block, because we could not be sure of uniformity.

Even with the required strength of solution, we still like a method of application that will insure the proper method of neutralization, and so uniformity of results is uncertain.

Zinc sulphate and ammonia carbonate as applied to concrete, unless fully satisfied by the presence of calcium hydroxide, are still soluble in water, and thus offer difficulties of a serious nature.

The neutrolization of calcium hydrate and calcium oxide appearing on the surface of concrete does not always mean that the surface will remain neutral. Moisture finding its way from the inner portions of the block or wall carries with it alkali—the foe to linseed oil paints.

The treatment with zinc sulphate or ammonium carbonate, even though successful, does not offer a solution of the problem, because a linseed oil paint is unsuited for either exterior or interior painting of concrete. The gloss robs the surface of the appearance of stone or masonry. Linseed oil has water-absorbing, and lacks water-resisting, properties. It cannot be applied over a damp or wet surface, which means that following a rainstorm or rainy season a painter must wait weeks and perhaps months before he can commence work on or complete a contract already begun.

A series of practical tests developed the fact

that a wash of zinc sulphate or ammonium carbonate was a help in some instances, but the lack of uniformity in results, are low degree as well as non-permanency of improvement, demonstrated their inefficiency to cope with this important problem.

Before passing this phase of my subject, I want to say that the above is intended as no adverse criticism of the master painter or chemist recommending the use of these treatments. On the contrary, the master painter is to be commended for his wisdom and reaseach in figuring out, in the absence of anything better, a method or process that helped, in a measure, at least, to overcome the difficulties confronting him.

Third—Colorless liquid coatings.

Certain of these may be of some value or service in retarding moisture, absorption and efflorescence, but they are all alike found lacking in the following respects:

They serve to emphasize any defects in, or difference in, color of concrete construction.

The yimpart to concrete a soggy, water-soaked appearance.

They do not render impermeable to moisture for any length of time .

They do not decorate.

Fourth—Paint for concrete:

If there is any truth or logic in the foregoing, it would appear that we need, and the building trades demand, a paint peculiarly adapted to the coating of concrete surfaces. The requirements of such a paint must be exacting, and from my study of this question I conclude that such a paint to meet the needs must be—

A durable protection, resisting disintegration of concrete by the elements.

A preventive of dampness through resistance to water and moisture.

A paint that can be applied directly to the concrete surfaces without any previaus treatment.

This paint must be economical.

After weathering, it must offer a good surface for repainting.

It must be adapted to receiving and holding a plaster coat.

It must be so constituted that it will be artistic, appropriately pleasing to the eye.

Its consistency and nature should be such that it will spread easily, work well under the brush, penetrate the voids, fill and cover their cracks, and act as a bond of connection between the concrete and succeeding coats. Not only must it penetrate and fill up the voids, but it should, in a measure, level up the rough portions of the surface.

It must be suited to painting over damp and wet surfaces and dry even when surrounded with moisture. When dry it must adhere to the surface, be sufficiently hard to resist frictional influences, sufficiently elastic to conform to changes in temperature, and remain hard in the presence of moisture or water.

A paint composed of both pigment and vehicle in a paint for concrete is affected, physically or chemically, by the liberated calcium hydroxide.

As in all paints for wood and iron, the vehicle in a paint for concrete is a very important factor. It must not be linseed oil, blue, casein, or any other substance with like characteristics. It should be difficult of saponification, and of low saponification number. I am convinced that some kind of varnish product, peculiarly adapted to the purpose, is required.

The pigment, as in linseed oil paint, has its function to perform. In opposition to a theory advanced by some, I am going to say that this pigment should not be cement for reasons that are self-evident and self-apparent. It must be, for the first coat, at least alkali-proof. Not only must it decorate, but it must protect the vehicle, and, in conjunction with the vehicle, the surface coated.

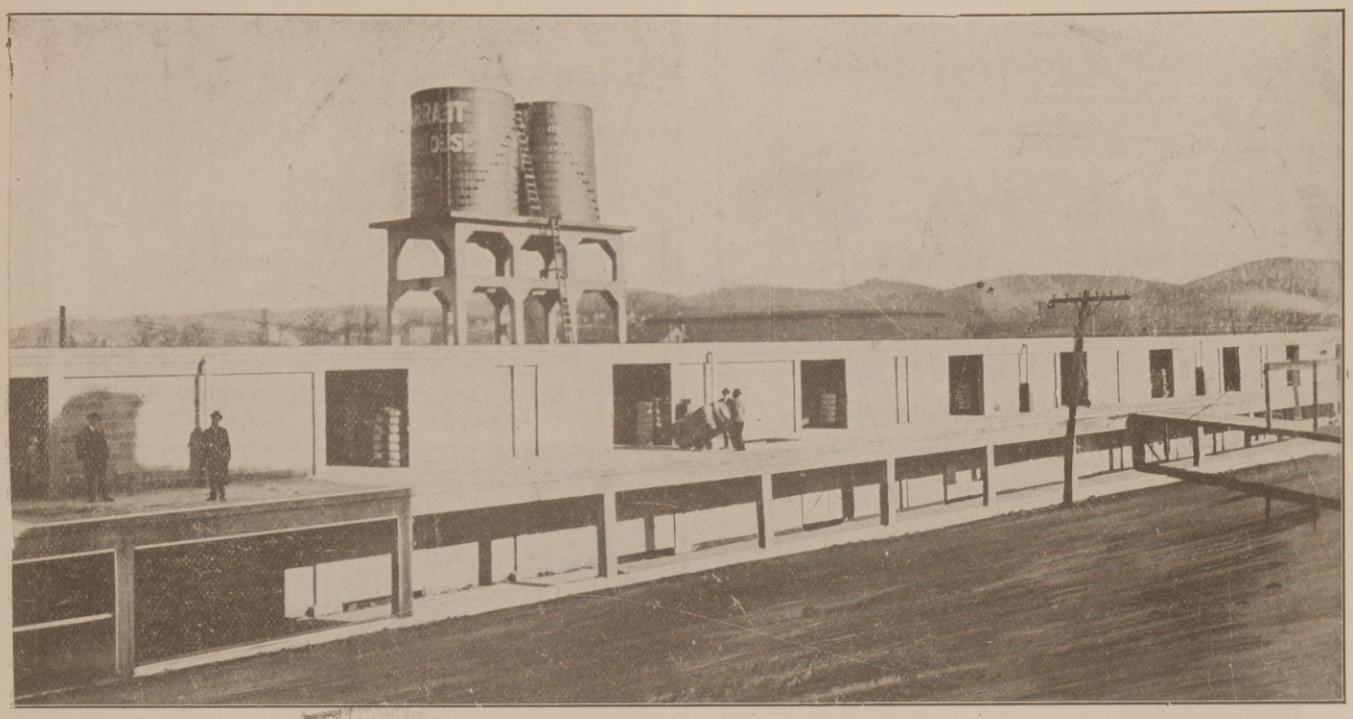
A paint consisting of both pigment and vehicle working in unison, with the minimum of opposing forces, favorable of application, serviceable under exposure, resistant to water and moisture, economical to the consumer, is necessary to perform the functions, to meet the need, to fulfill the requirements of a paint for concrete.

Concrete Paving on Steep Grades.

Concrete paving has often proved its adaptability to steep grades. So far as is known, the steepest upon which concrete has been used is in Los Angeles. The Portland Cement Association, 111 West Washington Street, Chicago, has recently distributed a photographic reproduction of Baxter Street, Los Angeles, showing the concrete pavement mentioned, where grades range from 11 to 29 per cent, and some people say concrete is not suited to steep grades.

New Roads Bureau in Salvador.

The National Assembly of Salvador has created a bureau of public roads, designated Direction General de Caminos, to operate under the Ministerio de Fomento, according to a decree in a recent number of the Diario Official. The new bureau will be in charge of technical men who will make an exhaustive study of all plans for roads and bridges, with a view to working out a system of connecting routes which will provide means of communication for the entire country. All work relating to the construction of new roads or the repair of old ones will be administered by this roads bureau



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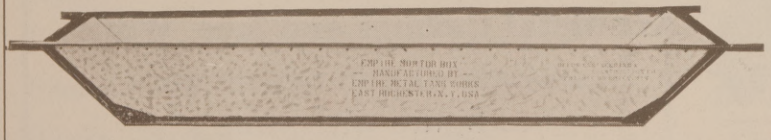

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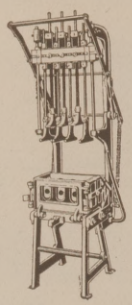

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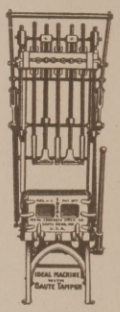

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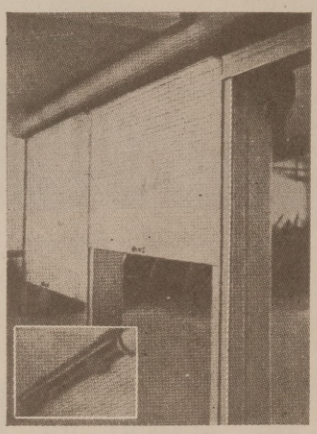

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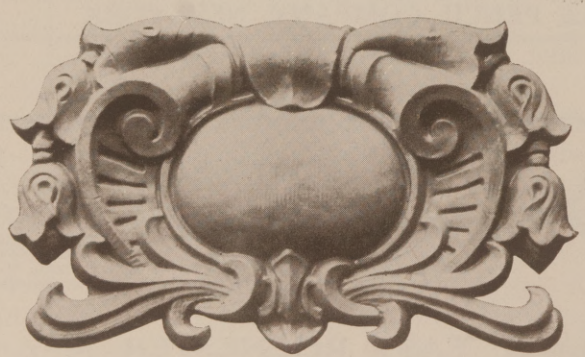

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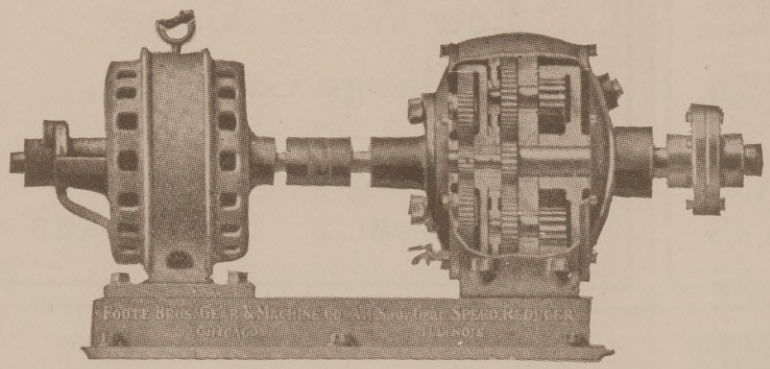

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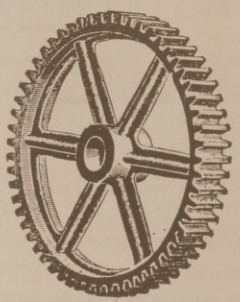

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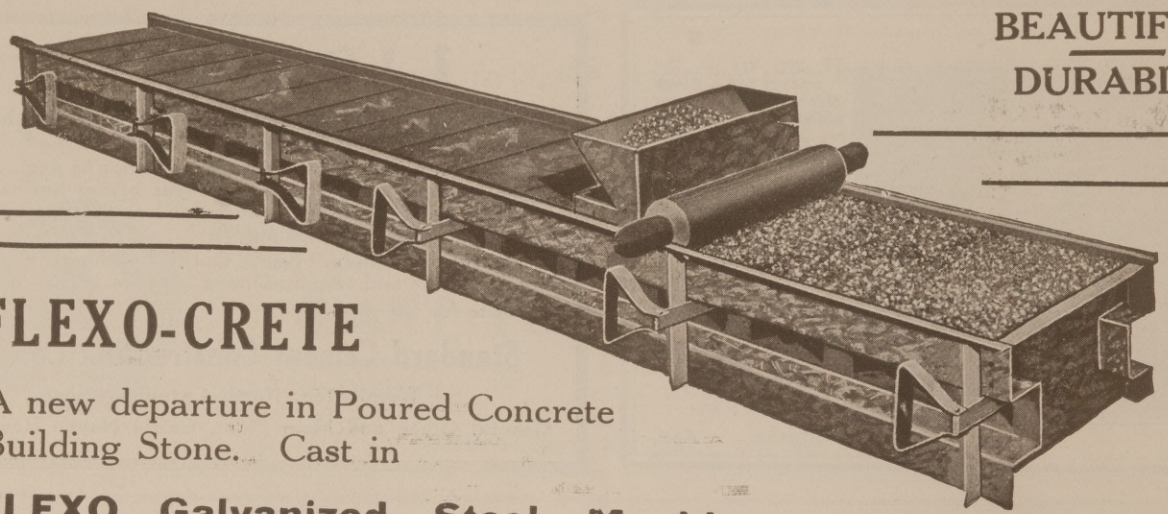

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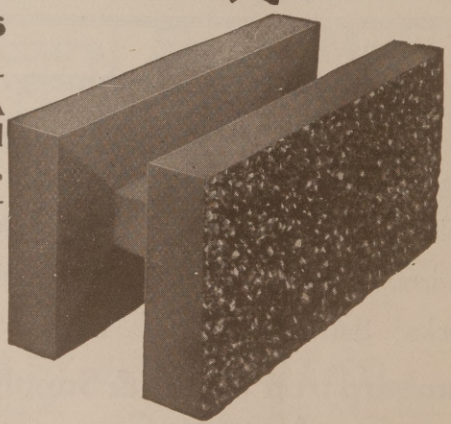

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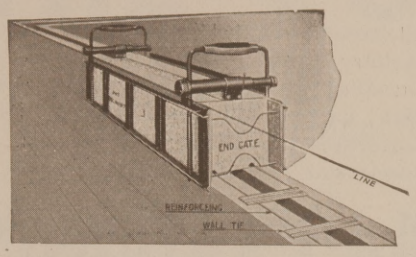

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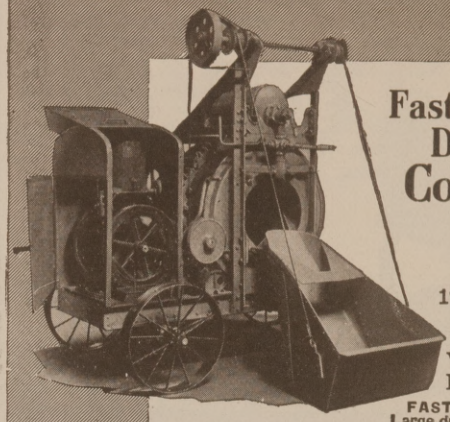

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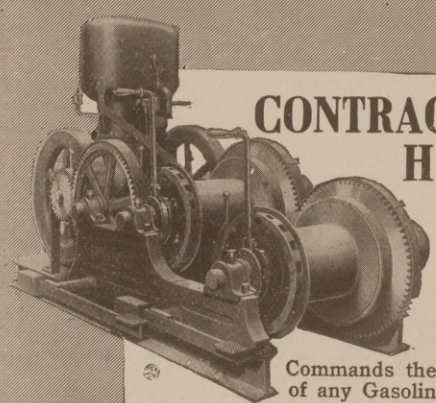

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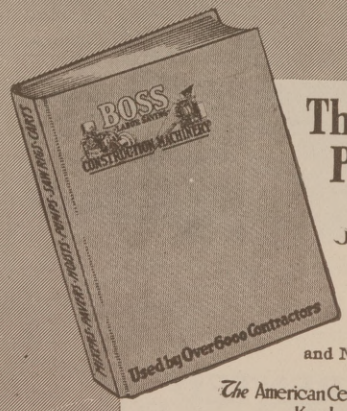

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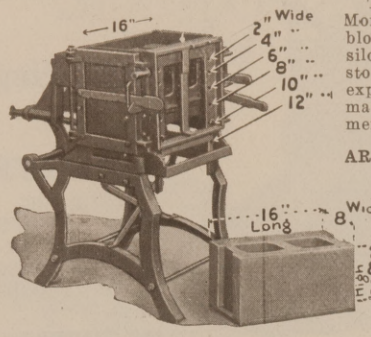

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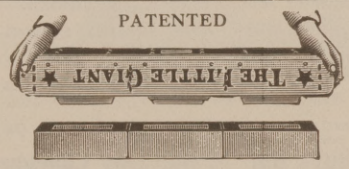

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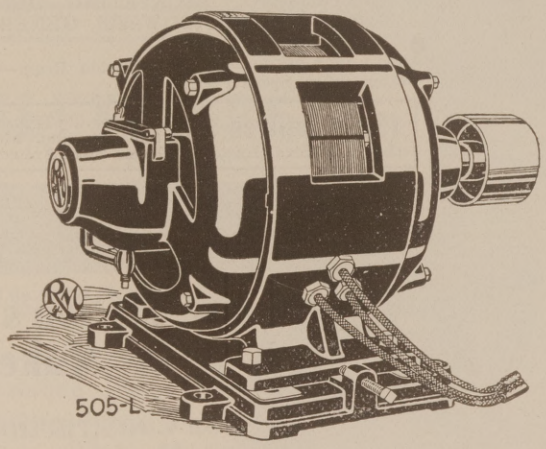

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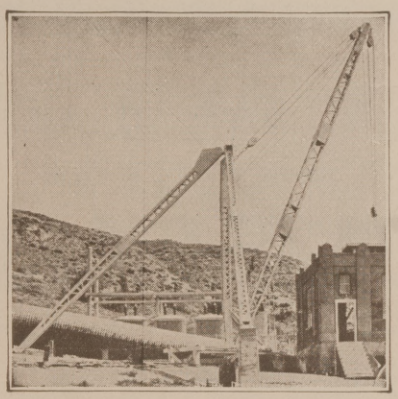

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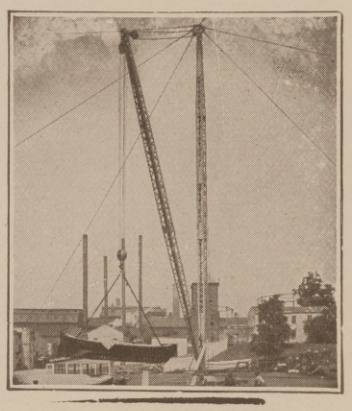

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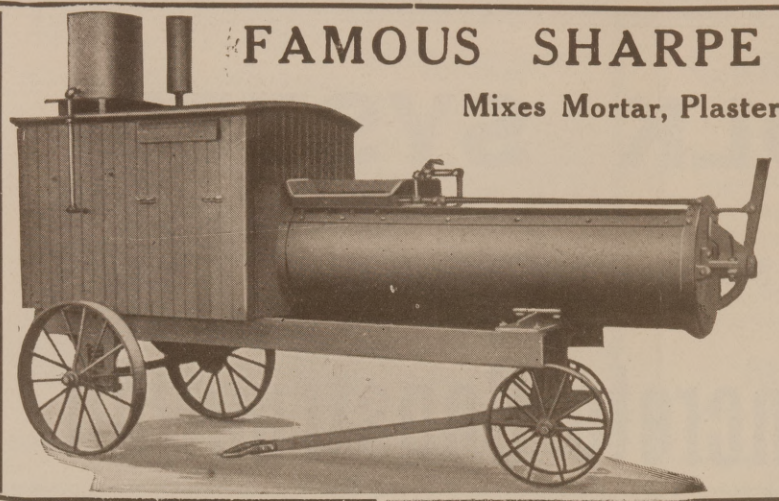

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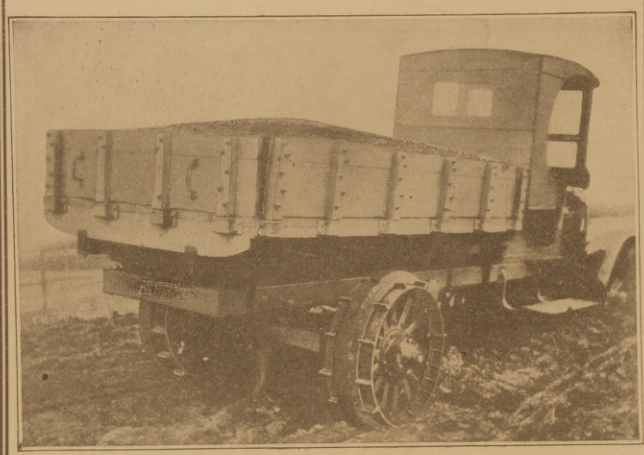

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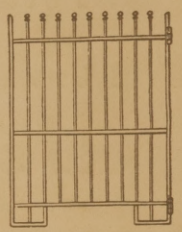

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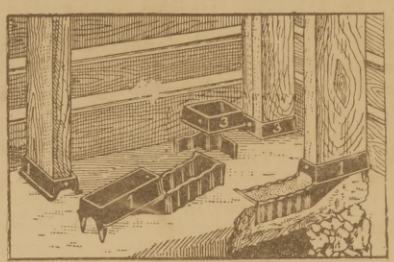

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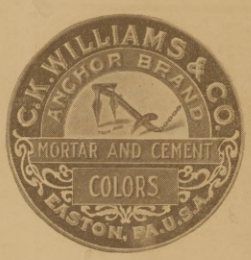

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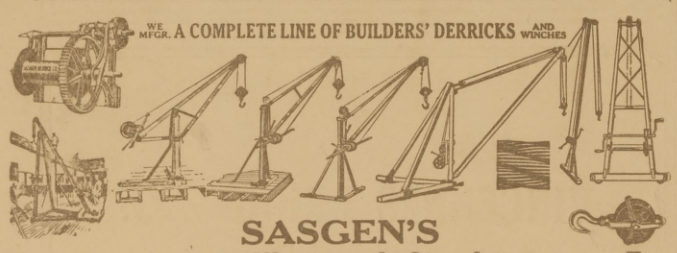

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