THE CONCRETE AGE

REPRESENTING THE INTERESTS OF MODERN PERMANENT CONSTRUCTION

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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.

Mortar Joints in Concrete Blocks.

Cracking of concrete block walls at mortar joints indicates a structural defect in either the foundation or the wall, which developes a crack in the weakest place; namely, the mortar joint.

In constructing a concrete block building, the bearing strength of the soil must be ascertained and concrete footings of sufficient width must be designed to distribute the load over a proper bearing area. The foundation must then be accurately and firmly placed upon the footings so that there will be no possibility of the foundation failing in any part.

Assuming that the foundation has been substantially constructed, the most common causes of cracks developing in concrete block walls are expansion and contraction due to temperature changes in walls built without reinforcement, piers, pilasters or cross-partition bonding. When such a wall exceeds 30 feet in length, it is desirable to guard against cracks by occasionally filling one or more of the hollow spaces, preferably beside a window or door opening) with 1:2½:4 concrete of quaky consistency. If the wall is subjected to unusual stress of any kind, ½-inch reinforcing rods may be introduced at the time of fllling the hollow spaces with concrete. If a hollow space is filled in this manner on each side of a window, a reinforced concrete pier is created which gives remarkable stability to the wall.

Concrete block should invariably be laid in cement mortar, mixed in the proportion of 1 sack of portland cement to 2 cu. ft. of clean sand. A small quantity of hydrated lime, not exceeding 10% of the weight of the cement, may be added for the purpose of making the mortar easier to work. Block should be thoroughly soaked with water before laying in the wall, in order to prevent them from absorbing water from the mortar. No mortar should be used after it has been wet more than 30 minutes. Mortar joints should be uniform and carefully filled. Nearly all manufacturers of block machines now furnish mortar plates or templates, which make it easier to secure uniform joints; ⅜-inch is probably the best thickness of mortar joint to adopt.

Consistency of Concrete.

Here is a statement from Mr. Ernest McCullough, Chief Engineer of the Fireproof Construction Bureau of the Portland Cement Association citing the report of the Committee on Mixing and Placing Concrete in the proceedings of the Second National Conference on Concrete Road Building. He says: "There we have definitely stated the consistency should be about equal to that of a medium soft tooth paste, and this can be obtained by using from 4 to 6 pounds of water per cubic foot for cement, sand and stone used in concrete. A great deal of unsound concrete is being discovered these days because too much water was used in mixing. Contractors can mix and place concrete at a very low expense when plenty of water is used and for years they have been permitted to do this. A great many engineers even believe that a very soft-flowing consistency is best to use. They are learning better, and we hope that in two or three years, if not in less time, sloppy concrete will never be seen."

Think, For Preparedness For Future.

It is related that Mr. John D. Rockefeller, being asked for an opinion as to why so many men fail in business undertakings, replied: "They don't think enough," or words to that effect.

The writer heard a story a number of years ago. It struck him then as going right to the core of the matter, and every year has added to its impressiveness. Proof is on every hand. Blind, drifting business management is everywhere.

It isn't at all probable that Mr. Rockefeller would for a moment consider the dreamer a real thinker. That seems to be the trouble with too many people—they think they are thinking when really they are only dreaming. Unless there is real "pep" behind the think, it will probably not amount to much.

Looked at from every side, Mr. R. is correct. The thinking owner of a business is more apt to succeed. The thinking employee becomes valuable to his employer and naturally goes ahead of his fellows who merely work, without thought.

And while this thinking proceess is in working order it is well to dwell upon the fact that preparedness for the future should be one's aim in life. Make yourself indispensable to the business.

The story is told of how one young man on the other side had been drafted for war service in England, but when it had been shown he was the only man in his town who could fill an industrial position for which he had fitted himself and that if he was sent to war the whole town would be industrially idle, he was given work at home, that being the best form of service he could render his country.

Concrete Plant Essentials.

Safety, good work, and time limit come first. After that the plant for storing material, mixing and distributing concrete and filling the forms should be designed to secure the total minimum cost of the work, charging it with full labor cost, plus the purchase, installation, and removal of plant, and crediting with the minimum salvage of plant materials.

This does not necessarily mean the minimum direct cost per yard of mixing or placing concrete, because on a small job it may be far cheaper to pay a dollar a yard for hand labor than to install a $10,000-plant that would mix and handle the con-crete for 10c per yard.

The plant should be of standard type but need have no greater capacity than is necessary for the governing conditions, the output being, of course, measured by that of the slowest part of the work, generally taking the concrete away from the mixer. The investment justifiable for plant often depends largely on the availability of the plant for other work after this is completed and on the assurance that the contractor will have such use for it, says "Contracting."

The American Vandal.

The other day we walked by a particularly attractive surburban residence. The house was good and the broad lown showed both taste and care. Like a pretty little girl in a becoming Sunday school dress, with her hair curled, the premises made you think pleasantly that somebody's affection was centered upon it. It was so attractive that we turned into the cross street in order to walk along that side of the grounds. A garage stood at the corner of the grounds abutting on an alley; and fairly in the mouth of the alley, unavoidably catching the eye of whoever passed down the cross street, lay a heap of junk and offal, evidently thrown out from the garage and the house. The alley itself looked as though it might lead to a pigsty.

That is strictly typical. The alley, of course, did not belong to the householder, and he did not care a rap how it looked; so, with one hand he offered the passerby a rose, while with the other he hit him in the eye with an old tin can.

Perhaps such negligence is due to the pioneer spirit, to which Nature was just something to be subdued, as quickly and unitidily as possible, to human uses. But we have the habit of blaming everything disagreeable on the pioneer spirit, and the justification for it seems pretty well played out.

We do litter up the landscape abominably. It is a national habit that ought to be broken. Cities and towns should not only have ordinances forbidding unnecessary litter, but enforce them. Anywhere you will find a city spending a hundred thousand dollars or a million to make a beautiful park, and then tolerating all sorts of needless ugliness.

Any woman will tell you there is no use in wearing a fine dress along with a hat that has been fished out of a garbage can; for the dress simply emphasizes the hat. The more we spend on parks and front yards the less tolerable junk-heaps and refuse-piled alleys become. What cities and towns are insisting upon reasonable sightliness?—The Saturday Evening Post.

Tonkin Cement Production.

The production of cement and hydraulic lime by the factory of the Societe des Ciments Portland Artificiels de l'Indochine at Haiphong, Indo China, during 1919 amounted to 75,697 tons of the former and 3,494 tons of the latter, against 72,000 tons of cement and lime in 1915. The company expected a production of 95,000 tons, but was handicapped by a lack of European supervisors and a delay in securing machinery and supplies necessary for repairs.

A Suggestion.

In a concrete products plant a common custom is to have the mixer empty onto the floor, from which the concrete is shoveled into the various machines and molds. The results is a scattering of the concrete over a considerable floor area unless care is exercised.

This can be prevented by having in the floor under the mixer discharge a slightly depressed pit, just deep enough at the edge to shovel against.

A simple Method of Grading Aggregate.

While much attention is being given to the study of aggregates by experts, any method that will help the man in the field to judge, at least approvimately, the best mixture, is valuable.

Prof. A. B. McDaniel suggests the following:

First, pass the gravel twice over a 1-4-in. mesh screen to separate the sand and gravel or lesser and coarser aggregate. Then secure a stout cylinder such as a tile or section of pipe having a diameter of about 12 inches and a depth of from 12 ins. to 18 ins. Weigh out 1 unit of cement, 2 units of sand and 4 units of gravel, being careful to have the whole mixture less than enough to fill the cylinder. With a cylinder of the size stated above, 15 lbs. of cement, 30 lbs. of sand and 60 lbs. of gravel would give suitable quantities. mix the materials together and then add about 10 per cent. of water, to make a concrete of about normal consistency Tamp the concrete into the mold, leaving the upper surface smooth and horizontal and then measure the distance of the upper surface of the concrete from the top of the cylinder. Dump out the concrete and clean the cylinder and the tools. Using the same amount of cement, but different proportions and amounts of sand and gravel, make up other batches into the cylinder in the same way. Tamp each batch into the cylinder in the same way and measure the depth of concrete as described for the first case. Several trials can be made and the proportions determined that give the least depth of material in the cylinder.

Shrinkage of Reinforced Concrete.

F. R. McMillan, of the University of Minnesota, has been making a number of tests to determine the shrinkage and time effects in reinforced concrete. According to a summary of his paper by A. A. Klein, published in Chemical Abstracts, the following results were obtained:

Beams tested were 5 1-2 ins. deep, 30 ins. wide and 12 ft. long between supports. Concrete consisted of 100 lbs. cement, 2 cu. ft. sand, 4 cu. ft. stone, hand mixed. Results show that shrinkage of 3-4 in. to 1 in. in 10 ft. can be predicted when concrete is exposed to the ordinary dry air of a heated building. Changes in moisture content will retard shrinkage and even cause swelling. The yielding of concrete under compressive stress with time is greater as the unit stress is greater and goes on indefinitely. The deformation was found to be 3-5 times that produced immediately upon application of load. The time yielding under stress combined with shortening due to shrinkage may result in deformations 15-20 times those expected from calculations.

Architectural Ornament in Reinforced Concrete Buildings.

Architectural ornament is discussed by Frank H. Heaven in an article is Concrete and Constructional Engineering, England, on "The Effect of Reinforced Concrete Upon Architectural Design." He says:

It may be thought, perhaps, that reinforced concrete can have little or no influence upon the architectural ornament of a building, but its employment might greatly add to the grace of our building by producing a greater degree of light and shade upon elevational design by giving a large projection to strings, cornices, etc. The limits of stone or other granular material when in projection are well known, but ornamental reinforced concrete work could be employed to advantage where other materials fail. The Greek temples of old owe a great deal of their charm to the effects of light and shade cast by their projections. The sun, however, does not treat all lands alike. In Southern Italy the proportioned cornice of the Orders produced the desired effect by reason of the high altitude of the sun, but the use of the same projection in England has an altogether different effect, due to the lower angle at which the light from the sun can produce shadows. Many of our monumental buildings, for that very reason, are almost shadowless. The architects of the Renaissance in Northern Italy recognized this fact and crowned their Palazzi with great overhanging cornices. The Americans, too, have seen the necessity for a deep shadow to give repose to their large scale buildings and obtain the same by the use of zinc or iron cornices of great projection, painted to imitate the material in which they are working. The use of reinforced concrete in decorative cornices would be legitimate construction if we recognize the material and give the members its true value in relation to the whole design, and the deeper shadow cast by greater projections on our building would be appreciated.

Coloring Concrete.

You can not use paints or stains, but must use a pure mineral cement color that is free from clay, gypsum and organic matter, says a well-informed contractor.

I recommend the use of an average of 5 lbs. of color to every bag of cement, with the exception of green, in which instance use 7 lbs., and in the case of black use 2 lbs. in 1 to 2½ mix.

I submit, says another, the following formula for coloring cement, which I am sure he will find to be satisfactory, and I might say durable. The colors will not fade if the directions are closely followed. These recipes were given me some years ago, and I find, that wherever tried, they have proved to be all that was expected of them. The quantities given are per barrel of cement, the coloring matter in each instance being mixed dry with cement and sand. Caution is given that venetian red and common lampblack should not be used, as the color obtained with these materials will run and fade. The various colors and quantities of coloring materials for each barrel of cement are as follows:

For brown, 25 lbs. of best roasted iron; or 15 lbs. to 20 lbs. of brown ochre.

For black, 45 lbs. of manganese dioxide.

For blue, 19 lbs. of ultramarine.

For buff, 15 lbs. of ochre. (This is likely to considerably reduce the strength of the mixture.)

For green, 23 lbs. of greenish-blue ultramarine.

For gray, 2 lbs. of boneblack.

For red, 22 lbs. of raw iron oxide.

For bright red, 22 lbs. of Pompeiian or bright vermillion.

In using coloring matter with concrete, the color should always be mixed with the cement dry, before any sand or water is added. The mixing should be thorough, so that the mixing is uniform in color after this mixing. The combination is treated in the same way as clear cement.

House Built in Two Hours.

A house built in two hours—this is one of the many novel features of the Paris Fair which the minister of commerce opened, writes Henri Pickard in Cincinnati Enquirer. It is a small chalet, it is true, for the cost is less than 3,000 francs, but it is built of brick and has all the appearance of solidity. Substantial-looking four-room chalets in wood, easily taken down, can be had for 7,000 francs, and there are other model dwellings more ambitious still with flowers blooming on the windowsills, for a few thousand francs more.

Passadena, California. Robert D. Farquear, Architect.

Concrete Frontage—Main Entra nce—House of Mr. E. R. Kellam.

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 the 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—Treatment 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 the treatments:

(a) Hydrochloric or muriatic acid wash.

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

(c) A wash consisting of ammonia 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 thus 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 neutralization, and so uniformity of results in 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 neutralization 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 to 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 adcerse 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 research 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.

They impart 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 preventative of dampness through resistance to water and moisture.

A paint that can be applied directly to the concrete surface without any previous 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 a immediately 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 reason 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 St., 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.

The Architect and the Structural Engineer

THE following is a summary of a paper read at the forty-ninth ordinary general meeting of the Concrete Institute at Wesminister, S. W., by Mr. William E. A. Brown, A. R. I. A. B., M. C. I.:

An architect is necessarily a structural engineer, with the addition of the artistic sense and skill to clothe the structural forms with beauty of line and contour, and to so arrange mass and void into one harmonious whole, studying the great lessons of the past, and carrying on the architectural traditions of Ancient Greece and Rome, down through the Middle Ages, and on through the Renaissance. The architects of such buildings as the Church of Santa Sophia at Constantinople; St. Peter's at Rome; the Pantheon, Rome; the Duomo of Florence; and to come down to more recent time, Sir Christopher Wren's masterpiece in London, and Bentley's last great work of Westminster Cathedral, were structural engineers.

Were not all our Cathedrals, which were the delight of artists and lovers of the beautiful, wonderful examples of architects' engineering skill?—majestic buildings with vaulted roofs poised on slender pillars and held in position by flying butteresses, each thrust met by a counter-thrust, all combined so as to keep the whole structure in a stable condition.

Structural engineering include not only steelwork used in buildings, but also all forms of construction, whether in brick, stone, timber or concrete, and in designing buildings, and other structures the architect was called upon, not only to exercise his artistic ability, but also as to plan and arrange the various materials to carry, in addition to their own weight, all superimposed loads and external forces, so that the whole might remain perfectly stable.

No doubt the Council of this Institute had this in mind when it was decided to enlarge the scope of the Institute by adding structural engineering, and not to confine itself to one branch only, i. e., concrete and reinforced concrete. The wisdom of this, he thought, was manifest by the large increase in the membership as well as by the greater attendance at the meetings.

It was the architect and the architect alone, who should determine the position of all main girders, stanchions and supports. In many buildings it was impossible to proceed with the design until these positions were determined. In some cases it was the run from north to south or east to west. In others it would be such a feature as a dome; for example, how could Wren have planned St. Paul's, unless he knew before hand how he was going to support that great and glorious crowning feature of his design? That building could not have been erected had Wren simply made a drawing and handed over the structural work to someone else to deal with; or had that course been adopted, the resulting design would have been different to that made by the architect.

There was no doubt that tradesman and others who did not realize the importance of having a properly qualified professional man to advise them. They were led to believe and fondly imagined that they were saving a large sum in fees, until they found by experience that their folly had cost them more. It was not his intention or wish to belittle in any way the status of the consulting engineer, as he occupied a very important position in the building world. But he did wish to emphasize was that it was the architect's duty to determine the position of all girders and supports in the building he designed. He should also be able to make the necessary calculations for the steelwork in, at any rate, the smaller buildings under his control. Architects often did employ consulting engineers to do the calculations for the steelwork—first for lack of time to do so themselves, and often because in some modern buildings, the steelwork was of so complicated a character that it was advisable and necessary to do so; but that did not alter the question of the position of the architect in the matter.

A good deal of stress has been laid upon the question of whether the steelwork should be designed, and quantities taken out by the consulting engineer before being sent to the constructional firms for estimates, or whether these firms should be allowed to do the calculations themselves. For contracts involving a large amount of steel work of a complicated character, the author agreed that a consulting engineer should be appointed by the architect, but there were many smaller works where this was not necessary, nor would the outlay of the building work warrant the expense incurred. It was quite satisfactory, given certain conditions, laid down, for the architect to send the drawings to several firms of engineers, and let them make their own calculations and quantities; but to enable the various contractors to estimate on the same basis, the following information must be given to each:

1. Plans of all floors showing the lines of all main girders and the positions of stanchions and columns; also a section or sections and outline elevations must be given.

2. The loads that each floor had to carry and whether live or total loads.

3. Whether British or Foreign steel was to be used and whether the L. C. C. Regulations under the General Powers Act, 1909, were to be complied with. If not, the stress should be specified that were to be worked to.

4. Whether price was to include for hoisting and fixing, or only for steelwork delivered to site.

5. If it was to be delivered unpainted, painted,

or oiled, and if painted with what materials, and that all scales and rust must first be removed.

6. Workmanship, whether connections must be riveted or bolted and if the latter whether ordinary bolts would be allowed.

7. Whether the price was to include 10 per cent profit for the builders or only 2½ per cent cash discount.

The author's practice was to state the latter.

There was a diversity of opinion as to whether dead loads and superloads on a floor should be kept separate in making the calculation, or whether a load to include the dead weight of the floor itself, should be taken. The author's practice was to work to the latter, as the calculations were much simpler and the liability of error was materially reduced.

One must, of course, take into consideration the point loads which often occurred from partitions, etc. This was often neglected by competing firms of engineers, but of the concrete partition blocks on the market weighed a considerable amount, and one was often surprised when the weight was calculated out.

Another matter that he sometimes had to argue with the steel contractors was the central loading on girders carrying walls with openings and narrow piers between. Some assumed that the loads were evenly distributed over the span through the brickwork below window sills. If the sills are very high up, this may be so, but in many cases the sills are only 12 in. or 18 in. above the girder, and in his opinion, the loading over a length of the girder equal to the width of the pier.

In calculating the loads on stanchions, etc., he did not take advantage of the reductions allowed by the 1909 Act. He did not think it advisable, as buildings were often loaded to a greater extent than was allowed for. How often has an architect told that the floors will never have to carry more than a certain weight, and on going over the premises, when occupied, he is surprised to find these loads greatly exceeded.

When the various estimates and plans showing the steelwork were received the architect should carefully go through each set, and compare the sections of the girders, etc., and make rough calculations to check the sizes, and ascertain if the allowable stress had been adhered to. It was also necessary to check the depths of the poists in relation to the span, otherwise undue deflection might occur.

After the plans had been gone through, the architect was in a position to determine which estimate he would accept and when given the general contractor instruction to accept the estimate it was important to state that all dimensions were to be taken from the site, and that the whole of the work was to be carried out to the architect's satisfaction, detail drawings of all parts to be submitted to him for approval.

The steel contractor must take his own dimensions from the site arranging of course, for the general foreman which portions of the steel work were to be delivered first, and the order of delivery of the remaining consignments. When the cleared site had been measured with steel tapes and all angles carefully triangulated, it should be possible for engineers to set out and scale off the lengths of the various parts. The connections and workmanship were in the author's opinion, very important matters to be considered and as far as his experience went, they did not always receive the attention that should be given them. Of what use was it to have a strong joist or stanchion if the cleats under the joist, or the joist under the stanchion were not properly designed, or if the design is correct the connections themselves were badly made. It was a regular practice to use ordinary bolts to take shear, such as the ordinary ¾-inch bolt in a 13-16-inch hole, the shank being threaded to within ⅜-inch of the head. He has examined connections made in this way, and often out of five bolts in the connection four of them could be taken out with the fingers when the nut was removed. What amount of bearing area did one get on the threaded end of the bolt, supposing that the bolt was bearing on the plates. The bearing surface consists only of a series of knife edges. If bolts must be used in shear, then the holes must be carefully drilled concentric through all the plates without the usual amount of clearance, and bolts with plain shanks long enough to pass right through all of the plates should be driven in. In order to make sure of having no portion of the threaded end bearing on the outer plate a ⅜-inch washer should be placed under the nut. I am aware that the 1909 Act says that rivits should be used in all cases where reasonably practicable, but there were a very large number of buildings to which this act did not apply. He thought that all steelwork should be designed in accordance with the provisions of the 1909 Act, but that the conditions for bolted work should be amplified in the Act, the only requirement now being that the bolt should extend through the nut and the latter be secured so as to avoid risk of becoming loose. Another important point, and one that was not always attended to, was that all holes through two or more thicknesses of metal should exactly coincide. If they did not concide, how could the rivets or bolts take a proper bearing and transmit the load from one to the other?

Filler joists in concrete floors should be bolted or cleated at least every third joist to the main beams. He had seen cases in which this was not

done, but the fillers simply rested on short cleats on beams connected to stanchions running through three floors next the street, and with no other tie than that afforded by two ¾-inch bolts at each floor level; the end stanchion, built on the fact of the party wall with only 4½-inch brick casing around it, was not tied in at all. He believed it was becoming a common practice to place the smaller filler joists on a concrete haunching resting on the bottom flange of the main girder and not tied in any way to the girder. In his opinion this method of construction should be condemned. The area of the stanchion base should be checked to see if the concrete was not loaded more than 12 tons to the square foot. Large gusset plates should not be allowed unless properly stiffened to prevent buckling. It was a good practice to encase the whole of the stanchion base right up to the floor line with concrete. This prevented rusting, and also held the floor of the stanchions. There was no difficulty in bedding both the template and stanchion and if the latter had to be grouted in the stone it might as well be absent. Girders supporting walls as well as main floor girders if they are formed of two or more plain I-beams side by side should have plates riveted on top and bottom. To simply bolt them together is, in his opinion, not sufficient, as the load from the main floor girders was not transferred to the outer joists, though some engineers think it is.

Caution must be observed in casting girders and stanchions with patent plasters, especially those that are stated to adhere without the intervention of any lathing. He had one in mind that corroded the steel to an alarming extent in a short time.

Stanchions and girders are best encased with fine Portland cement concrete, the steelwork having ⅛-inch wire wound round same, space about 12 inches apart. This held the concrete firmly in position and it was not easily damaged even by motors.

When he told them that he had seen specialist firms' own men sawing up timber for centering and the sawdust and shavings and small pieces of wood all left and mixed up with the concrete, he thought one's faith in trusting to such people was rudely shaken. One required a good clerk of words, well up in reforced concrete construction, with several smart assistants under him, to look after the work.

In calculating the sizes of steel joists embedded in concrete the author's practice was to let the steel carry the load as an independent beam, but taking the depth of the beam onything up to 1-36 of the span, limiting the stress to 7½ tons per square inch. This was quite enough, and he often found that these small joists, such as 3 inches by 1 1-8 inches and 4¾ inches by 1¾ inches were of foreign make.

He had also had a preference for joists with 3-inch flanges over those with 1½-inch and 1¾-inch flange for the reason that the concrete had a much better bearing on the joist. He then uttered a warning against using breeze for floors. There was a great danger of expansion and he knew of several cases where this had occurred and pushed walls several inches out of upright, and even when the wall was rebuilt it happened again. There was also a corrosive action between the concrete and steel which in time might endanger the stability of the floor. The modern architect had to be a man of many parts a jack-of-all-trades—a bricklayer, mason, carpenter, joiner, plumber and painter— always an artist, often a lawyer and last, but not least, a structural engineer.

Cement Made of Beets.

France with all her troubles of the past year and a half, has been able to develop one new industry not concerned with war or munitions, says The Philadelphia Inquirer, The French are now turning out excellent cement from a by-product in the process of making beet sugar. From 70,000 tons of beets treated, more than 3,000 tons of cement equal in quality to the best Portland is obtainable, purely as a by-product.

The scum which forms when the beets are boiled, and which hitherto has been thrown away, is pumped into large tanks, where it is allowed to dry partially. Finely divided clay is mixed with it and the mixture is thoroughly amalgamated by beaters for an hour and then burned in a rotary kiln, just about as Portland cement is treated. The clinker is removed and pulverized into cement.

The best scum, formerly a waste product, was found to contain large quantities of carbonate of lime and water. Four thousand tons of this carbonate is obtained from 70,000 tons of beets. To this is added 1,100 tons of clay, the resulting product being 3,162 tons of excellent cement.

Women Architect to The Front.

That the field for business women is not limited to routine of office work is proven by the number of women who are making good in comparatively new fields for women workers. Miss Vera Salomonsky, of New York city, is one of these pioneers, being an architect and in business for herself, her services being much in demand.

Test Structural Materials Jointly

IN September 1, 1916, Lewis Institute, Chicago, and the Portland Cement Association, 111 West Washington Street, Chicago, entered into an agreement whereby they will hereafter jointly operate the Structural Materials Research Laboratory at Lewis Institute. This laboratory has, during the past two years, attained merited distinction for the work it has done.

As our readers no doubt know, the Structural Materials Research Laboratory has as its object the carrying out of experimental research in concrete, reinforced concrete and concrete materials, and to give instruction to the engineering students of Lewis Institute on the properties of concrete and other materials of construction.

For a long time one of the greatest engineering needs in this country was a laboratory like that at Lewis Institute, where information as to the proper requirements of concrete materials and the influence of all other factors in the manufacture of concrete or its ultimate usefulness in service could be determined. Germany has for fifteen years had a laboratory operated by the German Association of Portland Cement Manufacturers. The work of the German laboratory has been directed along three principal lines. (1) Tests and certification of the cement manufactured by Association members; (2) Conducting experimental studies for the benefit of individual companies for which a few were charged; (3) Researches of general interest in the technology of the manufacturer and in the uses of cement. Until the agreement between Lewis Institute and the Portland Cement Association was entered into, no Association of american manufacturers, we believe, had undertaken to make provision for a scientific study of the uses of their product for the value which such a study would be to the general public. It is the function of Lewis Institute Laboratory to carry out exhaustive research on properties of concrete and aggregate and to study the influence of different factors on the manufacturing and placing of concrete.

Unlike the laboratory of the German Association mentioned, the Structural Materials Research Laboratory does not concern itself with the problems of cement manufacturer, nor does it exercise any mandatory powers as to the quality of cement marketed by members of the Portland Cement Association. The standard specifications to which all cement must conform furnish ample security as to the quality of their product.

At present the laboratory occupies about 8,000 square feet of floor space on the ground floor and basement of the Lewis Institute buildings, which are located at Madison and Robey Streets, Chicago. Equipment is available for carrying out all the usual physical tests of concrete and concrete materials. This equipment includes a 200,000 pound Olsen testing machine, a 400,000 pound Reihle testing machine, two briquet testing machines, Deval abrasion machine, standard ball mill, torsion machine, concrete mixer, Talbot-Jones rattler, sieve shakers, extensometers, rock crushers, silt washing apparatus, complete cement testing equipment and adequate facilties for making and storing large numbers of test cylinders of mortar and concrete. As an adjunct there is a chemical laboratory up with particular reference to a study of the impurities of natural sand. A considerable portion of the work already undertaken by the laboratory has been carried out in cooperation with several technical committees of the American Society for Testing Materials. Among these may be mentioned Committee C-9 on Concrete and Concrete Aggregates, Committee C-1 on Cement and Committee C-6 on Drain Tile. Committee C-9 has supplied the funds for equipping and operating the chemical laboratory for studies of the impurities in sands and for related problems.

Experimental work has been carried out in cooperation with other societies as follows: American Railway Engineering Association, tests of reinforced concrete fence posts; National Conference on Concrete Road Building, tests of concrete in a study of the effect of time of mixing.

The following will indicate the scope of the experimental work already completed or now in progress:

A comparison of the results of tests of mortar and concrete using 23 different lots of cement.

Of particular interest in determining the most satisfactory form of test piece for use in standard strength tests of cement.

Effects of fineness of grinding of cement on the strength of mortars and concrete:

As influenced by the degree of fineness of cement.

As influenced by the quantity of cement.

As influenced by the age of the concrete.

A study of the impurities affecting the concrete making qualities of natural sands.

Methods of determing the silt in sands.

Chemical analysis of silts.

Effect of silts of different kinds.

Study of the effect of clay and other finely divided inert materials on the strength of concrete.

Methods of detecting refective sands.

Effect of organic materials in sands.

Effect of alkalies in sands.

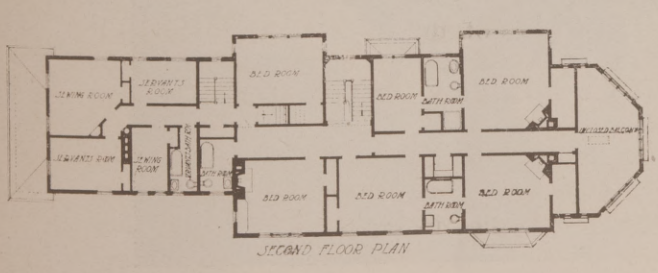
Remedial measures which may be used to improve defective sands so that they will be satisfactory for concrete.

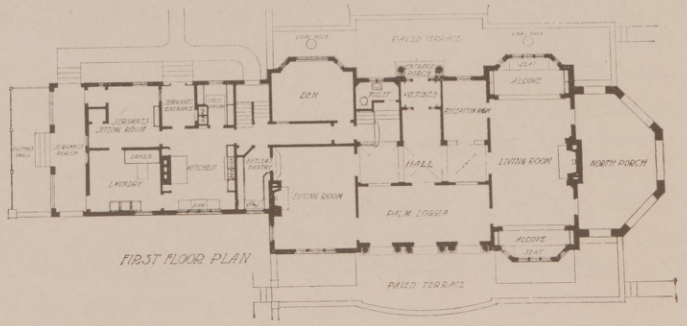
Details of Concrete Residence for Victor E. Edwards, West Boylston, Mass.

L. W. Briggs, Architect, Worcester, Mass.

Carriage Approach.

Southeast Exterior.





East Terrace—Victor E. Edwards Residence.

Best Practice in Concrete Road Construction

THE ideas presented in this paper are based upon such knowledge as may be gained by inspection of concrete pavements in various parts of the country, and, more validly, on the actual construction in New York State of 201 miles of second-class concrete pavement, 1:2½:5 mix, a type which we have ceased using; and upon the actual construction of 364 miles of cement concrete pavement, 1:1½:3 mix, built in the last four seasons. There still remain 127 miles of this type of construction under contract in New York.

Grades.

Grades are still treated differently in different sections of the country. Our original practice was not to exceed 5 per cent, but today we are building them as high as 8 per cent under certain conditions. Grade seems to be limited only by the ability of the wet concrete to run during the process of construction, by the character of the mix and the kind of traffic to use it. Even on a steep grade, the use of a coarse sand prevents the roads from being slippery; and I believe that brooming of the surface facilitates the traction hald of all classes of traffic. Floating should be at a minimum as this operation brings the finer particles to the surface which gives a smooth top.

Accidents on Sixteen-Foot Roads.

In order to obviate the danger of accidents on our 16-foot roads, we have been widening or mooning out the curves, so that in some cases for those of small radius at the center the actual curve is as much as 22 to 24 feet wide.

We have also considered it good practice to give the outside of these curves a super-elevation in order to make easier the steering of a car, to lessen the likelihood of skidding, and to insure greater safety in taking these curves at speed. This has been objected to as inducing people to travel round these curves at high speed, but speeding seems to be an inherent mania, unrelated to external conditions, and certain it is that banked curves lessen the casualties resulting from it.

Specifications.

Cracking of a concrete pavement is generally due to the unequal settlement of a poor sub-grade. If the road is to be satisfactory it is of first importance that a good sub-grade be secured. These we consider the essentials of a good sub-grade:

1. It must have uniform bearing power.

If an old road-bed is to be used it must be scarified, reshaped and rerolled for the entire width of the pavement, removing all large stone to a depth of 6 inches.

2. It must be dry.

Ditches should be low enough to take away the water from under the pavement. With unstable soil good results can be secured by providing subdrains and spreading a layer of gravel—preferably run-of-bank gravel—over the sub-grade to increase its stability. Material used for this purpose must be impervious; if it is porous it will act during wet periods as a reservoir, which, under conditions of frost, will break the pavement proper.

3. It should have metal reinforcements.

(a) Under very bad, that is, unequal soil conditions.

(b) Whenever the supporting power of the sub-grade changes, as from rock to earth, or passing over a trench.

Our experience indicates that the expense of reinforcement is not justified in gravelly or sandy soils where good natural drainage prevails.

The Mix.

The mix should be proportioned in such a manner as to give the greatest density. With our requirements for materials we have found that the proportions of 1:1½:3 most nearly do this. Our specifications provide that the concrete shall be mixed in the proportions of 1 volume of cement to 4½ volumes of sand and broken stone or gravel, and the proportions of fine and coarse aggregate are varied slightly as a result of field void tests so that the greatest density is obtained. Should the size or character of the materials change there would be a corresponding change in the proportioning of the mixture.

The coarse aggregate should consist of a well mixed product of clean No. 1, No. 2 and No. 3 stone or gravel.

No. 1 size is that retained on ⅜ in. circular and passing a ⅝ in. circular screen.

No. 2 size is that retained on ⅝ in. circular and passing a 1½ in. circular screen.

No. 3 size is that retained on 1½ in. circular and passing a 2¾ in. circular screen.

It is provided, however, that not more than 25 per cent of the total shall be No. 1 size, the proportions being so graded as to give a minimum of voids.

Aggregates should never be used unless they comply with the tests prescribed.

You may note that we allow as our maximum size, stone that will pass a 2¾ inch ring, whereas most specifications permit only 1½ inch stone as a maximum. This seems radical, but our reason for the increase in size is that we get equally as good if not better results from the larger stone, and at a cost decidedly lessened by our using more nearly the product of the crusher. Especially is the price to be considered on contracts where the local supply is crushed on the ground, as is

the case in most of our work. If you desire economy, this change is worthy of your consideration. We save 15 per cent in crushing costs by this use of stone larger than the previously accepted standards.

From a practical standpoint a pile of stone graded from ¾ to 2¾ inches has more stability when properly mixed than stone graded from ¾ to 1½ inches. On our 1916 work we used up to 2¾ inches in size; as an indication of the compressive strength per square inch of field cubes tested at an average of 28 days we have a grand average of 3,370 pounds per square inch for 504 cubes of stone and gravel, of which only 13¼ per cent were under 3,000 pounds. Greater density can be obtained by using stone up to 2¾ inches in size. With the larger size stone there is less probability of spalling at joints and along edges.

Tests.

Theoretical tests are fine. They are necessary to tell you what you should have as a final product. You proceed on the hypothesis they offer and then you have to wait until service and climatic conditions prove how far your hypothesis conforms to reality.

Tests for concrete materials have never been given their proper consideration with the exception of cement which has been tested with all the gneness of the art of testing. In general little if anything has been done on the sands, which have been casually accepted if they looked good or had ever been used before in a structure that would stand up. As for the stone or gravel all kinds and conditions of both have been used with practically no tests at all.

Our work has shown that if we are to omit any of the tests, we might better take a chance with the cement, for of the last 455,000 barrels used only one per cent failed to conform to the test of the American Society for Testing of the materials. Fifty per cent of these failures was due to flash set and fifty per cent to failure on the 200 mesh sieve requirement would have given good work and that rejected for flash set would have been aged enough by the time it was placed in the work to give good results.

Engineering skill presupposes judgement so why not inject it into our problems. After priming ourselves with theory, let us apply it to practice. Let us make field tests that will parallel laboratory experiments; let us conduct our laboratories in such a way that their value may be significant to the man in the field, and so that their results may be checked up by him. Success of work depends upon the fieldman; in every case his personality helps determine the results. Put him in line with your tests, practices, etc., and his interest and co-operation will show most profitably in the work. All of our men, from the engineer in charge of the road up, are instructed in all the tests and methods of inspection and they complete them on every inspection of the work. We of New York State believe that our results may be attributed to the spirit de corps engendered by this method.

Field Tests.

The principal tests which can be made in the field accurately enough for all practical purposes are:

(1) Gradation tests for sand.

Our fieldmen are furnished with sand testers which have the ¼ inch, the 20 and the 50 sieves. By using these they can be assured of getting a uniform product from the bank, for they would at once detect any change for the worse in the character of the material and would reject it. Each engineer is supposed to make a daily report of the gradations. A laboratory test, however, is essential to ascertain the presence of any deleterious matter in the sand.

(2) Test for loam and silt content in sand.

This can be made in the field and checked up by the laboratory results.

For the loam test, an excess of water is added to a given quantity of sand in a glass graduate, the whole is well agitated and allowed to stand until the loam and silt has settled on top, when their percentage may be measured.

(3) Test for set.

This is made by mixing the sand with cement and forming a pat with thin edges. By breaking the edges after 24 to 48 hours it may be determined how the material sets.

(4) Tests for stone and gravel.

Field determinations of these materials can be made only for voids. Visual inspection should, of course, detect soft material and dirty aggregates. Such inspection on the road and at the quarry should be made constantly to know that the material is running uniform and is equal in quality to the original samples.

When we realize that nature never has two deposits alike, the importance of these tests in securing good work will be readily appreciated.

Conclusion.

It has been our aim to designate essentials in design and specifications; to hold only such standards as have been proven practical, from our field and laboratory tests; and to employ only such methods of construction that will insure serviceable pavements at the lowest possible costs.

Official Classification of General Contractors

The Bulletin, official publication of the General Contractors' Association of America, has suggested and advocated that contractors be classified according to financial responsibility and business experience as a means of contributing to the welfare alike of the public and the contracting profession. The points of view, respectively, of the head of a large construction company and the editor of a magazine appear to E. T. Thurston, a writer, to involve a certain lack of appreciation of the basis of the building business. In this Mr. Thurston is prompted to offer the following remarks:

Ever contractor invited to bid on a job has the right to expect an equal chance with every other contractor. This necessarily involves (1) absence of prejudice on the part of the owner and (2) identical terms and conditions for all bidders. It is the private owner's privilege to include or exclude bidders at will, but some general, impartial way of selecting desirable bidders must govern public work. In either case the fact that a contractor is officially invited or permitted to bid should be considered **prima facie** evidence of his desirability as contractor for the work from the standpoint of the owner. This means no less than that the lowest regular bidder is entitled to the award of the work, provided, of course, he be able to qualify by signing a proper contract and furnishing the necessary bond or other security. Any owner, having received competitive bids, who refuses to award the contract to the lowest bidder competent and willing to qualify as such is guilty of misrepresentation and fraud, unless the aforesaid low bidder is given suitable compensation for his estimate.

Having disposed of the ethical fundamentals, let us consider how bidders may be intelligently selected:

For public work, it is submitted that the only measurable responsibility is financial responsibility, whereas for private work the personal element and the matter of professional and business reputation may properly be considered as even more important than large material resources. In fairness, we see no escape from the universal practice of insuring the responsibility of a bidder on public work by requiring of him a bidder's bond or a certified check. If previous experience with a proposed bidder has resulted in prejudice against him on the part of the public body, the public should have the same authority to refuse him the privilege of bidding as to refuse to award him the contract if his bid is low, and the former procedure would surely be more ethical than the latter.

There are various sources of information available to the private owner for the determination of the responsibility and desirability of any contractor whom he may have under consideration as a bidder; such as his architect or engineer and his banker. Owners and their architects and engineers should be made to realize that they may not invite and receive competitive bids from contractors without obliging themselves to award the work to the contractor submitting the lowest regular bid. By "regular bid" is meant one in strict conformity with the specifications and the call for bids.

The writer sees no merit in the suggestion that contractors be classified according to years of experience and gross annual business. Large personal assets or sheer luck may enable a poor, inefficient contractor to continue in business many years and to carry out successfully, from the owners' standpoint, a large volume of work, whereas limited assets or misfortune may seriously hamper the business of the most efficient contractor. In general, if a contractor pays his bills, no other assumption is warranted than that his business is a financial success. Responsibility is ability and willingness to meet one's obligations. From the layman's standpoint these obligations are in fact exclusively financial. Every contractor knows that years of experience alone will never make a high-grade contractor. Ability, intelligence and integrity are also needed. Every contractor also knows that no amount of ability is absolute assurance against error in estimate and bid. Furthermore, every business man knows that personal endorsements as to moral responsibility and capability are themselves in general irresponsible and as unreliable as they are easy to get. Many years of membership in the American Society of Civil Engineers has convinced the writer that such membership has little influence in securing commissions from laymen; much less influence has one's relative classification therein.

Securing business on a profitable basis is purely a matter of salesmanship, no matter what the line. The keenest, most experienced business man and the most timid, unsophisticated member of society alike capitulate to the clever salesman.

It appears to the writer that contractors give too much attention to the matter of interest and convenience of the owner, who would be more safely left to his own devices.

Standard Directory American Architects

(Continued each month until completed)

ALABAMA.

AUBURN—
Biggin, Frederic.
BIRMINGHAM—
Breeding, H. D., Watts Bldg.
Brodie, T. L. (Church Work), Jefferson Co. Bank Bldg.
Greene, J. E. (Church Work), 1204 13th Ave. N.
King & Burnham, Jefferson Co. Bk. Bldg.
Knight, Eugene H., 1607 Empire Bldg.
Maddox, J. M., Gate City Rd.
Martin, Hugh, Title Guaranty Bldg.
Mewhinney, Woodward Bldg.
Miller, J. A., Title Guarantee Bldg.
Rayfield, W. A. & Co. 105 1st Ave. S.
Ranger, J. G., 1118 Princeton Ave.
Warren, W. T., Empire Bldg.
Welton, Wm. Leslie, Am. Trust & Savings Bank Bldg.
Wheelock, H. B., Steiner Bldg.
Woodman, D. O., Title Guarantee Bldg.
HUNTSVILLE—
Love, Edgar L.
MOBILE—
Dowey, Alois H., 111 S. Franklin.
Hutchisson, C. L. Emanuel Bldg.
Rogers, Geo. B. Van Antwerp Bldg.
MONTGOMERY—
Ausfeld, Fred'k, Bell Bldg.
Galliher, C. F., First Nat. Bank Bldg.
Lockwood, Frank, 121 Adams.
Oke & Cooper, Vandiver Bldg.
Smith & Carter, 21 Dexter Ave.
TUSCALOOSA—
Ayres, C. M.

ARKANSAS.

FORT SMITH—
Chisholm, A. C., 801 Garrison Ave.
Klingensmith, A., Merchants' Nat'l Bank Bldg.
HOT SPRINGS—
Beaty, C. N.
Hart, Frank J. W.
Horn, J. G.
JONESBORO—
Mitchell T. Edison.
LITTLE ROCK—
Almond, John Parks.
Blasdell, Frank M.
Bliss, J. H.
Dill, Wm.
Lawson & Wittenberg.
Gibb Frank W. & Co.
Mann & Stern.
Sanders & Ginocchio.
Thompson & Harding.
Watts, Charles.
PINE BLUFF—
Seligman, Mitchell.
TEXARKANA—
Moore, Stewart.
Witt, Seibert & Co.

DELAWARE.

DOVER—
Hirons, J. A.
GEORGETOWN—
Jones, Charles R.
WILMINGTON—
Brinckloe & Co., 5th & Shipley.
Brown & Whiteside, Du Pont Bldg.
Cloud, Newton H., 2627 W. 18th.
Hanse, Wallace E., 204 W. 24th.
Kennedy, John J., Ford Bldg.
May, Edward C., Du Pont Bldg.
Rhodes A. Edward, Masonic Temple.
Rice, Edw. L., Jr., 815 Market.
Rogers, Laussat R., 911 Market.
Thompson, Jno. D., Jr., Ford Bldg.
Tindall, Roscoe C., 914 Orange.

DISTRICT OF COLUMBIA.

WASHINGTON—
Adams, Percy C., Woodward Bldg.
American Institute of Architects, New York Ave.
Atkinson, A. S. J., 3801 Macomb, N. W.
Atkinson, R. B., 818 Conn. Ave., N. W.
Baldwin, Frank C., 816 Conn. Ave., N. W.
Beaux-Arts Atelier, 1504 H., N. W.
Boal, Theo. D., 1712 H., N. W.
Breuninger, H. L., Colorado Bldg.
Brink, E. P. & Son (& Builders), 817 11th, N. W.
Brooke, Fred'd H., 1218 Connecticut Ave.
Brown, B., 806 17th, N. W.
Brown, Glen, 806 17th, N. W.
Brown, Ward, 1725 H., N. W.
Clark, Appleton P., Jr., 816 14th, N. W.
Cooper, George S., 1313 N. Y. Ave., N. W.
Cooper, Jas. E., District Nat'l Bank.
Cunningham, H. F., 1742 M., N. W.
Cutler & Woodbridge, 13th & N. Y. Ave., N. W.
De Sibour, Jules H., Hibbs Bldg.
Deming, W. I., 808 17th.
Diamond, I., 504 E., N. W.
Donn & Deming, 808 17th, N. W.
Donn, J. M., 1742 M., N. W.
Fitz Simons, A. Burch, Colorado Bldg.
Fleming, Wm. H. Irwin, 1504 H., N. W.
Gay, Chas. M., 1729 P., N. W.
Geare, R. W., Woodward Bldg.
Gregg, Chas., 1320 N. Y., Ave., N. W.
Gregg & Leisenring, 1320 New Ave., N. W.
Grimm, Nicholas R., McLeon Bldg.
Guss, Walter G., Maryland Bldg.
Harding, C. S., 729 15th, N. W.
Harris, A. L., Wilkins, Bldg.
Hatton & Co., 1200 U., N. W.
Heister, M., Union Sav. Banks Bldg.
Hornblower & Marshall, Wilkins Bldg.
Julien, P. M., New Com'l Bank Bldg.
Kendall & Smith, Southern Bldg.
Leisenring, L. M., 1320 N. Y. Ave., N. W.
Lepley, Matthew G., 3509 New Hampshire Ave.
Lyles, J. E., 734 8th, N. W.
Marsh & Peter, 520 13th, N. W.
Marsh, W. J., 520 13th, N. W.
Marshall, James Rush, Wilkins Bldg.
Meyers, B. Frank, 1033 Pack Road.
Milburn, Heister & Co., Union Sav. Bank Bldg.
Miller, Otho, Harvey, McLachlen Bldg.
Moore, M. F., Colorado Bldg.
Moss, L. R., 901 20th, N. W.
Mullett, A. B. & Co., Union Trust Bldg.
Murphy & Olmstead, 1413 H., N. W.
Olmsted, W. B., 1413 H., N. W.
Peaslee, Horace W., 1504 H., N. W.
Peter, W. G., 520 13th, N. W.
Pierson, F. G., Wash. Loan & Trust Bldg.
Poole, T. H. & Co. Colorado Bldg.
Pyle, Fred'k B., Evans Bldg.
Reynolds & Reynolds, 748 Lamont, N. W.
Russell, Lewis H., 3916 N. H. Ave., N. W.
Santmyers, Geo. T., 921½ N. Y. Ave., N. W.
Schneider, Ferd. T., 1314 F., N. W.
Simmons, B. Stanley, District National Bank Bldg.
Smith, D. L., Union Trust Bldg.
Smith, Marshall J., Colorado Bldg.
Sonnemann, Alex H., 2400 16th.
Speiden & Speiden, 1403 N. Y. Ave., N. W.
Supervising Architect, U. S. Treasury Annex.
Talbott, Wm. R., 1314 F., N. W.
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Upman, Frank, Woodward Bldg.
Vogt, Oscar G., Home Life Bldg.
Waggaman, Clark, 1742 M.
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Weng, Julius, 721 10th, N. W.
West, Cloughton, Homer Bldg.
White, F. R., 1314 F., N. W.
White, J. G., 818 Conn. Ave., N. W.
Wilson & Hamilton, Wash. Ln. & Tr. Bldg.
Wood, Waddy B., 816 Conn. Ave., N. W.
Wyeth, Nathan C., 1517 H., N. W.

FLORIDA

Registered Resident Architects in Florida.

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Avery, Lester, Clearwater.
Ballard, Agnes, W. Palm Beach.
Benjamin, R. A., Jacksonville (Greeley & Benjamin).
Benjamin, M. E., St. Petersburg.
Bigger, John W., West Tampa.
Bodine, F. V., Orlando.
Bonfoey, B. C., Tampa.
Bryan, T. M., Gainesville.
Buckley, Ashbury W., Miami.
Cairns, John, DeLand.
Carr, W. H., St. Petersburg.
Childs, G. Sherman, Lake Worth.
Cole, A. N., Jacksonville.
Curtis, F. M., Tampa.
Davison, C. M., Miami.
DeGarmo, W. C., Miami.
Dozier, Henrietta C., Jacksonville.
Dupont, H. H., St. Petersburg.
Eckler, W. B., W. Palm Beach.
Ehmann, E. A., Jacksonville (Geo. O. Holmes & E. A. Ehmann).
Elliott, M. Leo, Tampa.
Ernst, Erich B., Miami.
Espedahl, Jacob, Daytona.
Feltham, George, St. Petersburg.
Ferdon, Edgar, St. Petersburg.
Fink, H. Geo., Miami.
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Frederic, W. C., Pensacola.
Fuquay, D. F., Daytona Beach (Fuquay & Gheen).
Gambier, Richard B., Tampa.
Geiger, August, Miami.
Gheen, F. D., Daytona Beach (Fuquay & Gheen).
Gove, S. H., Daytona.
Greeley, Mellen C., Jacksonville (Greeley & Benjamin).
Hall, H. N., Sarasota.
Hampton, Martin L.
Hawkins, J. H. W., Jacksonville.
Henderich, Fred A., St. Augustine.
Hey, Henry T., Pensacola.
Hilburn, Geo. N., Tampa.
Hollingsworth, F. A., St. Augustine.
Holmes, Geo. O., Jacksonville (Geo. O. Holmes & E. A. Ehmann).
Holmes, Rutledge, Jacksonville.
James, Fred J., Tampa.
Johnson, A. H., Tampa.
Kennard, F. J., Tampa.
King, Murray S., Orlando.
Kitchell, Bruce P., W. Palm Beach.
Klutho, H. J., Jacksonville.
Krug, Geo. Edw. Orlando.
LaPointe, Henry, Miami.
Lewis, E. A. Miami.
MacDonough, A. J., Kissimmee.
MacDonough, G. M., Jacwsonville.
MacKay, Geo., Ocala.
Manley, Marion I., Miami.
Mark, V. Earl, Jacksonville (Mark & Sheftall).
Marsh, W. Mulford, Jacksonville Marsh & Saxelbye).
Mayer, Gordon E., Miami.
McCarrell, Henry, Lawe Wales.
McClarren, S. T., St. Petersburg.
Mizner, Addison, Palm Beach.
Moughton, Elton J., Ocala.
Mundy, H. M., Miami.
Newell, Frank V., Miami.
Nolan, E. A., Miami.
Ohlhaber, William, W. Palm Beach.
Park, Linus H., Avon Park.
Parslow, F. D., Tampa.
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Pfeoffer, Geo. L., Lemon City.
Poteet, A. J., Lakeland.
Powell, Jefferson D., Jacksonville.
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Swarz, August, Pensacola.
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Williams, Owen J., W. Palm Beach.
Wyeth, M. S., Palm Beach.
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Bencker, Ralph B., Philadelphia, Pa. (McLanahan & Bencker).
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Elliott, J. B., Pittsburgh, Pa. (Kiehnel & Elliott).
Frehling, Walter, Altoona, Pa.
Garfield, Abram, Cleveland, Ohio.
Humphrey, J. C., Buffalo, N. Y.
Hunt, R. H., Chattanooga, Tenn.
Hunter, Edgar O., Indianapolis, Ind. (Rubush & Hunter).
Hutton, L. P., New York, N. Y.
Ingle, John W., New York, N. Y.
Ittner, Wm. B., St. Louis, Mo.
Jonsberg, Frank F., Boston, Mass.
Kiehnel, R., Pittsburgh, Pa. (Kiehntl & Elliott).
Lynch, H. H. H., St. Louis, Mo. (J. Hal Lynch & Son).
Lynch, J. Hal, St. Louis, Mo. (J. Hal Lynch & Son.
Mackenzie, Clinton, New York, N. Y.
McGuire, Wm. E., Indianapolis, Ind. (McGuire & Shook).
McLanahan, M. Hawley, Philadelphia, Pa.

(McLanahan & Bencker).
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Perring, H. G., Baltimore, Md.
Preacher, G. Lloyd, Augusta, Ga.
Ritchie, James N., Boston, Mass.
Robinson, Arthur N., Atlanta, Ga.
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Sayward, Wm. J., Atlanta, Ga. (Edwards & Sayward).
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Mauer-Knoblock-Simank.
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Uniform Contract Form for the Heating Contractor.

The uniform contract form for heating contractors is a recent product of the Trade Extension Bureau in its nation-wide campaign for standardization of methods and for improvements of business in the heating trade. The Bureau's explanation of this new form is given in the following reprint from its Monthly Service Bulletin:

"This form carries with it all of the conditions and is recommended as adopted by the Heating and Piping Contractors' National Association. Much credit is due that organization, for the major portion of the conditions and terms included in the contract form herewith produced.

"The Bureau recommends that over printing on these contracts be eliminated. That is, it is our opinion that the heating contractor will have less difficulty in getting signatures to this contract, if his own name, or his firm's name is eliminated from the top.

"Printed in the form recommended, the heading would indicate that it is a 'uniform contract form' adopted by a national organization and by using a uniform contract of this character, the average buyer will take it for granted that all of the conditions printed on the back of the contract are standard conditions and therefore accept them without argument."

On the reverse side of the form is printed the set of standard conditions. These forms are now available on application to the Trade Extension Bureau, Evansville, Ind. They are furnished in pads of 50 sets (original and duplicate forms) to the pad, at $1.25 per pad or $2.50 per hundred sets. The Bureau requests that remittances accompany orders.

Wonderful Operations at Miami.

The Miami, Florida Herald says that "building operations in Miami for the four months are wonderful." The newspaper adds that new structures are to be seen in every direction and that permits show that hundreds of thousands of dollars are invested." Withal, it is declared that the "best months are to come." The Herald's story is a general one, and does not go so much into figures as details, showing that the work of construction is general in that city and suburban sections near. Hotels, apartment houses, business blocks, stores, dwellings and bungalows and cottages show in the records of new buildings, and the activities appear to be increasing as the summer comes on. According to the Herald there is much more in prospect for Miami during the next few months.

ALPHABETICAL DIRECTORY OF ADVERTISERS