REINFORCED CONCRETE CONSTRUCTION—LEWIS G. HICKS, C. E.

The Architect and Engineer of California

VOL. II SEPTEMBER, 1905 No. 2

BURNHAM—HIS PLAN FOR SAN FRANCISCO—THOMAS M'CALEB.

THE HOUSE BEAUTIFUL—CHARLES P. WEEKS, ARCHITE

The Architect and Engineer
Of California

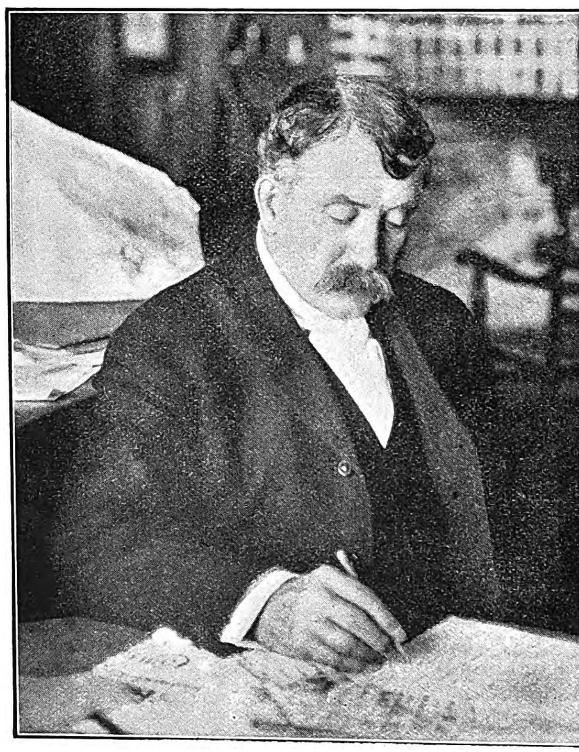
Issued monthly in the interests of the Architects, Constructing Engineers and Contractors, and the Allied Trades of the Pacific Coast.

Terms of subscription, $1.00 per year.

Single Copies, Fifteen Cents.

Offices { 215 Sansome Street, San Francisco, Cal., Telephone Davis 945.
142 S. Broadway, Los Angeles, Telephone Home 5747.

Contents for September



Mr. Daniel H. Burnham

The Architect and Engineer
Of California

VOL. II SEPTEMBER, 1905 NO. 2

Burnham — His Plan for San Francisco

By THOMAS M'CALEB

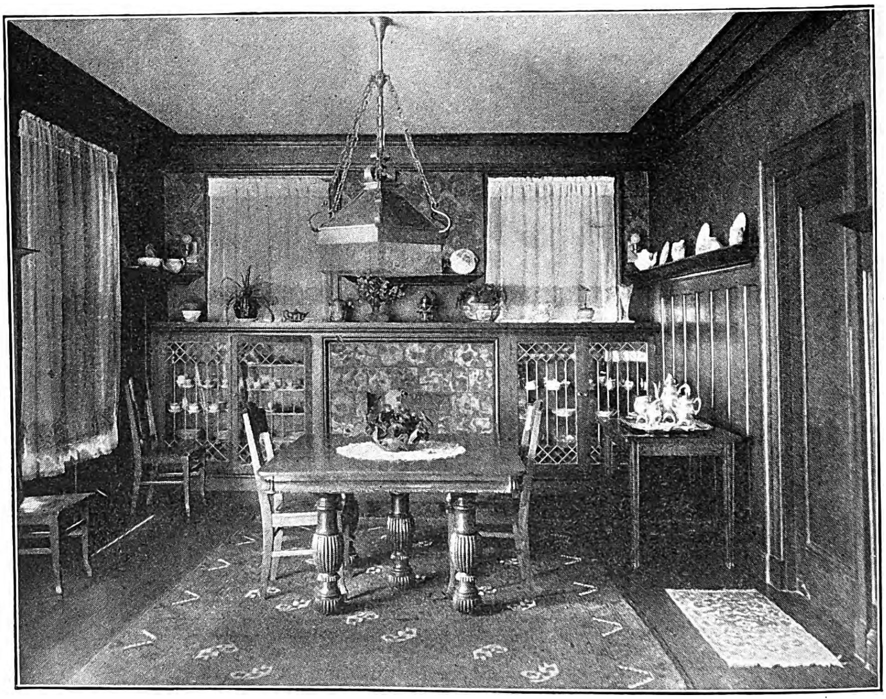
MEN of surpassing eminence in their profession are not always well known to the general public. While the late James C. Carter, of New York, was the recognized leader of the American bar for the past decade, how few men, except lawyers, had ever heard of him! How many of us know of Dr. William T. Bull, the greatest New York surgeon? And until the comparatively recent newspaper exploitation of Luther Burbank, the fame of the California wizard of horticulture had not become widespread.

Similarly, there are those amongst us to whom Daniel H. Burnham was little more than a name, prior to his engagement by the "Association for the Improvement and Advancement of San Francisco" to prepare an elaborate plan upon which to base all our future municipal improvements. True, we may have heard of him as the designer of the Mills Building in this city, but beyond that he was little known to us.

It is not surprising, therefore, that although he had been recognized by his brother architects throughout the country as one of the foremost of their craft, a few local men, doubtless inspired by jealousy, and taking advantage of the public's lack of information as to his abilities, had seen fit quite recently to endeavor to belittle his importance. But his life labors are the best answer to these critics.

What has been his career? In the first place, he is a former president of the American Institute of Architects, as well as a founder and trustee of the American Academy at Rome. And no man in his profession—not even Richardson or McKim—has done more to adapt the classical models of architecture to up-to-date practical needs; for he is the father and actual inventor of the modern fire-proof office building. Moreover, his genius directed and designed the famous "White City" of the Chicago Fair, perhaps the greatest architectural triumph of the last century.

Having in recent years made the planning of cities his specialty, he has been chief of more architectural commissions than any man of his generation. He was authorized by an Act of Congress to prepare a scheme for the grouping of government buildings and the park adornment of Washington, in which he was aided by Messrs. Charles F. McKim, Augustus St. Gandans and Frederick Law Olmsted. He was also the head of the commis-



Dining Room in Residence of L. I. Cougill *Sutton & Weeks, Architects, S F.* C-185

sion that drafted the "Civic Center" for Cleveland, now in course of construction, admittedly one of the greatest designs in civic adornment ever proposed.

He has just completed a magnificent scheme for the reclamation and extension of Manila, made at the instance and by appointment of the Secretary of War. He has also made plans for portions of Chicago, now being carried out.

His most recent achievement in pure architecture is the Field Museum, in Chicago, the gift of Marshall Field to that city; its cost when completed is estimated at about $8,000,000. The designs have been pronounced by the architects who have seen them as the most beautiful of their kind on this continent. Mr. Burnham also planned the famous Flat Iron Building of New York, the most notable "sky scraper" in the world, also the new grand Union Station at Washington.

He won the competition, entered into by eminent fellow architects, for the reconstruction of the buildings of the United States Military Academy at West Point; and fine examples of his work are to be found in all leading American cities. Among these might be mentioned the Land Title Building in Philadelphia, Ellicott Square in Buffalo, and the Railway Exchange in Chicago.

Whether as architect or construction engineer his title to "master" cannot be gainsaid; and particularly considering his brilliant achievements as a designer of cities, the "Adornment Association" knew it was not experimenting when it assigned to him the task of directing and executing a comprehensive plan for the reconstruction of San Francisco on artistic lines. The preparation of this plan has been going on now for nearly a year, but it will be finished within three weeks, when it will be formally presented to the municipality. And later a report, explaining its scope and purposes, and pointing out as far as possible the needs of the city, will be issued as a municipal publication, the Board of Supervisors having appropriated $3,000 out of this year's budget for that purpose.

While the plan will serve as a guide for all our future municipal betterments, it will at the same time (so far as I am able to judge after just seeing it in its almost completed state) interfere as little as possible with present conditions; nor will it, therefore, impose too great or unreasonable a tax upon the financial resources of the City.

Unfortunately San Francisco is handicapped by a rectangular street system which somewhat hinders intercommunication and causes traffic congestion at certain business centers. This difficulty Mr. Burnham has in great measure overcome by proposing a girdle of roads drawn about the city, the whole to be known as the Outer Boulevard. Beginning at the foot of Market street this boulevard will follow the water line of the peninsula and wend its way inland into the Lake Merced District, until it reaches Sierra Point and the place whence it started, thus affording a pleasant means of communication from one district to another.

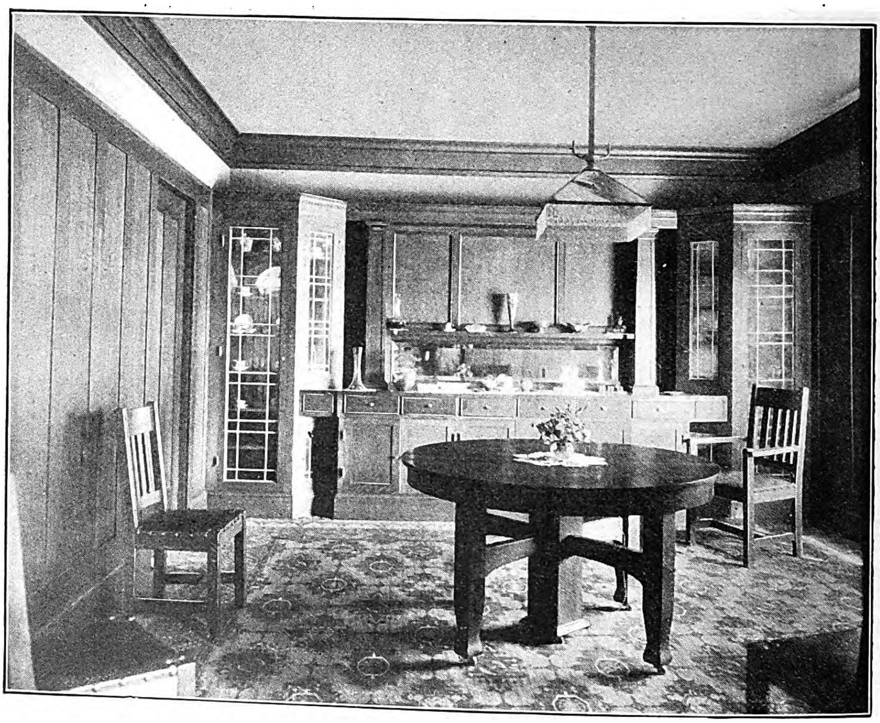
Diagonal streets and parkways are to be "cut" in all parts of the city; but the most important of the proposed arteries will be the extension of the Panhandle from its present terminus at Baker Street to the intersection of Market Street and Van Ness Avenue. At this point the Civic Center—that portion of a city which plays the most important part in urban life—will meet eight thoroughfares, to wit: Market Street, the Panhandle, Van Ness Avenue, the prolongation of the Panhandle to the Pacific Mail Dock, a prolongation of Van Ness Avenue south of Market Street, a diagonal to the City Hall, Eleventh Street, and a prolongation of Eleventh Street north of Market Street.

This treatment is typical of what has been planned for every section of the city; for in all the important districts there are somewhat similar points radiating from them in every direction.

The plan also calls for a creation of public parks and playgrounds in all sections, as well as the terraced treatment of the hills that are such a distinguished physical characteristic of the city. The recommendations for beautifying Twin Peaks are especially elaborate, and involve the construction of an amphitheatre, an academy, a maternity and an athenaeum.

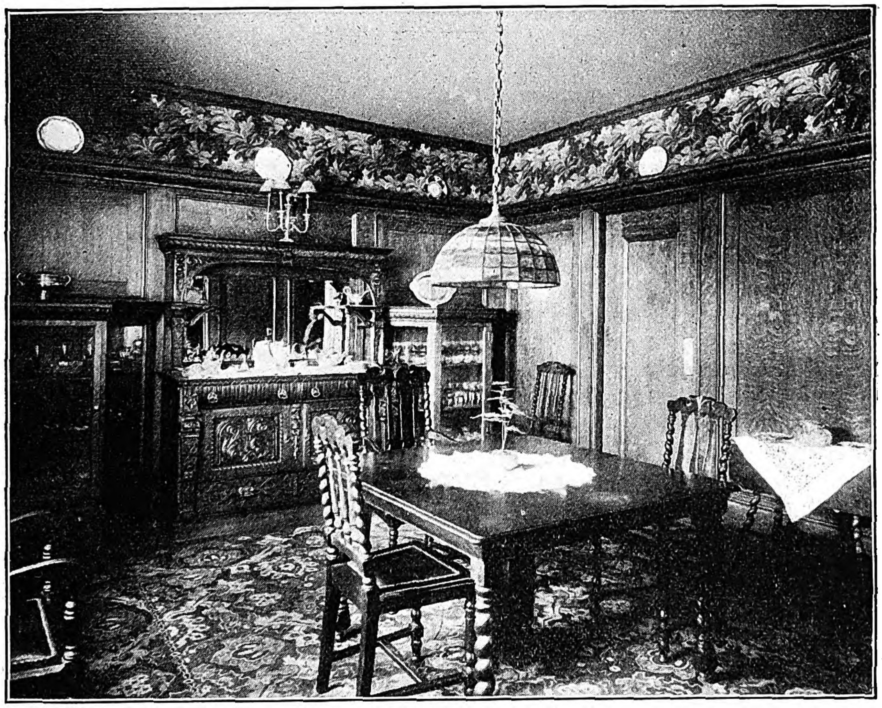
In his report, too, which will be included in the plan, and follow its presentation, Mr. Burnham has given us the benefit of his expert studies in older and more finished cities; for it will contain suggestions on such subjects as the uniformity of the height of public buildings, the arrangement of hospitals, of cemeteries, the abatement of the smoke nuisance, the excavation of hills, pavements, public nuisances (such as obnoxious bill boards, signs and street advertisements), cornice heights, floral adornment of house fronts, windows and balconies, the use of statuary in parks, restriction of heavy traffic on certain boulevards, a discussion of the question of the water supply, etc., etc.

From the few subjects briefly referred to in this article, out of the hundreds with which Mr. Burnham has been dealing since his advent amongst us, it will correctly be inferred that only a small part of his scheme can reasonably be carried out in this generation; but if there be a unanimity of sentiment in favor of his projects, and if our leaders in this movement be not hampered by vain rivalries or petty jealousies, we will no doubt witness a sufficient transformation, even in our own time, to warrant us to acclaim San Francisco the "City Beautiful."



Dining Room in Residence of Mr. Balsom *Su'ton & Weeks, Architects, S. F.* C-136

Living Room in Residence of Albert Sutton *Sutton & Weeks, Architects, S. F.* C-137



Dining Room in Residence of Albert Sutton — *Sutton & Weeks, Architects, S. F.* C-138

The House Beautiful

By CHARLES P. WEEKS

A SUCCESSFUL house is one that is both practical and beautiful. The practicability is obtained by laying out the plan in such a way as to get the correct juxtaposition of its parts. The hall in right relation to living room and kitchen; the bath to bed rooms, etc.

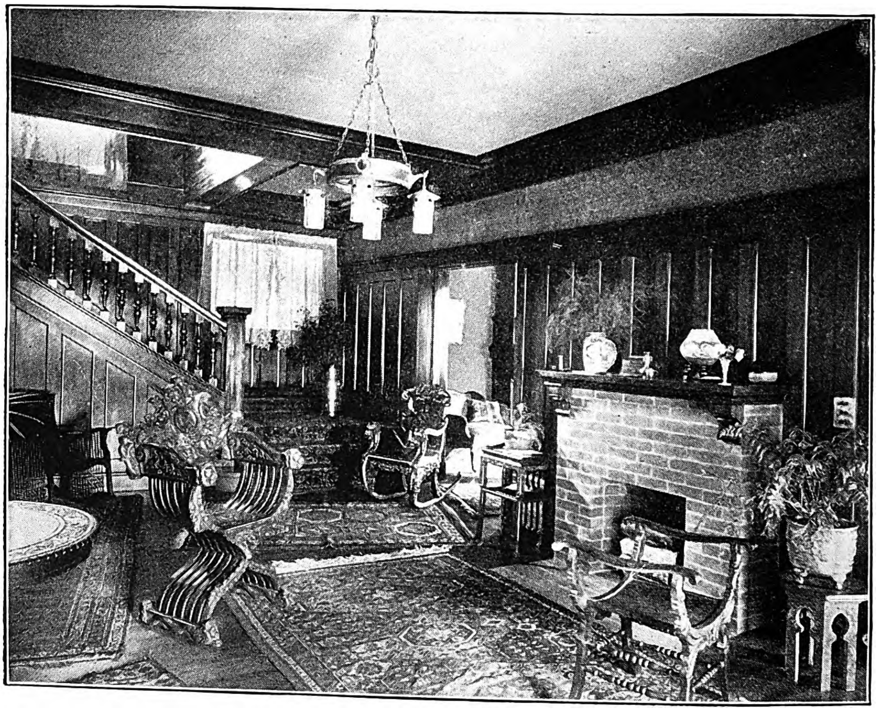
Beauty is obtained by correct proportions of the different rooms, right spacing and size of openings, and carefully selected colors.

It sometimes happens that beauty beckons like vice, one way, and the practical requirements the opposite, like sturdy virtue. It is always wise to be practical; for beauty without virtue is a continual annoyance.

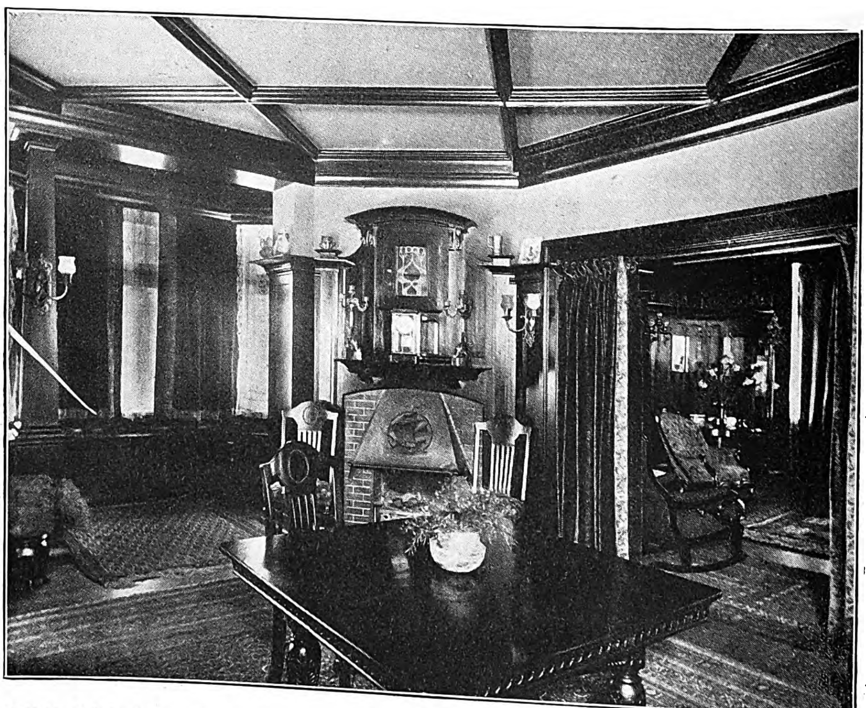
An English country house illustrated in a recent publication, had its dining room so planned as to make it necessary to go from it to the kitchen by way of the main hall. What beauty could make up for this continual source of annoyance?

The desire for the picturesque is always tempting the artist to sacrifice the practical question. As an example: Stairways leading from living rooms, a means by which the English architect secures some of his principal charming effects, are really day in and day out impractical. On the other hand, it is very difficult to make a successful room out of a square box.

Simplicity and naturalness must be the guides to all decisions in decoration. The tendency is to over do. Woods must be treated to imitate other



Hall in Residence of L. I. Cougill *Sutton & W eks, Architects, S. F.* C-139



Artistic Dining Room in Residence of John Sutton *Sutton & Weeks, Architects, S. F.* C-140 woods; papers to imitate other materials, etc., etc. Deception. An attempt to make thirty cents look like a dollar. It does not deceive, it only disgusts the beholder.

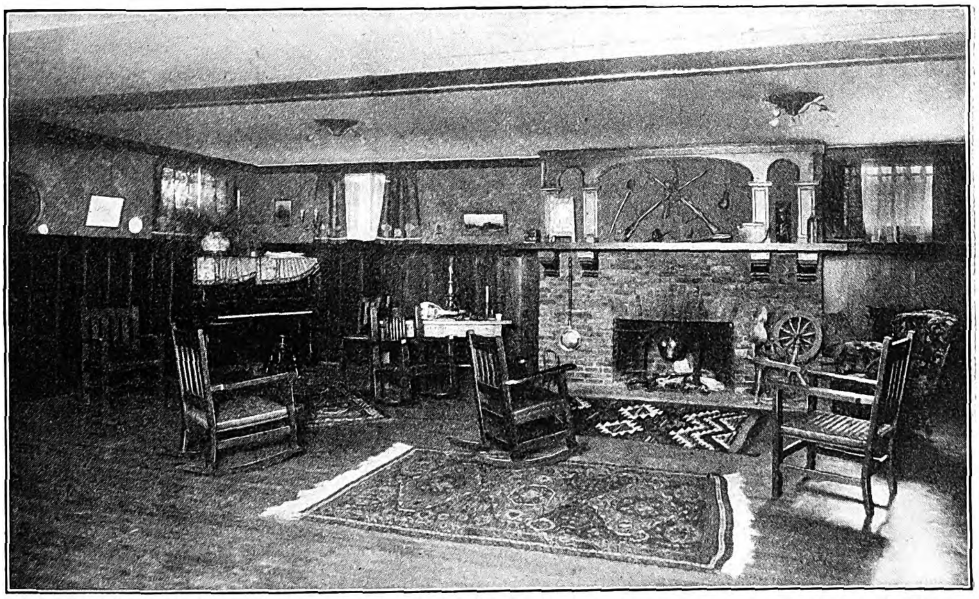
Natural woods in natural finish are intrinsically beautiful. What is more beautiful than the soft red-brown tones of redwood in its natural finish, and what more ugly than the same wood highly varnished?

The world is continually flying to fads: Cosy corners, plate shelves, imitation this, and imitation that, and at last, sick to death of the artificial she comes back to the simple honest truth, and it is at these times of depression that the best work in art, is done.

Another grave mistake made by many home builders, is that after adopting the architect's suggestions and ideas as to the design of their houses, the detail of the inside finish, and even the color of the woodwork, they then suddenly take the completion of their decorations into their own hands, select their own papers, rugs, furniture, hangings, etc., without once consulting the designer as to what his ideas on these subjects were, when he laid out the work, for one naturally must take all of these things into consideration when designing.

Another difficulty of the decoration, is attempting too great a variety of color.

In sum: Study your own requirements, plan to meet them, allow the structural part of your design to be its decoration. Use simply and sparingly of color, and be honest. Contrasts of color are very difficult to handle. A variety of tones of the same general color is much safer.



Billiard Room in Residence of L. I. Cougill — *Sutton & Weeks, Architects, S. F.* C-141

Test Loads of Piles Driven with a Steam Hammer

By JAMES J. WELSH, Member of the Technical Society of the Pacific Coast

THE lot on which this piling was done is the southeast corner of Spear and Market Streets, San Francisco, and was formerly a part of the bay which was gradually filled in, the lot therefore being "made ground."

After six piles had been driven it became evident that the ground was exceedingly soft, and inquiry among architects, engineers and pile-driving firms showed that the ground here was much more yielding than the surrounding area. This may be explained by the manner of filling in. At that time the lot was occupied by houses on stilts and the sand and rubbish were dumped around the stilts, causing the soft mud to rise almost to the same level under the houses without materially compressing it.

The new building was to be of brick and six stories in height, making necessary a careful determination of the actual resistance of the piles. The softest spot was found by driving piles in a number of places. Here a pile and follower were driven down 105 feet, without finding a hard stratum. The following day another pile was driven, which sank 1 foot in the last two blows. On the next day it required 16 blows to sink this pile 1 foot, the first three blows having no apparent effect, while the fourth blow started it.

It was decided, as a third test, to load four piles. In order to make the conditions such as would exist under a pier 11 piles were driven into a trench. The four outer ones were left 18 inches higher than the others, so as to bring the bearing only on these four and give them the benefit arising from the consolidation of the material near them.

The piles were Oregon pine, 70 feet long, and were 12 to 14 inches at the butts and 6 to 8 inches at the point. The test piles were spaced 4 feet 8 inches on centers for the short span, and 7 feet 1 inch for the long span; on top of the four piles were set four steel plates 14x14 inches x 7/8 inch thick, and on top of these were placed two 15 inch I-beams, weighing 1,000 lbs. each, bolted together to each set of piles in the long span, and upon these were placed eleven I-beams, weighing 1,000 lbs. each, which formed the platform. Before putting the platform and pig iron on, levels were taken and bench marks made. The pig iron was brought to the grounds in trucks, and each load was weighed on public scales before being delivered.

The accompanying table gives (1) the conditions and results (actual loads and settlements) for each of the four piles, (2) the calculated safe load for each by three well-known formulas, and (3) the extreme load by the Trautwine formula, which is the only one of the three giving extreme load, defined by Trautwine as the load "that will be just at the point of causing more sinking."

The steam hammer, used with piles Nos. 3 and 4, was known as No. 1, the heaviest made. Total weight 9,850 lbs., length 12 feet, diameter of cylinder 13½ inches, normal stroke 42 inches, weight of striking part 5,000 lbs., distance between jaws, 20 inches, width of jaws 8¼ inches.

The steam hammer used is a gravity hammer, raised by steam, then automatically tripped. When the hammer reaches the pile it automatically opens up the steam, which raises it, consequently the motion is automatic, both up and down.

Now, if we figure the striking part of 5,000 lbs. as the hammer, we hardly measure the efficiency of the machine, important elements being the constant weight of 9,850 lbs. (nearly 5 tons) on the pile and the rapidity of the blows.

This machine could strike 65 to 85 blows per minute.

In "Engineering News" a comparison of the results obtained by steam and drop hammer is given. In this test a steam hammer, weighing 4,500 lbs. and having a stroke of 42 inches was used. From 48 to 64 blows, using a follower, were required to drive the pile the last foot. In the same soil and with a pile of the same dimensions, a test was made with a drop hammer weighing 3,000 lbs. and falling 30 feet. In this case 16 blows were required, using a follower, to drive the pile the last foot. As the ratio of blows without follower is as one to two, the number of blows required to drive these piles the last foot without a follower would have been only one-half as many. Again, in this case, the weight of the machine, being constantly on the pile, is not taken into consideration.

We can readily understand that formulas derived from tests made under different conditions, will vary considerably, and, as the circumstances vary so greatly, it is always well to allow a large margin in calculating the strength of a pile, and a superintendent in charge of the work must depend to a considerable extent upon his own judgment rather than upon results obtained by any of the formulas, and, if any doubt exists, make an actual test.

In conclusion, the results obtained by Wilcoxon & Kearns Co., of Pensacola, from an economical point of view, will be given.

The firm was engaged in the construction of a large wharf and warehouse for the L. & N. Railroad at Pensacola, Florida, which required 7,000 piles 60 to 80 feet long. A drop of 4,200 lbs. was started on a pile which had been half driven with a steam hammer. The hammer had a drop of 60 feet, and the pile only 1¼ inches penetration to each blow. The live oak cushion block was mashed into pulp. Another pile 75 feet long was driven

RESULTS OF TEST LOADINGS OF PILES WITH FORMULAS FOR BEARING POWER.

Pile Number.	Number of Blows Struck.	Type of Hammer.	Penetration* and Falls.	Time of Driving, Minutes.	w. Weight of Hammer, Pounds.	h. Final Fall, Feet.	$\sqrt[3]{h}$	s. Final Penetration,‡ Inches.	Safe Load, P, in Pounds. Sanders.	Engineering News. Drop.	Engineering News. Steam.	Trautwine.‡	First Day's Load, 80 Tons; Total, 41,800 pounds per Pile. Settlement, Inches.	Second Day's Load ** 144 Tons; Total, 80,640 Pounds per Pile. Settlement, Inches.	Extreme Load, P, by Trautwine's Formula.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	117	Drop.	24 inches per blow of 8 feet.	15	3080	12	2289	6	9240	10560	....	12958	⅛	⅛	51932
2	92	Drop.	72 " first blow, 5 feet. 18 " per blow, 9 blows 5 feet	3	3080	29	3072	9	14887	17864	....	12187	⅛	¼	48748
3	62	Steam.	513 " first blow. 24 " per blow, 3 blows.	2	5000	3.5	1518	6	4375	....	5738	13966	⅛	⅜	55864
4	120	Steam.	429 " first blow.	3	5000	3.5	1518	4	6562	....	8536	19552	⅛	½	205

*See also column 9. See also column 4.

‡Trautwine says: "As to the proper load for safety, we think that not more than one-half of the extreme load given by our rule should be taken for piles *thoroughly* driven in *firm* soils; not more than one-sixth when driven in river mud or marsh; assuming, as we have hitherto done, that their feet do not rest upon rock. If liable to tremors, take only *half* these loads." We here take safe load. P equals ¼ extreme load, P.

**Left on for a little over two weeks. No further settlement.

with the drop hammer without the hood. This took 50 minutes time after it was in the leads, and required 120 blows from the top of the 75 foot leaders. On the next pile of the same length, and 3 feet from the one driven, they used a steam hammer and drove it to the same depth with 130 blows in 90 seconds after it was in the leaders.

This pile had no broomage, while the one along side of it, driven with the drop hammer without a hood, was broomed over 3 feet. The piles were cresoted, and cost 50 cents per foot net, delivered on the grounds. In using the steam hammer throughout this work a saving of 21,000 feet of piling was made, at 40 cents per foot, or $8,400 total.

Since writing this paper the author has discovered that some of the piles has penetrated through old piles which had been covered up since the filling in. This accounts for the fact that these particular piles could not be driven with the drop hammer, while the steam hammer sent the piles clean through the old piles to the proper depth.

* Trautwine's Civil Engineer's Pocket Book, editions of 1902 and 1904, page 592, where the Trautwine formula is given in the form: $P = 2{,}240 \dfrac{0.023\, W \sqrt[3]{h}}{s + 1}$

† Engineering News, Dec. 20, 1888, page 511. For drop hammer, $c = 1$. For steam hammer, $c = 0.1$. See Engineering News, Nov. 17, 1892, page 470.

‡ (The factor of safety used in the Engineering News formula is 6.—Ed.)

The three formulas:

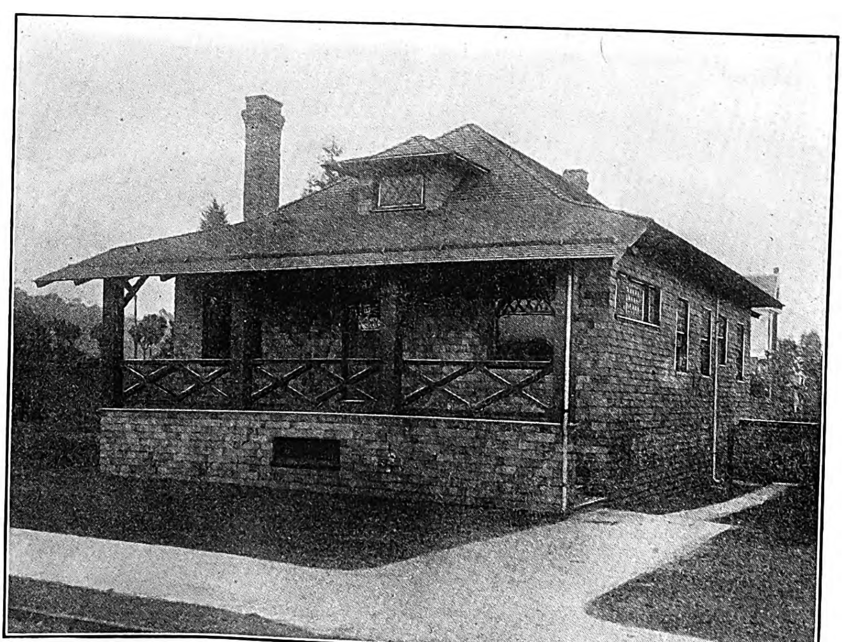
* Sanders. $p = \dfrac{12\, w\, h}{8s}$

‡ Engineering News, $p = \dfrac{2\, w\, h}{s + c‡}$

† Trautwine. $P = \dfrac{51.52\, w \sqrt[3]{h}}{s + 1}$

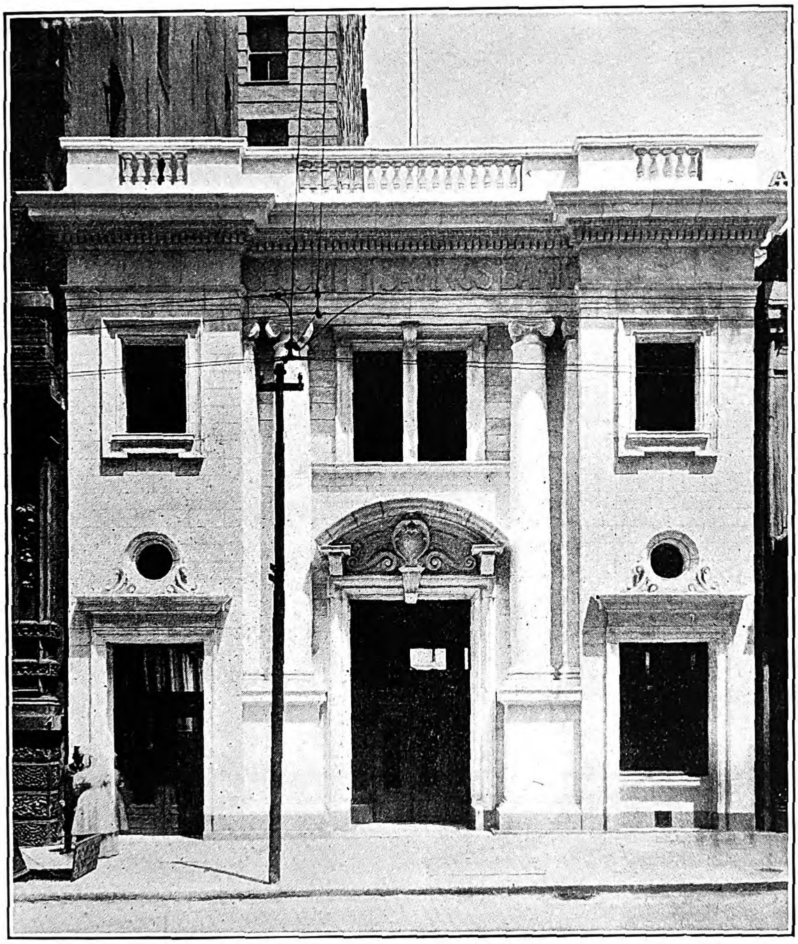
where

P equals the extreme load on one pile, in pounds;
p " the safe load on one pile, in pounds;
w " the weight of hammer, in pounds;
h " the fall of hammer, in feet;
s " the final penetration, in inches.



A Karl H. Nickel Bungalow

C-142

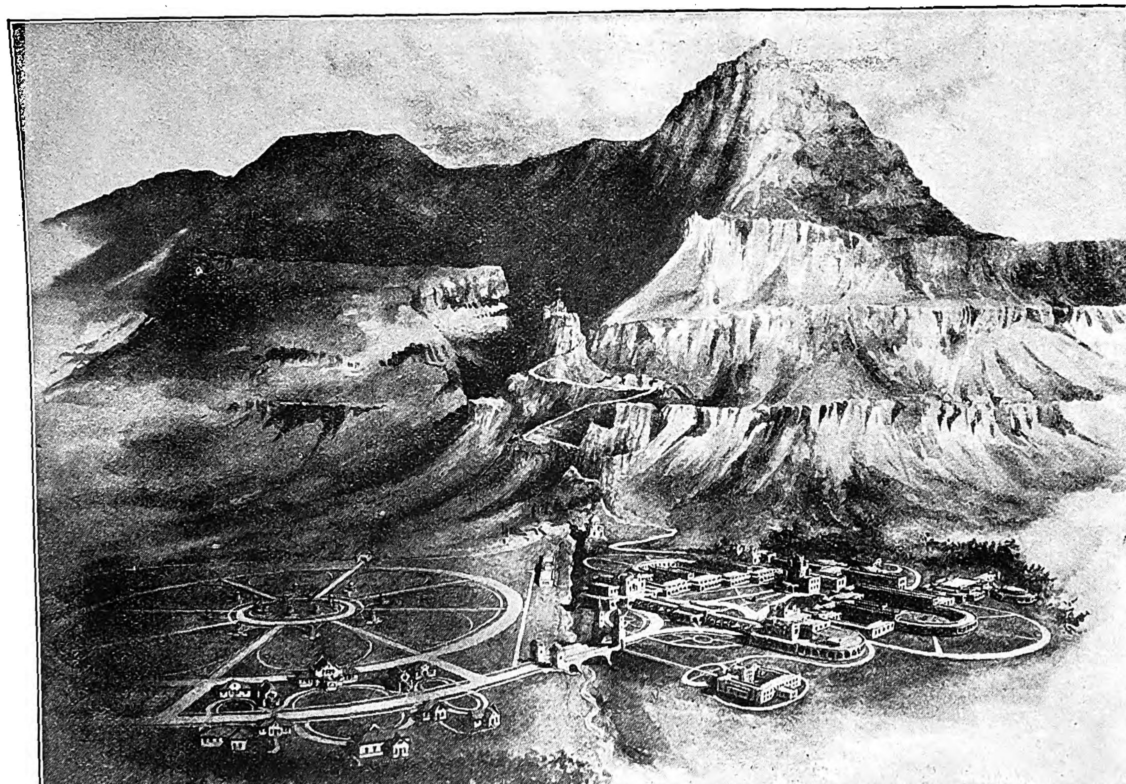


Securities Bank Building *Nathaniel Blaisdell, Architect* C-148

Home of the Securities Bank

ONE of the most substantial of the so-called class A buildings lately to be constructed in San Francisco is the building of the Securities Bank, on Montgomery street, near California street. It is of steel construction, with concrete floor, arches, terra cotta fireproofing and a street facing of white marble. The latter material is from Rutland, Vermont. The building is of the classical style, and on the Ionic order.

The plans were made by Architect Nathaniel Blaisdell, and the same substantial construction used on the exterior is followed in the interior work. The walls are broken at intervals with scagliola columns, and with lintels which divide the ceiling into deeply recessed and enriched stucco panels. Verde-Antique and Pavanazzo marble are used in the wainscoting, pedestals and base of the counters. The counter screen of the main banking room is of bronze, with bronze wickets and handsome plate glass enclosure, while the backing and fitting of the counter are of enameled metal, with steel curtains and steel lockers. The desks, tables and cabinets are of the same material.



Unique Plan for Sanatorium at Alamogordo, New Mexico — *Charles F. Whittlesey, Architect, Los Angeles* C-144

Sanatorium at Alamogordo, New Mexico

THIS group of buildings will cost approximately $1,000,000; will be built of reinforced concrete, and will constitute one of the most complete equipments for the purpose in the world. It is the intention of the builders to avoid the use of the word "Sanatorium," by coining the word "Climatorium."

The buildings cover an area of forty acres, located at an elevation of 4500 feet, at the base of the mountains, which shelter it from the prevailing winds.

In the general group of buildings, which are clustered around the Administration Building, are contained immense dormitories built around open courts (no part of which is more than two stories high), in which each suite has a private bath and an open loggia for sleeping out of doors.

Approaching the grounds by the boulevard from the City of Alamogordo, some three miles away, the grounds are entered through an archway with sentinel towers, beyond which a bridge is crossed over a deep Arroyo, through which a clear stream runs all the year round. On each side of the main driveway are the residences of the chief surgeon and the principal staff officers.

Beyond the bridge is a pergola, which connects the building on the left containing the theatre, library and reading rooms, and the building on the right containing the ball-room, gymnasium and winter garden. Beyond the pergola is an immense plaza, flanked by the dormitories. At the other end of the plaza is the Administration Building, to which the arcades on either side of the plaza converge.

At the rear of the Administration Building are the dining rooms, which are grouped around and served from one kitchen. These consist of the main dining room for the guests, dining rooms for the staff and house help, and another for the yard help. Beyond the kitchen are the laundry, boiler room and disinfecting building.

To the right of this group is the Recreation Building, containing billiard room, buffet and parlors for games. At the left is the chapel, mortuary and isolation wards.

There will be in connection with the buildings, as indicated on the drawings, a half-mile speeding track, surrounding a Cactus Park, which is dotted with kiosks for sun baths, an arena for outdoor games and a baseball diamond.

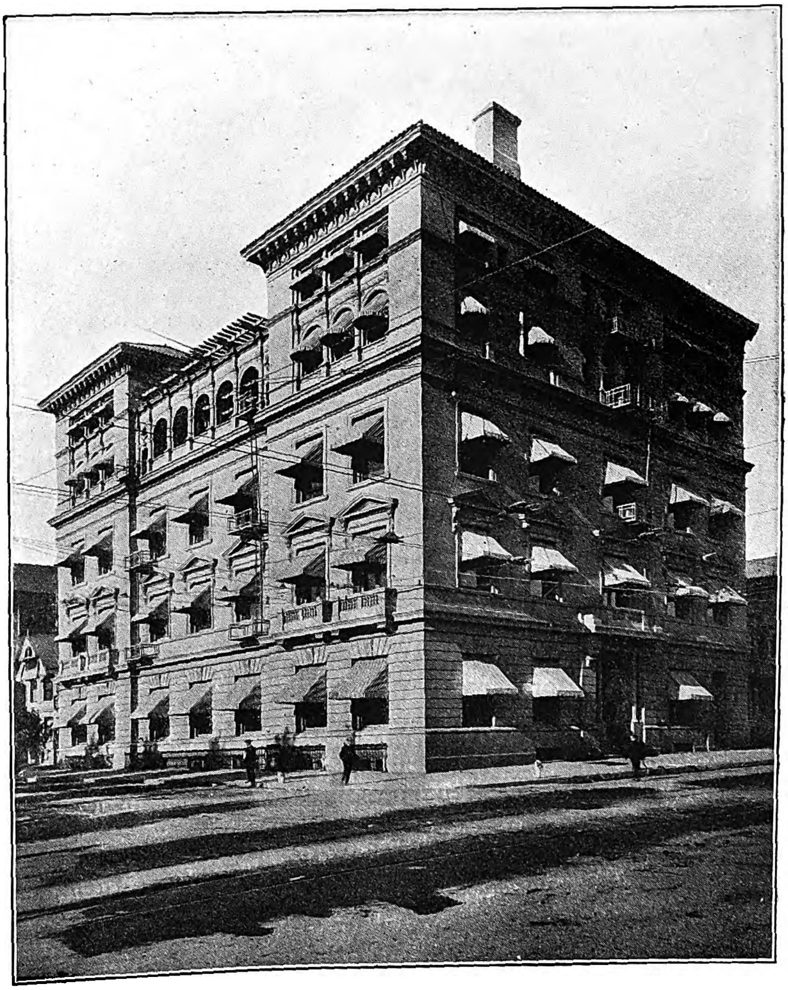
There are also automobile stables, mountain houses all the way up the sides of the foothills, with trails cut in the rocks leading to them, with little rest houses at the sides of the trail.

There are vegetable gardens and vineyards to be cultivated by irrigation from the reservoir built in the entrance of the canyon.

The plans of this gigantic enterprise are from the office of Architect Charles F. Whittlesey of Los Angeles.

❖ ❖ ❖

When Alexander asked his Aunt
What grew on an electric plant,
She answered, with some haste I fear,
"Why, currents I suppose, my dear."
—Childe Harold in Sunset Magazine for September.



California Club's New Home, Los Angeles *John Parkinson, Architect* C-145

Cement and Concrete

*Reinforced Concrete Construction

By LEWIS A. HICKS, Member Technical Society Pacific Coast

THE west, usually first to devise and adopt improved methods, has been slow to apprehend the merits of reinforced concrete, and even when engineers and architects are converts to its advantages, the difficulty in securing intelligent execution of work by reliable contractors, and the lack of standards, both as to specifications and practical methods, has retarded and prevented its use. The fact that it has been largely exploited in this country in conjunction with patented systems of floor construction has also operated to its detriment, for it has been very commonly the case that the commercial licensees of the various systems are not well informed as to the principles of design, and in their efforts to demonstrate the superiority of their own methods have made unwarranted claims which have not tended to establish the material in its proper place in the eyes of intelligent constructors.

Definite information is now available from actual tests in our college laboratories, that give us sufficient data to examine the general relations of stress and strain in transverse bending and the application of the simple fundamental principles that obtain with other structural materials are found to furnish rational solution for its problems.

The greatly extended use of reinforced concrete which has resulted from the rationalizing of its design data is amply in evidence from the many illustrations of its construction in the technical press, and from the flood of descriptive matter concerning it.

When the elementary principles of its correct design are within the knowledge of the engineering fraternity, and its phenomena of distortion under stress are known to be reliably reproducible, no argument is required to convince one of its prime importance in the list of materials available for engineering construction.

The factors combining to this result are economy in time and money due to the existence of the great bulk of materials where required as raw products; the possibility of assembling these materials with unskilled labor, by the use of machinery insuring uniform results; the supplementing of defects in the structural character of concrete by the use of small quantities of steel

*A continuation of this very interesting paper read by Mr. Hicks before the Engineering Congress at the Lewis and Clark Exposition will appear in the October number of The Architect and Engineer.

in the form of commercial shapes, everywhere available from stock; the substitution in many places of members of light sectional area, capable of withstanding known stresses to which they may be subjected, in place of heavier gravity sections required for other materials; its high value in fire-resisting and time-endurance characteristics, and, finally, the facility with which it may be adapted to the needs of rapid construction under intelligent, systematic organization.

Most engineers will concede its usefulness for dead loads in warehouse, powerhouse and other heavy construction. The latest expert testimony as to its fitness for live loads under the severe conditions of railway traffic is furnished by the report of the committee of the International Railway Congress at Washington, which finds favorably to its use for railway bridge work.

Weak design in this class of work, involving not only economic loss but the safety of human life, would be criminal, and the deliberate judgment of these experts should receive the consideration which their experience warrants.

The question at once suggests itself as to how far this conclusion can be applied to the construction of high buildings, where the conditions both as to property values and the responsibility for life are probably more acute than in bridge work. Here many will be dubious as to whether structural steel can be safely replaced with reinforced concrete, and those most familiar with building operations will be openly skeptical.

To examine briefly such data as may be available pertaining to the design of reinforced concrete cage construction is the purpose of this paper.

We will pass over the subject of foundation design, in as much as tension bars have already commenced to replace structural steel, by reason of the saving of time and depths, and because the data used for transverse bending stresses in the design for girders, beams and floor slabs, considered later, may be adapted to foundation work.

The next element to be considered in building work is naturally the design of columns, and the economic statement of the problem is whether we can, without loss of valuable floor space, substitute for steel, which under building conditions carries safe concentric loads of 12,000 pounds per square inch of sectional area, a combination of steel and concrete with a relatively low value of compressive resistance.

The best information available in the literature of the subject has its origin in the work of Considere, but its statement, like that of his conclusion regarding the increase of ductility of concrete by addition of steel, is paradoxical and misleading.

American experimenters have shown that the apparent increase of stretching power in tension members, which Considere regards as an actual change in the elastic characteristics of the concrete, is merely the distribution of the cracks present over the entire length of the members under stress, so that the total stretch is so subdivided that the cracks are invisible within working limits.

In the same way, the conclusions of Considere on the reinforcement of columns do not offer a complete analysis of the phenomena observed. Summarized, his conclusion is that ultimate columns resistance will consist of the sum of the compressive resistance of the concrete, within the windings; the proportionate elastic compressive resistance of the vertical reinforcement and the resistance afforded by the spiral windings, considered by him to be equivalent to 2.4 times as much as would result from the use of the same amount of metal if placed as vertical reinforcement. He also claims that conditions of maximum efficiency exist when pitch of winding is from 1/7 to 1/10 of diameters of winding.

Actual designs range from 2 to 4 per cent reinforcement, used in hooping or winding, and from 1 to 3 per cent in verticals, the percentages referring to volume of concrete inside the reinforcement. Using mean values of say 3 per cent for hooping and 2 per cent for verticals, with a factor of safety of 3.5, recommended by Considere, safe load values of 1000 pounds per square inch result.

When this loading value is applied to design of column for heavy loads in high building construction it will be found that while an economy of cost amounting to 25 to 35 per cent of steel column costs may be secured, it will be at the expense of loss of floor space. If the earning power of the floor space so lost is capitalized and added to the first cost of the concrete column it will appear that the economic cost of the concrete column is twice that of a steel column performing the same duty.

It follows, as a rough approximation, for heavy loads that safe load values of 2000 pounds per square inch must be realized before concrete columns can be regarded as economically superior to steel. Substantially the same floor space would then be required for both types of columns, and as the first cost of the concrete column would not exceed 50 per cent that of steel, it is evident that this difference would in time overcome any existing prejudice in favor of steel.

In the minds of many engineers not personally familiar with the actual use of reinforced concrete there would be grave doubt as to the propriety of using as a safe load value such a high figure as 1000 pounds per square inch, and this doubt is reflected in the ordinances which have been adopted by several of our American cities regulating the construction of reinforced concrete. The Cleveland building ordinance, adopted only last year, is, generally speaking, a notable improvement on the ordinances in force elsewhere.

Its provisions relating to concrete columns permit vertical steel members, tied or riveted together, to be filled and surrounded with concrete with an assumed division of stress between the concrete and steel, but finally begs the whole question by requiring that the steel itself, standing free, shall be capable of carrying the entire load, with a factor of safety of 3 when figured as a latticed column.

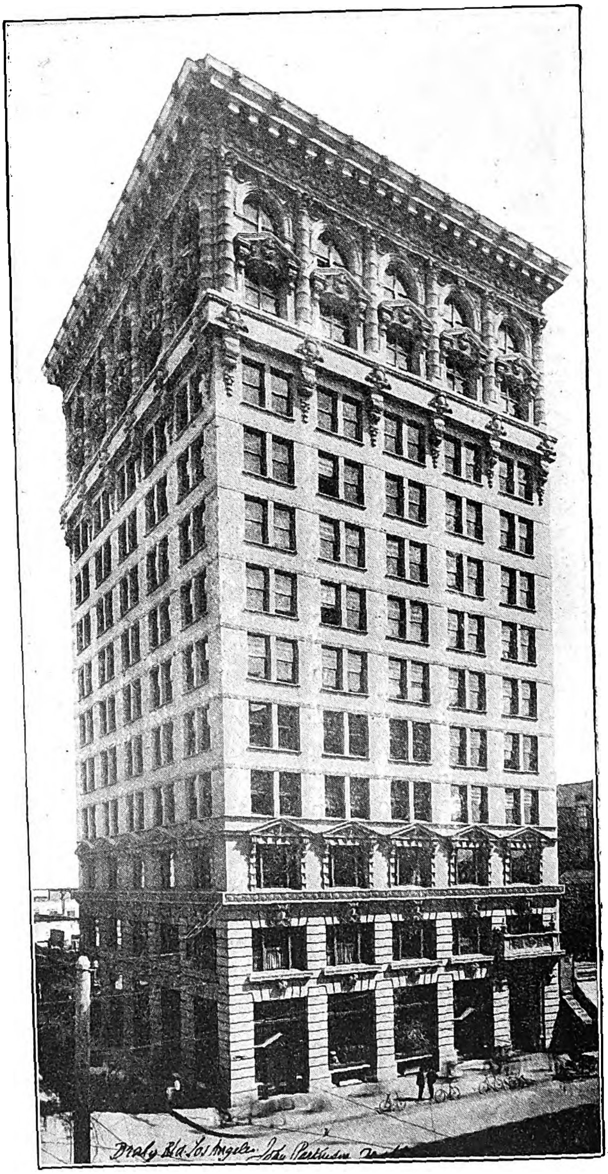
It is a common thing in constructed work, illustrated in our engineering press, to see hooping spaced from one to two diameters apart and without evidence of design with regard to the work to be performed.

All of these considerations indicate that present practice does not warrant such unit loadings as would tend to extend the use of reinforced concrete to column construction in high buildings, and we may conclude that unless some further improvement is made in the combinations of the materials there is no danger that the general use of structural steel in this field will be affected.

The writer is not content to accept this as a final conclusion without further investigation, and believes that there are possibilities suggested by the experiments of Considere which give promise of much better results. Some of the prisms of hooped concrete noted by him developed a compressive resistance of 10,500 pounds before ultimate failure, and the character of the failure is not noted.

Some months ago a general outline of some experimental work on full-sized columns was agreed upon with Mr. Loren E. Hunt, testing engineer for the University of California, which has a testing machine with a range of 200,000 pounds.

Some delay occurred in making up the test specimens, and it was not until May 10th that the concrete filling was placed. We had expected to test them about June 10th, so that the results would be available for this paper,



Los Angeles' First Skyscraper—the Brady Building
John Parkinson, Architect

C-146

but unfortunately the absence of Mr. Hunt for the summer, and the fact that the testing machine was in need of repairs, have entirely frustrated the object in view. If this could have been foreseen the writer would not have undertaken a paper at this time, but, in as much as it had already been programmed, it has seemed the better apology to give you the reasons which have influenced the undertaking of the experiments.

It is also hoped that any discussion evoked may serve to modify favorably the form taken by the experiments by bringing some new light to the problem.

The phenomena of the molecular resistance to displacement offered by the various substances used in engineering work are but imperfectly understood, and the conventional stress strain assumptions often fail to express all the facts.

As examples of isolated facts, there may be instanced, the fatigue of material; the raising of the elastic limit of steel bars by torsion or reduction of sectional area involving additional molecular displacement, without apparent change in ultimate resistance, and the similar increase of the modulus of elasticity for compression in concrete under successive loadings, well established by a number of observers.

Relatively little attention has been paid by investigators to the lateral distortion suffered by materials under compressive stress involving change of volume, and very little information is available regarding such deformation in other than true ductile materials.

In the test of any material where failure occurs without flexure by pure compression, diagonal shearing forces are produced which tend to cause the molecular structure to distort laterally by the sliding past one another of the particles.

In the case of metals which under ultimate stresses bulge all around normal to the pressure, failure is by convention conceived to have taken place when a stated percentage of distortion in length has been produced, but with natural stones, which are notably weak in shearing and tensile values, actual failure occurs primarily by the spawling out of material in triangular shapes normal on all sides to the axis of pressure followed by actual crushing due to reduction of resisting area and consequent increase of unit pressures. Concrete exhibits the same characteristics as the natural stones. Brick piers also fail by lateral bulging, accompanied by lonngitudinal shear, which is probably the real cause of failure in all non-ductile materials.

It is evident that before failure occurs in a non-ductile material there must be some elastic distortion laterally, and that the strain so produced by a vertical stress may be measured and stated, within the elastic limit, as a definite ratio of the vertical strain produced—within the same limit. It follows that the horizontal stress must be in the same ratio to the vertical stress.

In the case of gases and fluids under pressure there is perfect freedom of molecular displacement, and the full pressure is transmitted laterally to the containing receptacle.

With solids, a portion of the pressure is consumed in overcoming what Considere has termed the specific resistance of the material under test, and only a fraction of the pressure reaches the containing receptacle laterally, or is present as stress to produce lateral spawling. It seems probable that in a material of relatively low density, like sandstone or concrete, a vertical readjustment might take place without transmitting as large a transverse pressure as would be the case with such a material as steel.

A tabulation of the value of the ratio between vertical and lateral strains for building stones is given by Wm. H. Burr, without a statement as to its derivation. Its value varies from 1/11 for certain Oregon sandstone to 1/4 for marble and granite. Steel is stated to have a ratio of 1/2.35. To determine this ratio for concrete is the primary purpose of the proposed experiments.

It was found by Considere in his earlier work that failure of hooped concrete always occurred by bulging of the concrete between the spirals. The pitch of the winding was therefore decreased, and verticals were introduced to further break up the lateral yielding.

If the resistance moment of the verticals to internal bulging is in excess of the tensile strength of the winding, failure occurs by the breaking of the winding and the simultaneous bending outward of the verticals and characteristic spawling and crushing of the concrete.

Such failure under known conditions as to vertical loading and elastic limit of the winding evidently furnishes the data to determine the ratio of lateral strains in concrete at the moment of rupture.

An experiment made by Mr. R. F. Dunn is described by Charles F. Marsh in his work on Reinforced Concrete, which indicated internal lateral bursting pressures of about 1/15 of the vertical pressure applied at the ultimate strength of the winding, as determined by independent tensile tests.

This is the only test of the kind within the writer's knowledge where all the conditions are known, and does not, of course, furnish sufficient evidence to warrant the use of this ratio as applicable to concrete generally; neither does it inform us as to whether the ratio is maintained under changing load conditions.

Imagine a steel pipe with walls of such thickness that its distortion under internal pressure within a stated range would be negligible. Suppose another smaller pipe, of 2 inches less diameter, made of the same material except for the center joint, is inserted within the larger pipe and connected at either end so that the outer pipe forms an annular water-tight jacket. Let the center joint in the smaller pipe be made of very thin sheet steel and fill the small pipe with concrete, first filling the annular jacket with water under a slight pressure to prevent the tamping of the concrete from distorting the thin sheet steel portion. Permit the concrete to set, fill the outer jacket with water under a slight pressure to insure perfect contact, connect a pressure gauge to the jacket and submit the concrete inside the small pipe to endwise compression. Then will the resistance of the outer pipe, acting through the water and the thin sheet metal, prevent the lateral distortion of the concrete, and the gauge will record the internal pressures transmitted to the outer pipe shell by the water. It would thus be possible to observe the lateral thrust of the concrete for any given vertical pressure within the range of the apparatus.

With this bursting pressure as a known ratio of the unit load to be carried by a column, it is evidently possible to design a pipe of the right diameter to provide the proper sectional area of concrete inside for the unit pressure allowed, and of such thickness as to furnish safe resistance to the lateral thrust, utilizing the usual hydraulic pipe formula.

Mr. Hunt has suggested the testing of such a column, designed with a very small safety factor in the steel, by surrounding it with a water jacket provided with a glass manometer tube of small caliber so that the lateral enlargement under changing loads may be shown visually by the raising of the water in the tube and the displacement, together with the observed shortening of the column endwise, would determine the actual change of volume. Several specimens having diameters of 4, 6, 8 and 10 inches and lengths of 132 inches have been prepared, with a steel reinforcement of riveted hydraulic pipe designed for a factor of safety of 5 in the plate, from the simple relation $t=r/100$, which if reduced for rivet inefficiency probably involves an actual safety of 3 against a vertical working stress of 2000 pounds per square inch. The concrete filling is a mixture of 1-3-5 of California cement with Presidio beach sand having 40 per cent voids, and Niles roof gravel of from ¼ to ½ inches diameter and voids of 30 per cent. The ratio of length to diameter varies from 13 to 33, and as no provision for flexure was made, some of the columns will undoubtedly fail in that manner.

The introduction of symmetrically placed vertical bars against the pipe wall on the inside will evidently take care of bending moments induced by flexure or eccentric loading, and will also serve to distribute any local tendency to internal shear. For ordinary building story heights this would not be required.

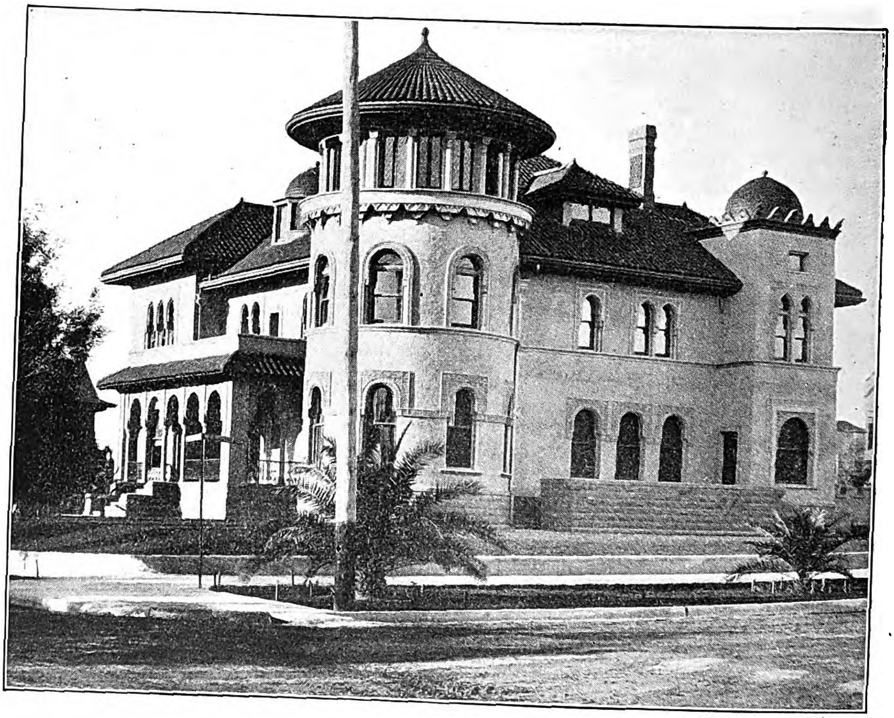
The writer questions whether the addition of vertical reinforcement without hooping really adds to the effective strength of concrete columns, for, inasmuch as the failure of the concrete has been shown to be in longitudinal shear, and the steel bars have no transverse bending strength, it seems apparent that the critical point would be the lateral yielding of the concrete from shear parallel to the axis of pressure. Believing this, the writer regrets that such a doubtful method of reinforcement has been adopted by Considere as the measure of value of so reliable a material as hooped concrete. On the other hand, if lateral yielding is prevented and the ratio of length to diameter is within flexure limits, and the modulus of elasticity within the reinforcement is increased by successive loadings until it approximates that of granite, there appears to be no other limit to the compressive resistance of the column than the final bursting of the reinforcement. It seems probable that the ratio of lateral to vertical strain may increase as the modulus of elasticity increases, so that the bursting pressure will not continue in the same proportion to the loading, and a limit may be reached much sooner than would be indicated if the Dunn ratio were a constant; but in any case the placing of the limit is evidently within the power of the designer when experiments have determined the actual behavior of the material under such conditions.

The theoretical and practical advantages afforded by the suggested form of reinforcement offer strong arguments in its favor. Inasmuch as the concrete outside the hooping has no structural value other than fire-proofing, it is evidently not important that the concrete within and without the reinforcement should be connected. Fire-proofing may be applied to pipe reinforcement, with light wire hoops to prevent cracking, in the same manner as to ordinary steel columns, either at the time of construction or afterward.

One of the common methods employed in building spirally wound columns has been to assemble the component parts for a story height in the shop, placing the vertical bars symmetrically in the winding, and tying them together thoroughly, so as to permit transportation and placing without disarrangement. Part of the verticals extend through above the floor level to anchor the next additional length, and four of the rods are commonly bent out at right angles to anchor the beams and girders intersecting at the column. Because of the bending down of these rods the winding usually extends from the floor to the ceiling line only, where the bending commences, and the concrete intervening between that point and the next floor line lacks continuous protection against lateral and vertical loading of 1000 pounds per square inch by the column within the reinforcement.

It is then in much the same condition as if a loaded column were placed directly on a concrete pier, without a shoe or base.

In the case of a pipe column, continuous protection is secured from the shoe on which it rests to the highest roof load imposed. At junction points the tension and shear rods of the girders and beams would be slotted through



Residence of Henry Martz, Los Angeles *John Parkinson, Architect* C-147

Residence in San Jose *Theo. Lenzen & Sons, Architects* C-148 the continuous pipe, with a loose hoop placed outside the pipe, both below and above the point slotted, to make up for the strength lost in the pipe.

Reinforced concrete beams as usually designed have a sufficient area of steel in the tension bars to provide for vertical shear without considering the concrete, but where this is not the case short shear rods may be inserted through the column walls to support the beams with loose hoops as above described.

It is apparent that the placing of the reinforcement as a pipe greatly simplifies and expedites the work of construction when compared with the handling of a mass of spiral winding which has every chance of displacement from its proper position at the hands of the tamper.

Assuming the correctness of the Dunn ratio, the percentage of steel required for safe loading of 2000 pounds per square inch in the form of riveted pipe would be only 2 per cent of the volume of concrete, as against 3 to 6 per cent recommended by Considere for spirals and longitudinals.

The considerations discussed contemplate only the use of the concrete within the reinforcement for compressive resistance and dependence on a thin exterior steel pipe in tension only for transverse internal stresses. There is a further possibility of reducing sectional area of columns for extreme cases by increasing the thickness of pipe wall and loading it in compression as well as the concrete, but the writer feels that it is useless to go further at present than to suggest lines for investigation and experiment which seem to warrant hope of practical results.

(To be Concluded.)

❖ ❖ ❖

Lumber—Concrete

By WM. B. GESTER, C. E.

IF we may believe the evidence that comes to us in the shape of government and state reports, of statements from timber-land dealers, and from practical lumber men generally, in every district of the United States without exception; and if we may believe the evidence of our own senses, those of us who have had opportunity to visit the once so thought and so-called "illimitable" forests of this country, the limits of the illimitable are being reached.

The immense consumption of that cheapest of building material, lumber, is having a marked and disquieting, not to say alarming, effect, on the supply standing in the street that is available.

Forestry laws, forestry commissions, and forestry methods of preservation are being invoked, and will in time, and in a measure at least, retard the rapid disappearance of the timber. But they prove the fact that a scarcity in the near future is feared by the best posted lumber and timber specialists.

Our country is growing more rapidly than at any period of her wonderful career. Our eighty millions will soon be a hundred millions. How shall they all be housed? In what kind of buildings will they live and work?

At present, a large proportion of our population is protected from the weather by board walls and shingle roofs, because boards and shingles have been plentiful and cheap. But lumber is comparatively perishable, and all our wooden quarters are temporary quarters, in that they are so perishable. Supplies of building material must keep pace not only with the needs of the increasing population, but with the rapidly increasing demand for repairs and renewals. Another condition is rapidly changing. The increasing wealth of the country, renders it more possible day by day, to build in permanent form. We can think of constructing for the centuries, where we have previously built for the years or the decades at most.

Because of the double reason that we can better afford to use the more permanent materials, and because scarcity will prevent the universal use of wood, even were it desirable, metal, stone, brick and concrete must displace the forest product.

As the lumber becomes more expensive, mechanical and other improvements are tending to decrease the cost of the more imperishable materials named. The days of construction of the permanent should be welcomed.

Our greatest city of the Pacific Coast, San Francisco, is one of which we are justly proud; and yet, as the celebrated Fred Law Olmstead once remarked of the district which now forms Central Park in New York City, "it is susceptible of great improvement." In an unusual degree, San Francisco is a wooden city, and will not reach its full measure of beauty and grandeur, until its hills are covered with permanent structures, made of fire and weather-resisting materials.

Of these materials, none is more worthy of notice and careful consideration than is concrete. This expression is not strong enough. Because of its superior availability for a great number of building purposes, there is no material that so fully merits thoughtful study and consideration. None is making, at this time, such rapid strides as regards improvements in manufacture. Not that it is new; for its use by man is measured by tens of centuries, but at no time in its history has it received the attention that engineers give it to-day.

All its remarkable qualities, hitherto but partially discovered, are becoming generally known, and their value recognized.

Where building construction is most progressive, there without exception is concrete in its various forms best understood, and most used.

A few years ago, its use in a prominent building structure, except for purely foundational work, would have been noted as a piece of interesting professional news. To-day structures are reared of it from cellar to dome, and excite but ordinary passing comment.

Where strength is required, engineers and architects resort to concrete. Where water and fire and weather resisting qualities are needed, they look to concrete. Where all these are demanded, with the further necessity of economical construction, they plan for, and specify concrete.

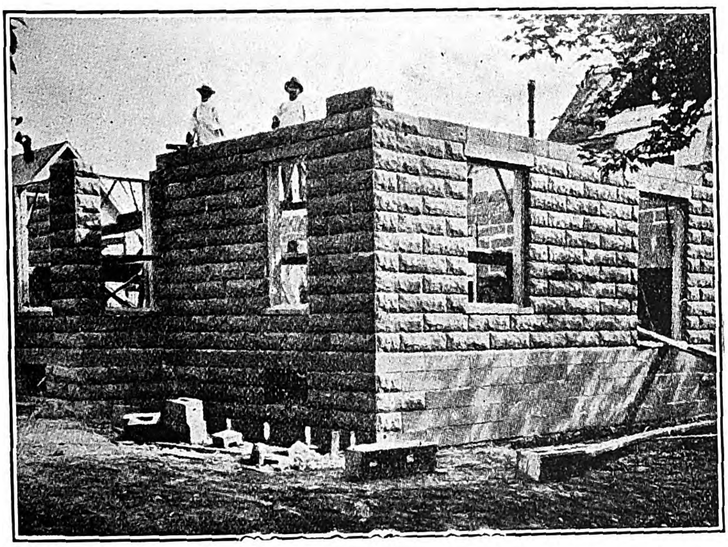
Foundations, walls, floors, even roofs and domes, designed by present-day masters of the building art, testify to the value in which it is held. For heavy construction, it is molded in place, in conjunction with steel, or without it. For ashlar or veneer blocks, and for trimmings of every description, it is molded in any prescribed form, and with a beauty and diversity of finish, that is a revelation.

Factories for the production of this class of concrete work, are numerous in Europe and the Eastern States, and the Pacific Coast is not without representatives.

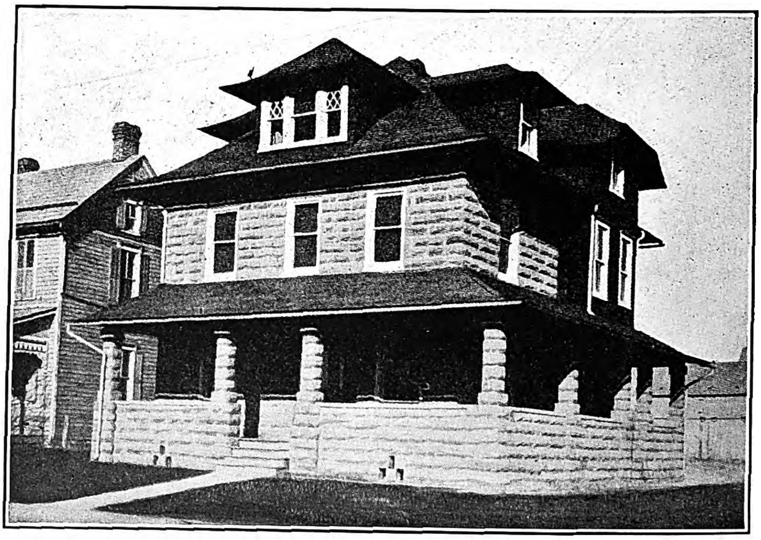
To quote from a recent address, made before the Retail Lumber Dealers Association of Michigan and Illinois, "Providence has apparently reserved the inexhaustible supplies of calcium carbonate, in the form of limestone and marl, and the clay, equally abundant, to unite them through the inventive genius of Aspdin and others, into the greatest constructive material of the age. It is only within the last two or three years that concrete building blocks or cement brick came into general use. To-day residences, stores and factories, built of this material, can be found in every section of the country. They are growing rapidly in favor with the property owners and architects, who are beginning to see the advantages of properly made concrete products over less enduring materials. Until recently, little has been done toward producing high artistic effects with concrete. The last few months however, have witnessed marked advance in this direction, which is causing the adoption of artificial stone as a substitute for laboriously carved natural rock. The concrete industry is destined to assume proportions not dreamed of to-day. The pioneers in the field, and the thousands being recruited to the ranks each day, are building better than they know. The campaigns inaugurated and being carried on by them will produce a demand and a market for Portland cement in every corner of the country."

It is true that on the Pacific Coast we are nearer great supplies of uncut timber than any other portion of our country; but the East with its local supplies rapidly disappearing, is already drawing heavily upon the Pacific Coast. Much lumber is loaded for trans-Pacific shipment also, and both of these drains are bound to increase rapidly. So that in spite of present large and low-priced supplies at our doors, this advantage cannot remain with us long, and the day is not far distant, when a shifting of comparative prices of the materials, will compel us to use less of the temporary material, the scarcer and more expensive wood, and more of concrete, the better and permanent material, of which the supply is limited only by the area of our deposits of limestone, clay, sand and rock. The change will not come all at once, but come it must and will.

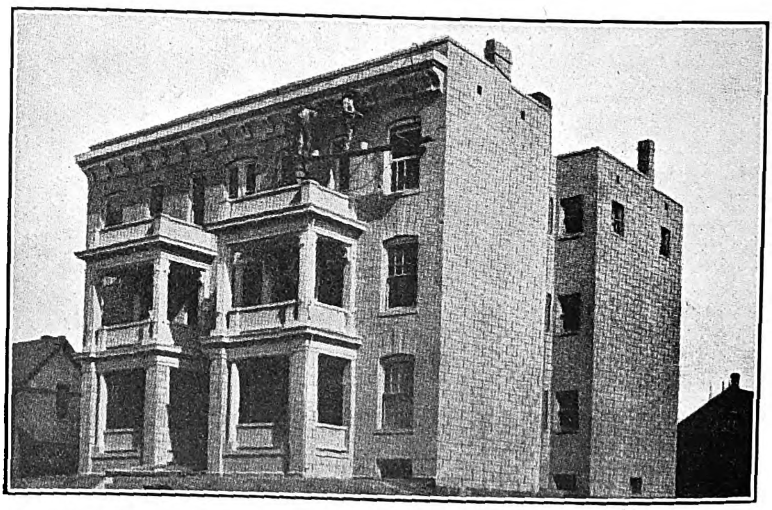
The pressure which comes from professional knowledge among engineers and architects, the pressure of public opinion, and the exigencies of business conditions, are making the change, already begun, entirely irresistible.



Building a House of Hollow Concrete Blocks C-149



Two Story Residence of Hollow Concrete Blocks C-150



Three Story Flats Made of Concrete Blocks C-151

Cement the Logical Building Material of the Future

By JAMES W. BUTLER

THAT the cement block has come to stay is evidenced by the remarkable activity in this branch of the building industry, apparent not only in San Francisco and near-by towns, but all over the United States. Architects have been slow to specify the cement block, some say because they have been skeptical of its merits; others declare because the brick men have used their influence to prevent the growth of the block industry, realizing that if it is allowed to get a fair start the clay industry will receive a serious setback. As to the truth of this last assertion it is not my purpose to debate. Suffice it to say that the cement block is bound to be the coming building material where economy is necessary, all efforts of the brick men to prevent its use, notwithstanding. If the cost of wood continues to soar as it has in the past few years, I predict that it will not be long ere the cement block can be had for less money than wood.

The use of some cementing substance for building purposes runs back into the darkness of prehistoric times, there being no record of any age in which cement, in some form, has not been used, and Babylonians and ancient Egyptians brought the use of cements to a considerable state of perfection, and many works still standing in Egypt to this day bear evidence of their knowledge of the proper manipulation of the natural rock cements, and it appears that these remote peoples understood in some degree the art of producing a modern cement which the present age has perfected and called into general use for modern building purposes. Some of their work which has escaped the ravages of war, with the covering and disintegrating action of the desert sands and later builders, is a very strong evidence of the lasting value of their cement manufacture and construction, many of these still standing edifices having been erected hundreds of years before the Christian era.

It is fully demonstrated that concrete is the most enduring material known to ancient or modern architects and builders. Of what is commonly known as the seven wonders of the world, only one, the Pyramids of Egypt, now remains in original form. The Pyramids were built of concrete. For more than 4000 years they have reared their majestic forms above the desert and have bid defiance to the eternity of time. The Phoenicians understood the art of cement masonry, while the early Romans were great builders of structures in this material. The pools of King Solomon, nine miles from Jerusalem, were built entirely of concrete, and still furnish water for the city.

Authentic records of the actual making of these ancient cements are lacking down to early Roman times, and from that period down to 1757 there was little or no improvement in the character or methods of cement making, at which later date Smeaton was the first to break down the tradition that the purest and hardest limestone was the best, at least for hydraulic purposes, and was the first to prove in demonstration that a mixture of carbonate of lime with clay, properly calcined, was the real cause of hydraulicity. From Smeaton's time to 1824 very little improvement can be noted, at which date Aspdin discovered the advantage of incipient vitrification and produced Portland cement, practically as we now know it. The first Portland works in this country were erected in 1875, since which time the manufacture and use of cements has increased very rapidly in nearly every class of construction and is absolutely indispensable in all engineering works.

What is to be the construction material of the future, and the near future? Various attempts have been made to devise some material which should have the merit of a substitute for wood, but there has never been any practical success. Many high authorities have, for some years, recognized this condition, and they are a unit for the extended use of concrete as the most permanent and economical material for all classes of construction, and many large concerns are now using it in the construction of immense buildings, railroad buildings and stations, schools and court houses, and, in many Eastern communities, elegant churches, business houses and residences are being erected of some form of concrete.

To one familiar with the facts in the case, and in consideration of the extremely high prices for labor and material that obtain, both of which are rapidly advancing, to say nothing of the constantly occurring matter of repairs to which all wood and brick buildings are subjected, it must be apparent that some material which is both cheap and durable and has as good or better finish and appearance than either, will be welcomed by all classes of builders. In fact, there have been many organizations formed in the East and Middle West within the last two years looking to cover this ground, and within the last year some heavy companies have been formed on the Coast, so it will be seen that we are no pioneers in this business.

Concrete is used in the construction of sea walls, such as that at Galveston, Texas; in government piers, in place of the old style crib work; in breakwaters, where conditions are severe, and where natural stone would disintegrate.

In the construction of the subway in New York City 1,250,000 barrels of cement were used, and if it were not for cement and its marvelous qualities such work would be impossible. The Pennsylvania Railroad Company is constructing a series of tunnels under the East River from the New Jersey side to Manhattan Island, using concrete. Under the city of Chicago there are seventy miles of concrete tunnels in which tracks are laid, by means of which goods are delivered to and from mercantile and manufacturing houses. In the construction of dams it takes a large place and supersedes wood and natural stone. Cases are known where such structures have been placed on the rock and the constantly falling water has worn the rock away, leaving the concrete in perfect condition. In building large sewers and water mains, solid concrete and concrete reinforced with steel is largely used. In this it is more economical than brick, more durable and more rapidly put in, and the work is done by common labor. The construction of sidewalks of cement concrete and the curbing and gutters is of general and familiar use, as is also the making of foundations for street pavements. Large reservoirs are made entirely of concrete. Railroad construction, in culvert, retaining walls and bridges is almost entirely done with concrete. Railroad ties, while now in an experimental stage, are showing good results; cement fence posts are coming into common use; telegraph poles made of concrete, reinforced with metal, are a success, and when wooden posts are used they are often set upon concrete bases. Paint to protect steel work is made from cement and is extensively used by the railroads.

Concrete is the name commonly given to a solidified body composed of crushed rock, or gravel and sand all tied together or united by cement, in the making of which due proportions must be carefully observed, and the proper amount of water added to the whole mass so that it is a damp, well-mixed and homogeneous body before it is put in place; that is, there must be no voids in the mass in order to utilize the full bonding value of the cement. The voids in crushed stone or gravel can be measured with considerable certainty by making a box that will hold, say exactly one cubic foot, which is filled with rock or gravel, then level off the top so the box is exactly filled, after which pour the box full of water.

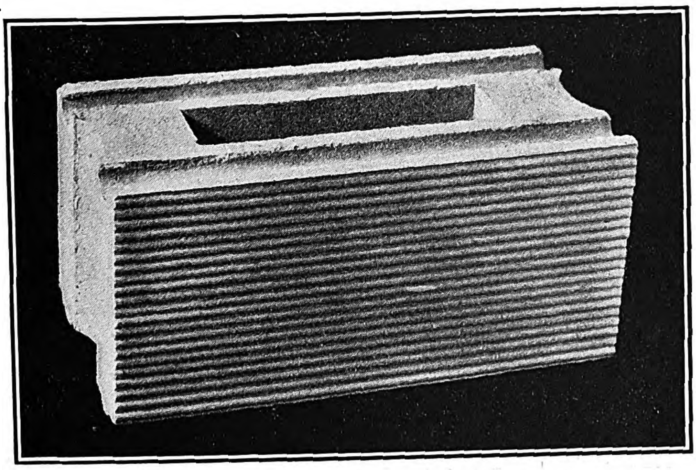
By drawing the water off at once before it has time to saturate the stone or gravel, it will be found, upon measurement, that the water is about four-tenths cubic feet, or in other words the voids in stone or gravel is about four-tenths of its bulk. Repeating this operation with sand as a filler, it will be found that the voids in sand are about thirty-three one-hundredths, so the rule in making good concrete is to add about four parts of good sharp sand to broken stone or gravel, and to this aggregate should be added enough cement to fill the voids in the sand, or about an approximate proportion of four parts of stone or gravel to one part of cement, which mixture will, in most cases, give the desired result, if the right quantity of water has been added.

The binding action of cement lies in its crystallization, which a chemical action produces only by mixing with it a proper amount of water, and any part of the cement in concrete that is not acted upon by a due allowance of water is worse than lost. The stone, when cast and taken from the molds, should be kept free from sun and heat until it has thoroughly set, and should be kept damp or wet for several days after making, so it can cure properly. It is always desirable to bring each particle of the mass into direct contact as nearly as posible, and the greater the force used in accomplishing this result, the better stone is made. This is done in several ways, the most desirable manner being by a hydraulic or some mechanical press, although most concrete in large bodies is tamped by hand, of necessity. It is not necessary for us to go into the matter of crushing strain of these blocks to any length, for the reason that in no ordinary construction is there any heavy weight for the walls to carry.

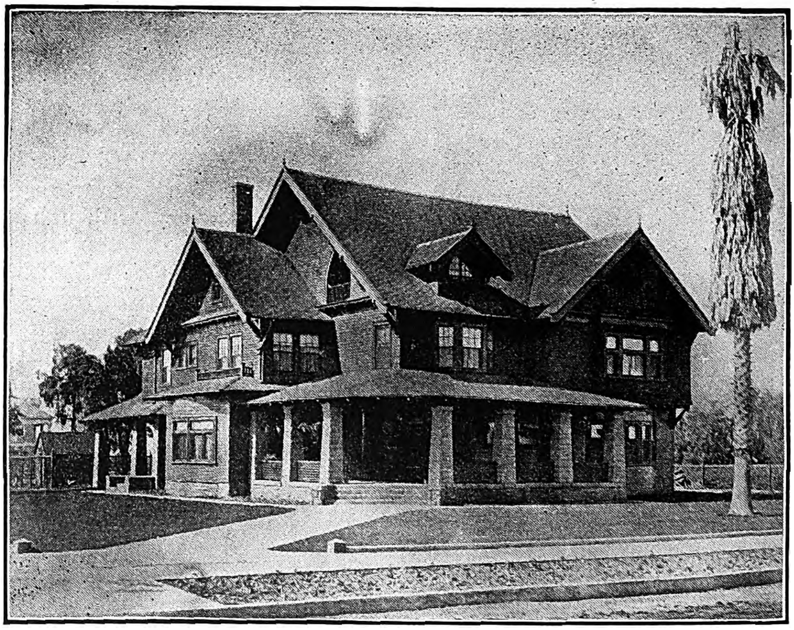
Trautwine, than whom no greater authority ever lived, gives the following table on the crushing resistance of concrete, made without voids and well rammed, a cube of which, either in air or water, should require to crush at different ages, not less than—

Age in months...........	1 mo.	3 mos.	6 mos.	9 mos.	12 mos.
Tons per square foot.......	15	40	65	85	100

Under favorable conditions of material, workmanship, and weather, these crushing strains may be increased from 50 per cent to 100 per cent.



A Hollow Concrete Block C-152



Residence of August Marquis *Ch rles F. Skilling, Architect, Los Angeles* C 153

Residence of R. D. Richards *Frank M. Tyler, Architect, Los Angeles* C-154

Experience—Comment and Suggestions

Molding for Artificial Stone

By J. A. DUVALL

PERFECT stone molding is a phrase easily expressed in words, but is not so easy to carry out in practice.

The making of sand molds for artificial stone is a new industry, but one which before long will employ many molders, as it has proven to be an unqualified success, the finished product being so similar to the natural stone that even the most expert are deceived. I am not referring to the various artificial blocks, which are rammed up in metal molds, but to an artificial stone which is poured in a sand mold, and which crystallizes. The causes that lead up to the perfect union and bond of the elements composing the stone mixture, and their crystallization, are secret at present, but the manner of making the finished product should prove of interest to our members. The perfect results obtained in the production of this marvelous building material during the past few years insures for it the hearty approval of the up-to-date architects and builders. Many devices offering a substitute for natural stone have been placed upon the market during the last decade, but most of these have been based upon wrong principles, and impractical methods. The main feature for success in the manufacture of artificial stone, is a proper method of induration; in other words, a process which will bring about proper crystallization. Induration as applied to the manufacture of artificial stone means that the composition used becomes hard, and the elements crystallized while absorbing and utilizing the moisture contained in the "treated sand" mold. The sand used is a sharp fine white sand, to which is added certain chemicals, and the whole tempered as is done with ordinary green sand.

A wooden pattern is used, as for grey iron or brass, and the mold is rammed up in exactly the same manner as it would be in any foundry. After the pattern is drawn the mold is finished or dressed up, great care being used to have a perfect mold, as the least grain of sand left loose, would leave a "pit" on the surface of the stone casting.

There is no limit to the shape and size of the patterns used, or the ornamentation which may be used. After the mold is finished, it is poured without a "cope." The mixture which is very fluid, is brought to the floor in a large ladle, containing revolving paddles which keep the mixture agitated. This ladle has an opening on the side, operated by a gate. After the mold has been filled, a man with a pailful of the mixture stands beside it, and as the mixture shrinks he feeds it, and continues to do so until it has set, when he takes a trowel and slicks a smooth joint.

The casting is left in the sand from three to seven days, when it is taken out and brushed off, just as would be done with an iron casting. The sand used in making the mold is used over again, but with this difference from ordinary foundry practice, the more the sand is used, the better it becomes. By the process referred to, the ingredients used are not only bonded and crystallized into one coherent mass, dense, strong and compact, but the effect of the mold upon the mixture takes away that "cementy" appearance, so characteristic of all other artificial stone products and produces that natural stone effect which is so pleasing to the eye, and so desirable for all kinds of building construction.

It is so perfect in appearance, and so uniform in texture, that it can be cut or carved like natural stone, and not one person in a thousand can detect the difference when it is placed in the wall or on the staircase, from the finest natural cut stone. Recently I saw a stone-cutter cutting a block of this material, and he could not be convinced he was not working on natural limestone.

Only the other week I saw some of this product in a building under construction, and until certain well-known stone castings were put in, I believed that it was natural stone.

The above extract from the "Iron Molder's Journal", is a practical iron-foundryman's description of the process of making "reformed" artificial stone in absorbent molds, the basic patents covering which were issued a few years ago to Charles W. Stevens of Chicago, and under which, a large number of companies, some twenty or thirty, organized for that purpose in various cities in the Eastern states and in Canada, are now making what is known to the trade as Litholite or Roman Stone, a most excellent high class building material. The matter is of interest to iron molders, because of the fact that from their ranks are drawn the most expert stone molders. One factory only, of the class described, is up to the present time located on the Pacific Coast, that of the Pacific Stone Co. of this city, at Black Diamond. It is reported however, that others will be instituted in the near future, at Fresno, Los Angeles, Seattle, and Portland.

WILLIAM B. GESTER.

❖ ❖ ❖

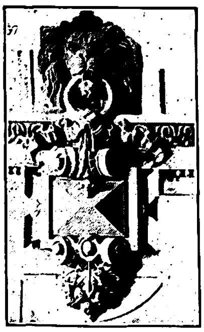
Use of Cement

DEVELOPMENT and expansion in the cement industry during the last decade have been phenomenal. In 1895 the production in this country amounted to 990,324 barrels. In 1904 more than 22,000,000 barrels were produced, with an additional 3,000,000 imported. The reason for this development is that the product is immeasurably cheaper than stone, brick, wood, etc., their equal for most purposes, and superior for many. The uses to which it can advantageously be applied are almost beyond conception, so that its growth during the next decade will undoubtedly be more wonderful than that of the last.

Portland cement is made from natural rock known technically as Trenton limestone, and when produced in commercial form is a fine powder, possessing the quality, when moistened with water, of binding itself and substances with which it may be mixed into a homogeneous mass, setting with remarkable quickness and drawing to a hardness greater than that of granite.

Terra Cotta and Brick

A Plea for the Clay Block



Detail by Steiger Terra Cotta Company

THE remarkable growth of the cement block industry might have something in it to alarm the clay workers of the country, were it not for the fact that anyone can go into the business with a few hundred dollars and an available bank of sand. As a matter of fact, the business has little in it to recommend itself to the clay worker or experienced building material men, for the reason that it is particularly a local trade industry, and liable to the most violent competition. There is not the slightest danger of "trusts" or "combinations" to control prices in this business, unless it is done through the cement manufacturers themselves.

There is a strong likelihood of this business being overdone, and when such is the case and equipment cost is low, the consequences will be most disastrous both to the good of the industry and the profit of those engaged therein. It is, however, not a good plan to look for the good to one industry to be accomplished through the failure of another. Good will came to the clay block through the advent of the cement block. It is a remarkable fact that one store added to the first one of a country town will increase the business of the first one in the field. Why? Well, generally because the first one thinks it sees more of a necessity for hustle, and that maker of all great business successes, advertising, is brought into play.

The clay workers have known right along that their blocks were a good thing, and they have congratulated themselves and talked among themselves regarding the fine points of the product and the fast disappearing forests of the country. Some of them have made hollow block a business, and got at it right and made it win, but the great trouble has been—there has been no large demand because there has been no large advertising.

In the case of the cement block, advertising is being done in every little inaccessible town in the country. Anyone can go into the business and have the first block of stuff turned out inside of a week. The result is that lumber yards which handle cement are in the field, and anyone who is approached by the machine man is pretty sure to become interested. With so many interested there is talk, and talk is advertising when it becomes spread over a large territory. It would be difficult to figure out how many thousands who are likely to need brick or block for building operations have become acquainted with the scheme of hollow wall construction for the first time since the advent of the cement block. It has taken hold of the country. Why? Is it because of its great cheapness or its great advantage in quality? No, it is because it has been advertised, advertised through an immense number of producers. Why, the advertising it gets for nothing is something wonderful. Even our clay working journals (excepting "The Clay-Worker" only) are devoting more space to cement news than they are to brick or clayware news, and it looks as though many of the clay workers were becoming frightened and were using the "Want Ad." columns of the cement-clay journals to advertise their brick and hollow block factories for sale.

When the smoke of battle has rolled away we will find that there has grown up a demand for good, everlasting hollow block, and there is one good place that we are sure they can be found, and that is on the clay working plant.

After the product is assured in quality we must get after the goods of advertising and reap a reward from the advertising of others through advertising the clay blocks, and all will be lovely and we will forget the cement block. Cheapen the cost by bettering the equipment both in the kiln and the machine line and then work the business of system to its full limits, and the clay-working business will prosper as it never has before. We don't have to spend any time "knocking" against the cement industry, but we do on pushing the clay block. We ought not to mix.—Extracts from article by "Van" in the Clay-Worker.

❖ ❖ ❖

The Pottery Trust Is Only On Paper

STORIES of the formulation of the gigantic pottery trust, with double column heads, have been occupying prominent places in many of the leading dailies during the last week. Newton Jackson, the Philadelphia broker, who has been endeavoring to secure options on many of the different plants during the last few weeks caused the statement to be given out that he had closed agreements with a sufficient number to give his hair-brained scheme a reality and clothe it with the control of the tableware output of the United States.

The announcement states that 75 per cent of the producing capacity of the country is included in the new combination. Investigation has shown that such is not the case. Jos. G. Lee, of the Knowles, Taylor & Knowles Co., of East Liverpool, O., stated in connection with the matter: "I can say positively that there is no truth in the report that such a combination has been effected. Newton Jackson had some talk with the officers of my company, including myself, but we have never considered the giving of an option—in fact, never had a definite offer. There could be no possible benefit from such a combination, and I know it has not been perfected. There are upward of 30 plants operating in this section, and while some of the smaller concerns may have entertained offers none of the larger establishments are known to have agreed to any combination."—Clay Record.

❖ ❖ ❖

The American Magnesite Company, of Oakland, Cal., has the construction work of its brick plan well under way. Three of the buildings are already practically completed and the others will be completed shortly. Two large dynamos and a 300-horsepower boiler will be included. Crude petroleum will be used for burning the brick and a steel tank of 8,000 barrels capacity is now being erected for oil storage purposes. Four kilns will be operated.

Pottery and Fire Brick Prices

THE pottery trade, for some cause of other, dropped down a little over a quarter of a million and fire brick fell off nearly three million, the total for 1904 being $11,167,972, against $14,062,369 in 1903. This is the most important loss on the list and it is impossible to tell from the tabulated figures, whether the loss is due to a decrease in price or a falling off in quantity, because the quantity of fire brick was not tabulated in 1903. The average price per thousand given for fire brick in 1904 was $18.68, while the average for Pennsylvania, which produced nearly half the total amount, was $19.88. The highest price of all those in the fire brick column came from Montana, which was $57.10 per thousand. North Dakota came second with a price of $34.53, while Georgia is listed with the lowest average price of $8.12, and the second lowest is Kansas, with an average of $11.36, which is closely followed by Indiana, with an average of $11.36.

Architectural terra cotta, fireproofing and hollow building tile or blocks all declined slightly in point of value in 1904, as compared to 1903, and fancy or ornamental brick also showed a slight decline. There is nothing small, however, about the volume of business in architectural terra cotta, for the total value for the year 1904 was $4,107,473, while under the class of fireproofing there is a total value of $2,502,603, and in hollow building tile or block the total is $1,126,498.

❖ ❖ ❖

A Queer Tale

A NARRATIVE compared with which the Orton-Lovejoy fish story is a mere child's fancy, is told in a recent issue of the New York Journal, and relates to the recovery from the depths of the briny ocean of precious Chinese pottery lost in a fierce storm at sea many years ago. The cargo, so the story runs, was made up largely of rare porcelains, similar to the famous "Hawthorn" jar, which it is claimed sold in London for $29,500. The recovery of such rare and valuable bric a brac is well worth while. The wreck lies at a depth which precludes the idea of recovering it in the ordinary method by deep sea divers, but the native fisherman have proven equal to the occasion and are bringing up the precious pottery in a most novel and astounding manner. It appears that the octopus or devil fish are very numerous in those waters and the natives capture these hideous creatures alive and fastening a strong cord to them, lower them in the vicinity of the wreck. It is the nature of the monster to grasp in his snake-like tentacles every object with which he comes in contact, so they are lowered and hauled up by turns with the hope, which is often realized, that they will bring up pieces of the pottery which have lain at the bottom of the sea all these years. Next!—Clay Worker.

❖ ❖ ❖

Beware of a young woman when she is unusually gracious and friendly; she is probably in love with another man. A man in love can see only one woman; a young woman in the same condition overflows with affection.—Cynic.

About Nails

By A. C. RULOFSON

FOR over fifty years the use of wire nails has been very general in Europe, where they have entirely superseded the old hand-forged and cut nails. It is only in recent years that the conservative Englishman has recognized their superiority, while in China and Japan wooden pegs have long been discarded and large importations of wire nails are made from the United States and Europe.

Twenty-five years ago the manufacture of wire nails commenced in a small way in the United States, and at that time a shipment of 25 kegs was made to one of the leading wholesale houses in San Francisco. This marked the introduction of wire nails on the Pacific Coast, and their consumption increased by leaps and bounds, so that in a short time they almost entirely drove out the old style cut nail which was being manufactured in Oakland, California.

In the course of a few years the cut nail manufacturers closed down and have never reopened their mills. Manufacturers, wishing to keep abreast with the times, started wire nail plants on the Pacific Coast, and at the present time, there are two in Oakland, one in San Francisco, and one being started in Vancouver, B. C.

The advantage of wire nails became so apparent that the engineer, architect and carpenter were quick to adopt them, and they have come into such general use that the term "nail" is accepted as meaning wire nail. It was generally admitted that the article designated "Smooth Wire Nail" by the trade, was more economical that the cut nail because there were a greater number of them to the pound, but a disadvantage lay in the fact that they did not hold as well as the old style cut nail. This, naturally turned the American inventive genius to a consideration of the subject, and many so-called improvements were adopted to increase the holding power. They were barbed, made flat, triangular and other shapes, but none of these changes were effective, nor did they come into general use.

Later, a Boston party by the name of J. C. Pearson discovered a process of coating the ordinary wire nail with a compound which in lieu of a short comprehensive name, he called "cement." This compound consisted largely of resin because of its holding power.

Nails dipped in this compound were introduced on this coast by specialists who, strange to say, devoted most of their attention to the making of boxes, and they met with great success. To-day there is scarcely any class of packing box on the Pacific Coast that is not fastened with these nails.

Railroad companies are using them largely to the exclusion of other nails and the Southern Pacific Company has used thousands of kegs of them in its building and car work.

These coated nails are now being carried by all the leading jobbing houses on the Pacific Coast, and they are gradually finding their way to the retail stores. As they are sold at the same price per keg as the common wire nails, it is believed that they will supersede the latter and come into general use, which will mark a new epoch in the nail trade.

Heating, Lighting and Electrical Work

A Few Notes on Ventilation

By WILLIAM E. LELAND

IT is a well-known fact that unlike liquids, gases of different densities readily diffuse; so that the composition of the air in any portion of a room (at any time) is practically the same as that of the air in any other portion, and therefore, ventilation does not consist of simply removing foul air, as is quite commonly supposed, but in supplying a sufficient quantity of fresh air to so dilute the air in the room that the proportion of carbonic acid gas will always be kept below a predetermined limit.

Air is simply a mechanical mixture in which oxygen and nitrogen, its principal constituents, are present in the practically constant proportions of about one to four. Carbonic acid gas exists in the atmosphere in varying quantities, but in the proportion of about 3 to 5 parts in 10,000 in pure country air. In closed rooms, audience halls, and theatres, this proportion increases to an alarming extent. Eight and nine parts in 10,000 will usually give an impression of closeness and 10 to 12 parts will produce a feeling of weariness and stuffiness and often cause a headache.

An amount of carbonic acid gas of over 12 parts in 10,000 is considered by the best authorities, to be decidedly injurious to health, and ventilation is not considered to be good which does not keep the amount of this gas below 7 or 8 parts in 10,000.

As this objectionable ingredient of air is caused by respiration and combustion, it follows that the amount of air required for the proper ventilation of any room depends primarily upon the number of persons in the room, and also their occupation, since persons in working or exercising produce more carbonic acid gas, moisture and animal heat than when sitting in repose.

The average adult man in repose makes about 16 respirations per minute of about 30 cubic inches each, or he requires 480 cubic inches of fresh air per minute for breathing. During the breathing process this air will have lost about 1-5 of its oxygen, which will have been used to form carbonic acid gas. This will increase the original amount of about 4 parts in 10,000 up to 400 parts in 10,000, or 4 per cent. If this exhaled air could be immediately and completely removed there would only need to be supplied a little less than ¼ of a cubic foot per minute for each individual to give the very best ventilation. But as this is not possible, and as the exhaled air is diffused in the room, it must be diluted with an amount of fresh air sufficient to reduce the total amount of carbonic acid gas to say 6 parts in 10,000. Therefore, if an increase of only 2 parts above the original 4 parts is to be allowed, the amount of air to be supplied would be 50 cubic feet per minute for each individual.

In actual practice, it is often very difficult from existing conditions to reach this amount; and the engineer has often to content himself with as low as 20 to 25 cubic feet per person per minute. First, in Massachusetts, and later in other of the States public opinion has resulted in the passage of laws requiring positive ventilation in all school houses, and has set the minimum limit of 30 cubic feet per minute per pupil.

This basis has been generally adopted throughout the country and is now recognized as the minimum air supply in any system of ventilation which is to be considered first class.

The requirements of good ventilation being realized, the methods of securing these results are next to be considered. The wrong application of well understood principles has often resulted in failure. Natural agencies, being less expensive, have often been called upon to perform duties far above their limits, and it must be admitted that all so-called systems of "natural ventilation" have utterly failed to perform the duties expected of them. A system which depends upon the arrangement of windows, doors, and the many patent exhaust ventilators with which the market is flooded, and for which such wonders are claimed, cannot be called in any sense ventilation, and any arrangement of openings, hoods, and deflectors, however intricately managed can never prove capable of moving any appreciable volumes of air, and therefore they cannot ventilate.

Some degree of ventilation may possibly be obtained by properly arranged aspirating shafts surmounted by one of the patent ventilators above mentioned, a number of which will, to a considerable extent, prevent down drafts of cold air. These shafts may have a gas jet, steam coil or other means of artificial heat applied, whereby the air in the shaft is heated, and by virtue of its expansion and consequent lighter weight per unit volume, ascends and is replaced by other air coming into the room from whatsoever source it finds opportunity.

Since the heat used for the aspirating effect goes out with the air and is lost, its use is very expensive in proportion to the amount of air moved.

In the system of mechanical or forced ventilation the movement of air is produced by some form of fan or blower; the ventilation is positive, and certain known volumes of air are absolutely moved. The following words of the late Robert Briggs, a noted ventilating engineer, express the matter very clearly. Mr. Briggs says: "It will not be attempted at this time to argue fully the advantages of the method of supplying air for ventilation by impulse through mechanical means—the superiority of forced ventilation, as it is called. This mooted question will be found to have been discussed, argued, and combated on all sides, in numerous publications, but the conclusion of all is, that if air is wanted in any particular place, at any particular time, it must be put there, not allowed to go. Other methods will give results at certain times or seasons, or under certain conditions. One method will work perfectly with certain differences of internal and external temperatures, while another method succeeds only when other differences exist. One method reaches to relative success whenever a wind can render a cowl efficient. Another method remains perfect as a system if no malicious person opens a door or window. No other method than that of impelling air by direct means, with a fan, is equally independent of accidental natural conditions, equally efficient for a desired result, or equally controllable to suit the demands of those who are ventilated.

"In all mechanical appliances, that is simplest which most positively and directly effects the purpose in view; and in this matter of supplying air, it may be claimed that the process of impelling it, when and where wanted, is at once the most certain and efficient, and that the fan (in its form of a rotating wheel with vanes for large uses), is the simplest and readiest machine for impelling air."

Prof. Carpenter in his work on "Heating and Ventilating Buildings" has prepared a table showing the comparative efficiency of the fan and heated flue for moving air volumes; which shows for example, that with a flue temperature of 100 degrees and a height of 60 feet the fan is 12.2 times as efficient as the natural ventilation of the heated flue.

A good ventilating system must usually be combined with a heating system, or at least the air supplied for ventilation must be heated to such an extent as not to cool the rooms below a comfortable temperature; a sufficient volume of fresh air must be supplied to maintain the desired standard of purity, and the apparatus must be simple, safe, and economical in operation, and absolutely controllable in all its details; and the ventilation of the several rooms must be accomplished without drafts.

There are three principal methods or systems called respectively, the Plenum System, the Exhaust System, and the Combined Plenum and Exhaust System.

In the Plenum System, a fan is provided and arranged to draw the air through some suitable window, shaft, or area, directly from out of doors, and deliver the same through ducts, flues, and registers to the several rooms to be ventilated. Thus each room is kept in a state of slight pressure, and the air once delivered to the room finds its exit through doors, windows or other leaks, or as should by all means be done, through flues provided for the purpose and arranged to communicate with the outdoor air.

The air can be handled in absolute and definite quantities, which can be varied at will by changing the speed of the fan, opening or closing dampers or registers, and in short, the whole system is under perfect control. The air can be further filtered through cheesecloth screens or washed by means of proper spray washers and also heated at such times as the outside temperature is below that at which the rooms must be maintained.

A decided advantage of this system is the fact that no possible leakage of foul air from toilets and kitchens can ever take place into the rooms ventilated as the tendency is for air to flow from these rooms outward in all directions.

In the exhaust system, just the opposite conditions prevail, and all the advantages of the Plenum System are replaced by decided disadvantages. Air leaks into the ventilated rooms from every conceivable source, and in cold weather, the proper heating of the rooms is well-nigh impossible. Cold drafts will be noticeable in almost every case and there is no remedy except to shut off the exhaust ducts or stop the fan.

In the Combined System, the most complete and perfect of all; the two above described systems are combined, but so proportioned that the plenum portion of the apparatus holds predominance over the exhaust portion, and thus the evil of inward leakage is prevented. All principal rooms have an excess of supply over exhaust, in about the ratio of 5 to 4; and all toilets, kitchens, etc., have only exhaust, but of ample proportions, with ready means provided for air to enter these rooms from the other portions of the building.

Too much pains cannot be taken in arranging the inlet and outlet points for the air, so as to get the best possible distribution, avoid all possible drafts, and assist by the action of the air currents to the uttermost the natural diffusion of the fresh air throughout the entire room.

In general, the inlet and outlet registers should be on the same side of the room, the inlet considerably above the head line, (not less than 8 feet from the floor) and the exhaust register should be placed as near the floor as possible. Both inlet and outlet should be placed on an interior wall and facing the windows, so that the general course of the fresh warmed air is across the upper portion of the room, to the cold outside wall where it passes down to the floor giving up its heat to useful work in warming the cold outer surface of the room and returning to the vent opening across the room near the floor and from the breathing line down. This arrangement is conceded by all engineers to be the most desirable.

It is practically impossible to give stated rules and directions for designing and installing a ventilating plant. Each building requires an individual treatment and conditions vary so much, and the limitations in the arrangement and construction of the building are so great, that each case has to be studied and planned in a special manner. While in general the arrangement of supply and vent openings should be as noted above, certain rooms should be differently treated. For example, toilets, kitchens and the like should be provided with exhaust ventilation only, and with outlets both at the floor and ceiling. Rooms in which much smoking takes place should have outlets at ceiling as well, as it is very difficult to carry off the smoke readily and quickly from the floor line.

A few words in relation to the general sizes of the different portions of the apparatus may be of interest.

The first question is of course the amount of air to be supplied per minute. This is determined from the amount to be furnished per occupant or from the number of changes per hour. From this total amount the size of fan is selected and the fan should be so chosen that it will furnish the air at a moderate speed corresponding to from 3/8 to 1/2 ounce pressure. It must also be remembered that the horse power required to drive a fan increases as the cube of the speed and from this fact it is quite evident that it is very good economy to use a large fan at a slow speed. High speed fans are very apt to be noisy on account of the whistling of the air over the tips of the rapidly moving fan blades and vibrations in ducts, etc., are apt to be caused.

The next consideration is the heating coil to warm the air. This is determined from this fact that 1 B. T. U. will heat 55 cubic feet of air 1 degree and with the amount of air per hour and the number of degrees through which this air must be heated as known quantities, the number of thermal units required is readily determined. The usual heaters for this purpose consist of 1 inch pipes screwed into cast iron bases, and in this form one square foot of heating surface will give off from 1200 to 1800 B. T. U. per hour, depending on the velocity of the air through the pipes, and the temperature of the steam in them.

From the fan outlet, ducts are constructed and connected to the various vertical flues leading to the individual rooms. These ducts should be so proportioned that the velocity of the air in leaving the fan will be about 1000 to 1500 feet per minute, this velocity gradually decreasing toward the base of the flues where it should be about 900 to 1000 feet.

The vertical flues should carry the air at from 600 to 800 feet per minute and the registers in rooms should be about twice the size of the flues. The whole idea being to gradually reduce the velocity of the air all the way from the fan outlet to the inlet into the rooms.

The main fresh air inlet leading to the fan should be of such size that the velocity therein will be about 1000 feet per minute.

In a plain ventilating installation on the plenum system with heater for warming the air, we have what is commonly known as the Hot Blast System, and it is always necessary to determine the size of boiler required for the supply of steam for the heater. This can readily be found by the number of B. T. U. necessary to warm the air as explained previously, by 33300 and the quotient will represent the horse power of the boiler required. To this of course must be added any other duty the boiler may have to perform and a sufficient working factor to provide for sudden or excessive temporary loads.

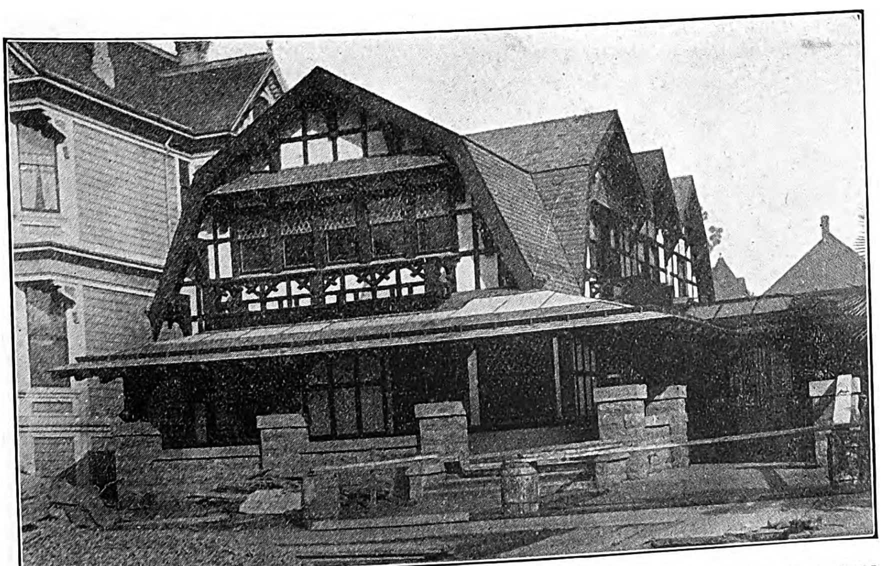
Of all the styles of fans on the market the centrifugal or paddle wheel type, designed to run in a steel plate housing, is to be preferred. With it air can be handled in absolutely known volumes, against a considerable resistance, and it is positive and economical of power.

The cone fan is also a very desirable type of fan for ventilating work and in certain cases where space conditions are peculiar it works in to very good advantage. It requires a brick chamber for its enclosure, and is cheaper than the housed type and is slightly more economical of power.

Disc fans should never be used where they have to draw or force air through any amount of duct work as they will not work against any pressure and it takes a great deal more power to run them than in the case of the other fans. They are very much more liable to be noisy owing to the higher speed at which they must be run.

Disc fans of the Blackman type with curved blades are considerably better than the ordinary type of disc fan with straight blades and may be used to advantage in a combined system on the exhaust ducts.

This style of disc fan is very well adapted for use in the exhaust ventilation of small kitchens, restaurants, basements, etc., where only an exhaust system is used and where the volume of air to be handled does not exceed about 4,000 cubic feet per minute.



A. W. Smith, Architect C-155

An Oakland Home

Farewell Jinks

ERNEST H. HILDEBRAND and August G. Steadman proved themselves to be capital hosts on Thursday evening, September 7, when their friends assembled in the rooms of the Architectural Club to bid them farewell. Messrs. Hildebrand and Steadman are to attend the University of Pennsylvania, to complete a course in architecture.

The evening's festivities will long be remembered as one of the happiest gatherings of the club. As a token of the high regard in which Messrs. Steadman and Hildebrand are esteemed by their colleagues, they were each presented, in behalf of the club, with a magnificent gift, by President Wagner.

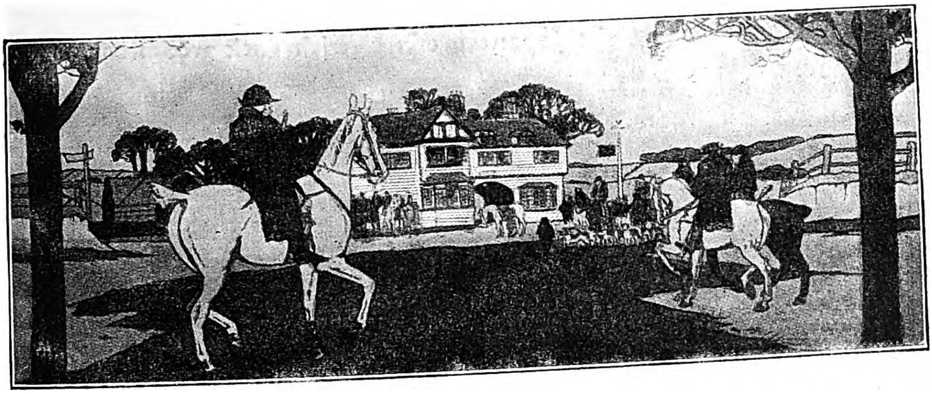
Among those who contributed to the evening's entertainment were: E. H. Hildebrand and A. G. Steadman, addresses; Club orchestra; Bohemian Quartette; C. A. Newbauer, song and stories; A. L. Ellis, recitations and side stunts; Bob Mitchell, in stories; Double Eagle trio, consisting of Arthur Barthold, Oscar Paulson and Albert Barthold; J. G. Drescher, mandolin solo, accompanied by Albert Winter; Knickerbocker Male Quartette; Bob Grennan, fancy dance; Fred Siebe, solo; "Holly" G. Corwin, specialties; Geo. Contrell, fancy dance; Will Fischer, ballads; Max Maxon, jokes; A. O. Johnson, jokes; Geo. Wagner, address.

Among those present were: Geo. Wagner, Albert Barthold, Mr. Irwin, Arthur Barthold, Oscar Paulson, Geo. O'Brien, Robert Barthold, Geo. Contrell, Max Stammer, Albert Barthold, Fred Siebe, Emil Barthold, William Cutter, Pete Decker, F. E. Hesthal, Carl Geilfuss, David Coleman, Al. Glidden, Arthur Glidden, Bobbie Mitchell, L. A. Larsen, D. B. Crane, Dr. R. W. Smith, Geo. Selig, Herbert Williams, T. Smith, G. E. St. John, N. Sexton, Geo. A. Thibault, A. H. Winter, Geo. Wiemeyer, A. Lacy Warswick, E. E. Youngberg, Claude Rickey, Milton Rapp, Will Garwin, Alvin Cobleigh, Will Fischer, C. T. Ramsden, W. Griffith, C. A. Henshaw, C. C. Nimetz, A. Terrill, Sasha Steadman, F. Saunders, C. P. Neilson, A. V. Adler, C. F. Archer, T. Bearwald, J. H. Baehrer, O. R. Baxter, J. P. Christianson, J. H. Christianson, H. G. Corwin, C. Chubhuck, Wm. Crim, Jr., J. G. Drescher, A. L. Ellis, F. A. Farskopf, R. Fishbourne, Sam Frichstad, A. R. Johnson, Oscar Mohr, A. O. Johnson, M. M. Marsten, Chas. H. McVey, C. A. Newbauer, James A. Magee, Geo. O'Brien, W. P. Porter, W. A. Ryer, Carl E. Roesch, E. B. Scott, M. A. Schmidtin, and others.

* * *

Save the Forests

VARIOUS trade journals have joined in the movement to save the Southern forests. Lumbermen have, as a rule in the South, invariably cut the valuable trees first, leaving the poorest to restock the land and the logging operations have proceeded with a waste in handling that verged on criminality. To insure the perpetuation of the country's timber resources, which are of special value to the building industries, it is necessary that ordinary business prudence be exercised by mill owners and land owners. The recklessness regarding fires in the forests is another item which merits serious attention. The economic feature of the Southwest rests as largely on its timber resources as on its mining, farming and manufacturing facilities. Many of the pine family are prolific seeders and producers, and the principles of forest management should be intelligently applied everywhere. If necessary, each State should set apart a domain as a forest reserve, co-operating with the Federal Government where necessary.



Interior Decoration Up-to-Date Furnishing

What Rooms Require

EVERY day every man in the retail business is confronted with the question of the propriety of the use of certain papers for certain purposes. It is not a mere matter of taste or fancy; it is to be considered from the utilitarian standpoint as well as from the historic and sentimental.

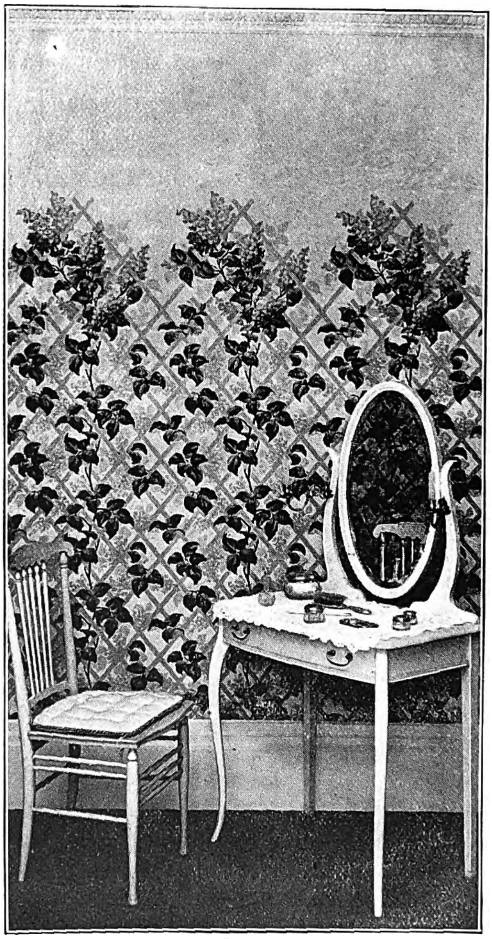
Each period of design developed characteristics which lasted because they were the most permanently pleasing. There was no law to prohibit the use of any pattern or color for any purpose, but with certain well-defined decorative principles in vogue, it was soon discovered that only certain goods left the best and most lasting impression, and for that reason with certain periods of design we find certain distinct kinds.

Following on the principles of this tendency, we can lay down the following rough rules:

For delicate woodwork and furniture it is well to use delicate wall-paper; for light-colored woodwork, light-colored paper; for dark woodwork, deep-toned wall-paper; for highly-polished woodwork, soft, clothy effects; for substantial styles of woodwork and furniture, strong, durable-looking papers. Nothing looks better with mahogany, with its waxed, high-glazed finish, than a soft, antique tapestry effect; nothing looks better with the dull-finished Circassian walnut of the French periods than high-lustre silk papers. Thus, the theory of contrast applies in some cases and the theory of analogy in others. In a young girl's room, where youth prevails, the color scheme should reflect youth and gaiety. In the study, where all is quiet and repose, there must be consistent soberness of environment.

That the above set of rules is rough and is open to exceptions, it is easy to see. There are times, for instance, when a rich red may be used with white woodwork, and when a light Japanese effect, with dark woodwork, is very effective and artistic.

We advise the man who is selecting wall-paper for a purpose to consider the character of the room. There is no period of design in which the use of wall-paper is not appropriate.



A Bedroom Treatment *L. Tozer & Son Co.* C-156

After that one must consider—

First, What is the size of the room?

Second, What is the style of the room?

Third, What is its purpose?

Fourth, What natural influences affect it?

Let us assume first, that the room is a large room, high-ceilinged and well-lighted; and second, that being a large room wherein large patterns are permissible and large pieces of furniture are in proportion, it is to be done in the English Renaissance.

Third, it is a dining-room, and therefore much color and brilliancy may be had from the glassware and silver and table and buffet decoraion.

Fourth, being large and well-lighted, it is affected during the day by plenty of natural light, which, coming from the north, inclines one to supply the deficiency of sunlight by the use of red or yellow on the walls. But considering that the use of the room will be largely confined to the fashionable dinner hour, when it will be brilliantly illuminated, the daylight effects may be ignored; otherwise, the furnishings which would please by day would be faulty by night. If, on the other hand, the room is dimly lighted, a condition which usually prevails in an Oriental room, it is impossible to use too much color. The success of an Oriental room, full of Oriental splendor, with color everywhere, is ruined and made vulgar by its presentation under too strong a light. The same furnishings which appear tawdry under ordinary conditions appear charming under a softened light.

Here are the four general points to consider, and the question what kind of a paper is to be used is answered by the four main characteristics of the room. No man can properly determine the wall coverings of a room until he has a picture in his mind of all that is to go into it.

If the furnishings are full of the ornate, sombre papers are advisable.

If the furnishings lack variety, this variety should be supplied by the draperies, upholsterings and sidewalls.

If the room is a small room, small figures, small details, should be adopted; large room, vice versa.

If a room is of dull woodwork, silks are introduced to give cheerful shimmer and glitter. If, on the other hand, there is a glare of white wood or cut glass or china, or a superabundance of sunlight or lamplight, dull-finish papers are a restful need.

Bear always in mind that no one feature of a room should be obtrusive. The old theory that one must not construct decoration, but simply decorate construction, is wrong. Decoration, to be correct, should be invariably planned, constructed. The decorative ensemble of a room is decorative construction, and each and every detail of a room should be introduced with the general construction well in mind.

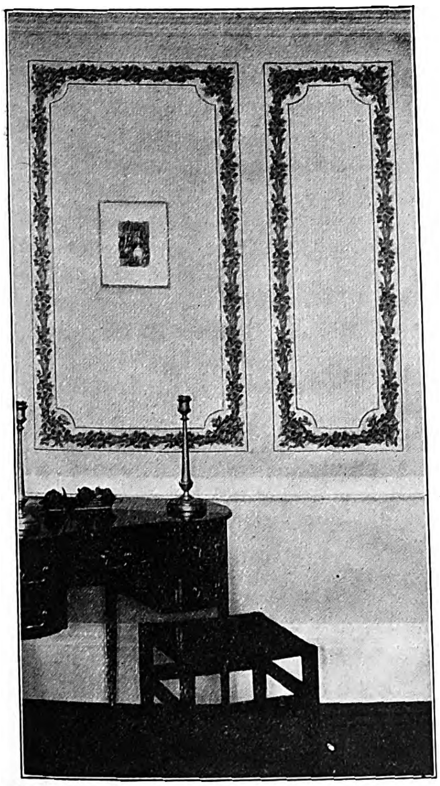
It can be seen by the above that, with the exception of the color scheme, the theory of contrast rather than analogy is more often appropriate. But, whether of contrast or analogy, there should always be a striving for harmony in general effect as well as in color.—Wall-Paper News.

* * *

Odd Facts About Color

DID you ever notice that there is no blue food? We eat things green, red, yellow, and violet; flesh, fish or plants in all the colors of the rainbow, except blue.

Many deadly poisons are blue in color, such as bluestone or the deadly night-shade flower. The color stands in our slang for everything miserable and depressing.



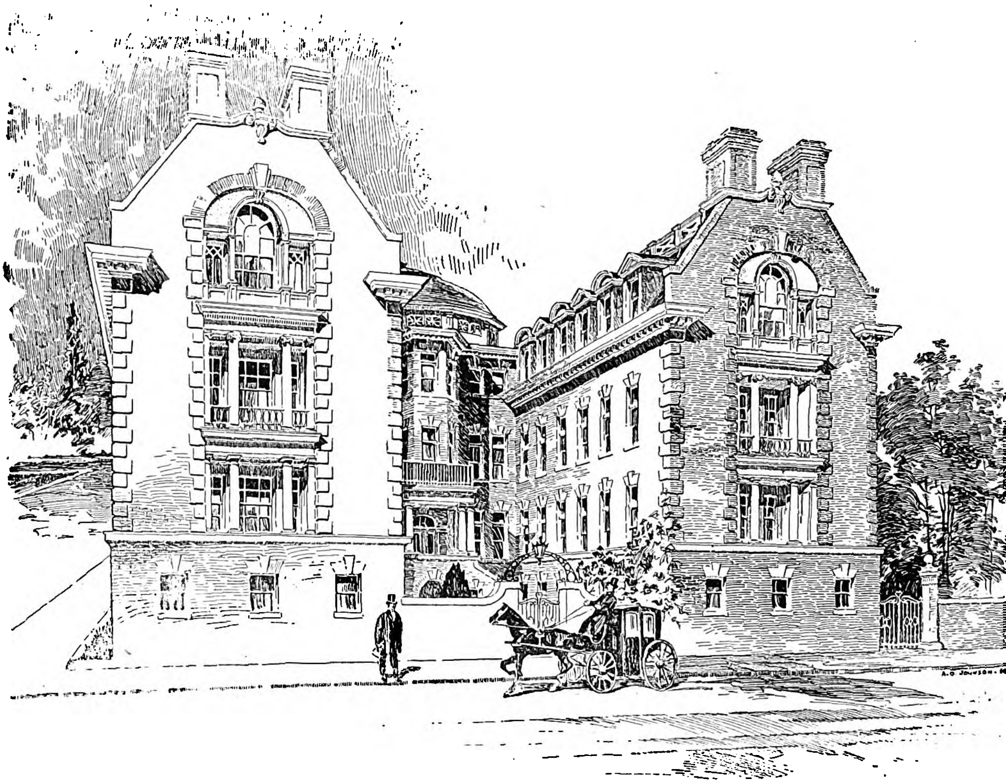
A Panel Suggestion *L. Tozer & Son Co.* C-157

But this is only one of a thousand queer facts about colors.

Heat a bar of iron and the particles of the metal are set in motion, shaking violently one against another.

Presently the surrounding ether is set in motion in large, slow waves through the air, like the waves of the sea, until they break upon our skin and give us the sensation of heat. As the iron gets hotter other waves are set in motion in immense numbers, traveling at more than lightning speed, and these break upon the eye, giving us the sensation of red light.

The red-hot iron, getting still more heated, throws out other sets of waves, still smaller and more rapid—orange, yellow, green, blue, indigo, violet, all the colors of the rainbow. The eye cannot tell one from another; the whole bundle of rays mixed up gives us an impression of white. That is the glow from white-hot iron, and such is the light from the still greater brightness of the sun. Sunlight is a bundle of rays of light—red, orange, yellow, green, blue, indigo and violet all mixed together. The mixture of all colors is white light. The absence of all color is utter darkness.—N. Y. Journal.



Hahnemann Hospital, San Francisco *Meyers & Ward, Architects* C-158

Modern Hospital Buildings

SAN Francisco's first Homeopathic Hospital is fast nearing completion at the corner of California and Maple streets. It is expected that the building will fill a long felt want which the public and profession alike will appreciate. The hospital is the result of many years of earnest planning and when completed it is claimed it will be one of the best equipped institutions for the care of the sick in the west.

The hospital has a frontage on California street of nearly 200 feet and a depth on Maple street of 132 feet. The architectural design of the main building is an adaptation of the New England Colonial style and presents cheerful and inviting facades which are in pleasing contrast of design of so many hospitals.

The building is three stories and basement, constructed of brick and iron and trimmed with stone. The interior will have broad and light corridors, and in place of stairways will be provided with inclines by which the different floors may be reached. The value of the inclines over ordinary stairways is obvious as it will greatly facilitate the care of the patients and in case of fire will provide for the easy removal of the patients.

Special attention is given to the ventilating system. The building is to be equipped with apparatus so that a forced system of ventilation will be used. Through this arrangement foul and vitiated air will be removed automatically. Fresh air properly tempered, warm or cool according to the need of the patient, will be forced from the room and an equal amount withdrawn in such a manner as to avoid all drafts and at the same time maintain an abundance of pure and sweet atmosphere.

Landscape Gardening

Making Our Cities More Attractive

By BERTHA M. CHAPMAN, Superintendent of Nature Study, Oakland Public Schools

AS I look over the magazines of the day, I find in almost every one an article on some phase of children's gardening. It may be an account of some work to improve agriculture or an interesting experiment in school gardening, or again we are shown a home as it looked before and after the gardening interest was awakened. One might almost say that a wave of fragrant flowers, green trees and vines is sweeping over our land. Let us hail it with gladness, and do our little to swell the flood.

We are doing something in our own State, in spite of the fact that many wise ones shake their heads and mourn the folly of our wasted time. Our attempts are young, but let those who delight in reading of the things done in some far-away State and idly wish we, too, might take some steps in the same direction, look about them and see the opportunities awaiting them. In many places in California groups of earnest men and women, with the enthusiastic support of thousands of our young people, are quietly taking steps to make our homes, our schools and our cities more attractive with trees and flowers.

We have our homes and our school gardens, but I wish to speak here more especially of what our children can do to beautify our cities. For years we have been distressed with unsightly vacant lots in the neighborhood of our schools. They were quite like the vacant lot that is perhaps near your own home. We look out of our windows, many, many times a day to catch a breath of fresh, sweet air, to look for a moment upon a clear, blue sky, and chase the shadows of the flickering leaves on the grass or feast for an instant on the wealth of color in a bed of poppies or geraniums that we may carry some of their joy with us into the darker shadows of the room. But instead of this, what do we get? Let me tell you, if you are so fortunate as to have no such surroundings. In the first place, the sidewalk is almost if not quite covered with weeds, grown gray with the weight of ripening seeds, and bowed beneath the feet of struggling passers-by, oat stalks tangled with the thistle and mallow dwarfed yet spreading wide its fanlike leaves. A few weather-worn boards cling by their rusted nails to the tottering fence posts. Beyond, where the neighbor's fence has not proven high enough, old oil cans have been battered into a sheet of rusty tin too fearful to look upon. An old gunny bag hangs from a dilapidated shed, both grown tattered and gray with the passing seasons. A few dirty rags and bits of cordage flutter airily from a one-time clothesline. Below, half buried in the tall weeds, is a great heap of rubbish, scraps from the table, rags, cans and bottles. What need to say more?

We turn from this sight with disgust, going back to our work with a sigh more weary and unrefreshed. The world is truly too much with us, and we long for the great, green world of nature.

Surely this need not be while we have thousands of sturdy children ready to take hold if we will but give them the chance. They carelessly play about these unsightly places, perhaps adding to the general disorder of the neighborhood. Why shall we not take advantage of all this energy, turning it to good advantage? Why is this in itself not a part of our school work? We talk much of making good citizens. Is it not the part of a good citizen to see that the neighborhood, the city in which he lives, is as beautiful as it can be made? Does he not have a personal responsibility to make and keep it so? This, then, is one of the objects of our garden work. We take vacant lots, clear them and plant them to flowers and vegetables, trying to make them an addition to the community.

There is no passion more firmly fixed in the human heart than the passion for digging in the ground, the passion for planting something to see it grow, to care for it, and wonder over the mystery of it all. Not one of us ever grows so old that the scent of new-turned sod does not send a thrill through our hearts. Our nostrils widen to catch the odor, and we clasp the spade and rush forth at the call of awakening nature. I never have found a child who at some time has not longed for a garden of his own. A little soil, a few seeds, and something growing to watch and care for. Like a flash the young people respond to the call and the opportunity, and we have made a start.

Friends and owners of neglected property, some of them thousands of miles away from the city, granted us the use of their vacant lots, provided we agreed to turn them over the moment they were needed. W esurely agreed to this, and set to work. The first thing to be done was to get the lots cleaned up. Now this was not an easy thing to do, but we all know how much easier it is if each one is doing his part. The lots were first laid out in small beds, averaging say 5x10 feet, allowing broad, three-foot main walks and narrower paths between each separate bed. Stakes were then driven and twine run to make the divisions plainer to the children. So far the work is done by a few boys or girls, who by good work have shown that they are equal to the responsibility. Now the time has come for the entire class to go into the field, and this usually comes half an hour before school closes in the afternoon. Each child goes at once into his own plot and begins to clean it up, and what a merry time they make of it, too. Boys and girls alike work with a will. Hours slip by unnoticed. The more persistent workers finish first, and they are rewarded by being allowed to clear the paths, or they turn to help some favorite friend who is less strong or was unfortunate enough to draw a stubborn piece of ground. The shadows grow very long, deepening into shade, and still they work on until they are actually driven from their labors. Of how much of this school work can this same be said? The early morning finds the slower ones at work long before the school hours, striving to catch up with their swift neighbors. When the lots are finally cleared comes the struggle of preparing the soil. It will indeed be a struggle if you have no way of plowing, and must depend on the efforts of the children. But if you must depend on them, do not feel discouraged, for they will rise to meet your needs, and the work will be done. These lots are often the playground for the neighborhood, and the soil is baked and pounded till it is as hard as stone. Here it is that the lack of tools will be most keenly felt. Take courage, for you are working with enthusiastic youth, a combination that sees beyond the obstacles.

The planting time. It is a question as to the best things to plant. Our young people have shown a decided fondness for vegetable gardens. The joy of raising something that can be used as food is, I suppose, a primitive instinct, and comes before the love of the beautiful. At least we seem to be very near our stomachs yet. Flowers are there, too, and our vines of sweet peas and morning glories, gay sunflowers and poppies are a joy to all who see them; and the beds of crisp radishes, light tufts of curling lettuce and waving bean and pea vines are quite as beautiful. The happy murmur of the children's voices as they work over their treasures, urging them on to do their best, is no less sweet to the ear than the hum of the brown-coated bees tumbling headlong into the yellow fluff of the poppy, or the song of the red-headed linnet who has hidden his nest away in the vines that now cover the once unsightly shed.

Friends will come to your aid with slips and seeds, water and tools, when you do a little to show them you are in earnest, and how your small efforts will add to the beauty of your neighborhood and your city. It must go slowly, very slowly, for remember that you cannot get finished work from children. They will not have the garden you could make. Their paths will not be straight, nor will their beds be shapely, and the weeds will grow, for as yet they do not know the weed from the plants they are watching for, but they will learn. They will not know what sorrow it will bring them if they persist in digging their paths far below the bed level, nor what will happen if they water in the full noonday sun, but they will learn. The mature mind must be willing to wait a little while, and then shall we see results.

Thousands of our young people have gone from these simple beginnings to their own homes, and in the barren yard which before knew only filth and neglect, now bloom the fragrant blossoms to delight the eye, and the table is dressed with vegetables far beyond price. Is this in itself not reward enough for our labor?

Even here in California, this land of blossoms, there is need for this work. Children must be encouraged and shown how to make these gardens before they will do it. Let them see what it means to the neighborhood of the school, and when they have taken these first steps they will be better fitted and more ready to help in the general uplift.

Naturally the children are eager to see what others are doing, so each year they have a public garden day, when they show their best, letting us see what a boy or girl can do with a few seeds, good soil and tender care. The variety shown at this time would surprise the older friends who come by the thousands to see what our army of young farmers can do. Many of these wee farmers sit all the long day through watching their precious plant, fearing someone might carelessly pass it by without knowing how wonderful it is, for his head of lettuce or cabbage may be the biggest at the show, and to him in his earnestness it is quite the biggest ever grown.

All over California this movement is taking its first steps. We all need help, encouragement, suggestions. We are all of us lovers of the out of doors, worshipers of the trees and the flowers. In our schools we have an army of young men and women longing for someone to show them the way to come into closer touch with the things of nature. The birds, the flowers, the rocks and streams are calling them just as they called to you and me. Can we not do more to answer this call?

✤ ✤ ✤

Prosperity, like misfortune, comes to many a man when he is not prepared for it.

Among the Architects

Information contained in this publication is gathered from the most reliable sources accessible, but to make it absolutely accurate the publishers urge the co-operation of the members of the profession :: :: ::

Architects Meyer & O'Brien of San Francisco have made plans for extensive alterations and an addition to the building at Kearny street and Hardy Place. The building is to be raised to four stories, the upper portion being arranged as lofts while the ground floor will be fitted up for retail stores. The cost will be about $20,000.

A brick building is to be erected in San Francisco, five stories in height for Roger Johnson, from plans made by H. Geilfuss & Son, San Francisco.

Plans are being prepared for a two-story and basement high school to be erected at San Pedro by that city under the supervision of Architect F. S. Allen of Pasadena. The cost is estimated at $40,000.

B. E. Remmel is preparing plans for a number of cottages to be built for the San Francisco Real Estate and Development Company, on the east side of Missouri street and to cost from $2,500 to $5,000.

An observatory and boat house of stone or cement will be constructed a Mission Park, San Francisco, by the city of San Francisco under the direction of the Park Commissioners.

A syndicate is to build a brick hotel of three stories with accommodations for at least 100 guests at South San Francisco. Dodge and Dolliver are preparing the plans.

Architect C. W. McCall of Oakland is drawing plans for a number of flats to be built at the corner of Merrimac and Telegraph Avenue, Oakland, with all modern conveniences, and to cost about $3,750. The same firm has plans for a $4,000 residence to be built in Berkeley by H. C. Kamar.

Five modern new school houses are to be erected in the City of San Francisco at an aggregate cost of $250,000. Work will commence as soon as the drawings by Architects Shea & Shea are completed.

Plans are being prepared by Fred P. Dorn of Los Angeles for a three story brick and stone structure to be built on Eighth Street between Hill and Olive Streets, Los Angeles, for H. W. Whitmarsh. The building is to have two stories and 20 living rooms with private baths, etc., and to cost about $16,000.

Architect Albert Porta of San Jose is preparing plans for a cathedral at the request of the Archbishop of this diocese. The Italian Gothic style is to be followed and the edifice will be built entirely of stone and marble, the cost of which will probably be $500,000.

Plans of Architect Matheson of Fresno for a new City Hall to be built in that city, have been approved and bids for the work will be called for immediately. The cost is estimated at $75,000.

The Marie Antoinette Hotel on Van Ness Avenue, San Francisco, is to have an addition of five stories. The addition will be built on the lot adjoining the present building. Plans are to be drawn by L. Mastropasqua.

Architect H. Barth has finished plans for a four story brick building with basement to be built in San Francisco for Mr. A. Lietz at a cost of about $35,000.

A bank building is to be erected in Haywards at the corner of Main and B streets, the lot having been purchased by the Bank of Haywards. This structure will probably be of stone and one or two stories in height.

Bliss & Faville, of San Francisco, are making plans for a large hotel to be built in Redwood Canyon, Mill Valley. Mr. Kent, the owner, is a Chicago capitalist and at present is a resident of Kentfield. The cost is estimated at about $150,000.

The Plater Estate of Oakland is about to erect a new business block in that city at the corner of Fourteenth street and Broadway.

Architect Albert Porta has just completed plans for a handsome edifice to be erected on West San Fernando street in San Jose by the Italian Church, at a cost of $30,000. It will be built of sandstone and brick, and finished in Italian Gothic style.

A four-story apartment house is to be erected at the corner of Santa Clara and Third streets, San Jose, from plans by Architect Charles Mau of Oakland. The owner is Mrs. Hubbard of Cloverdale.

M. Lissner, 322 Douglas Building, Los Angeles, has just purchased a site at Tenth and Main streets, and proposes to erect a modern three story brick building, to consist of stores and apartments.

Architects Dodge and Dolliver are preparing plans for a five-story brick rooming house to be erected on O'Farrell street near Leavenworth, San Francisco, to consist of 40 rooms, and to cost in the neighborhood of $20,000.

Work will begin at once for extensive alterations on the Thurlow Block at 126 Kearny street, a portion of which is at present occupied by Chas. Keilus & Co., clothiers.

Bliss & Faville, San Francisco, are the architects for a handsome residence which is to be built at Menlo Park for J. J. Moore, at a cost of $12,000.

Plans are being made by William Klinkert for a two-story parochial school and hall to be erected at San Jose, the cost of which will probably be from $10,000 to $15,000.

An orphanage building to cost $150,000 is to be built in San Mateo from plans by Architect Frank Van Trees. The material used in the structure will be mostly stone, brick and iron.

Fruitvale is to have a new school house to cost from $30,000 to $40,000. No plans have been accepted as yet.

L. Mastropasqua, architect, is preparing plans for a handsome residence to be built at Santa Rosa at a cost of $30,000. The features of the house will be a large dome built on the Italian style.

Buildings are to be erected at Pasadena, Cal., for the purpose of a woman's college at a cost of about $1,000,000. D. M. Linnard, president of the Board of Trade, Pasadena, is at the head of this project.

Architect F. S. Van Trees, Crocker Building, San Francisco, is drawing plans for a residence to be built on Presidio Terrace, San Francisco, for C. W. Clark of Sacramento. The exterior of the residence is to be of plaster and the interior of hard wood. The cost will be about $30,000.

A three story brick lodging house to cost from $30,000 to $50,000 is being planned by Architect W. H. Armitage. The building will be located on Clay and East Streets, San Francisco. This same firm of architects has plans for a Masonic Temple to be built on Geary street.

W. G. Hind is preparing plans for a structure to consist of five stores and twelve flats, to be built at the corner of Hyde and Pacific streets for Dr. Redmond Payne.

A seven story office building, with a handsome stone front is about to be erected at Eighth and Market streets, San Francisco, for James Otis. The McGilvray Stone Company has been given the contract for the stone work.

A brick business block valued at $50,000 is to be erected by Henry E. Bothin at Second and Natoma streets, San Francisco. Frank S. Van Trees is preparing the plans.

The Palo Alto Board of Trade is considering the erection of a tourist hotel to be built in that city at a cost of from $50,000 to $75,000. No plans have been prepared as yet.

Newsom & Newsom, architects, are drawing plans for an apartment house which is to be erected at the corner of Eighteenth and Castro streets, San Francisco, and to cost in the neighborhood of $40,000.

The Scottish Rite Masons have purchased a lot on the northeast corner of Van Ness Avenue and Sutter streets, and propose to erect a modern steel and stone building to cost from $250,000 to $300,000.

August Nordin has in preparation plans for a new church to be built on Howard street for the Trinity English Evangelical Lutheran Society at a cost of $17,000. The edifice will be frame and will seat 700 persons.

A theatre and office building located on Broadway, between 6th and 7th streets, Los Angeles, is to be built under the supervision of plans drawn by A. F. Rosenheim. Features of the structure are to be polished granite, terra cotta and pressed brick front; ornamental iron and bronze work, electric elevators, fire escapes, plate glass, steam heat, etc., etc.

Ralph W. Hart, architect, is drawing plans for a number of cottages to be built in Oakland in the near future.

Plans for stores and apartments to be erected in Los Angeles at Maple Avenue and 15th street, for G. W. Parker, are being considered.

Messrs. Kidd and Anderson have been given the contract for the erection of a three-story frame building to cost about $12,000, located at Twenty-ninth and Dolores streets, San Francisco.

A thoroughly modern structure is to be built on Wall street, San Francisco, for Mrs. M. A. Taylor, at a cost of $12,000. The building will consist of eight flats. The preparations are in the hands of William Helbing.

Architects Koenig & Pettigrew, are preparing plans for a mammoth warehouse to be built at the corner of Second and Brannan streets, San Francisco. The foundations and floors will be of concrete, the balance of steel and brick.

❈ ❈

The Architectural Association of London publishes a humorous journal called "The Tufton St. Tatler or the Purple Patch" from which the following is an extract:

THE DAY'S WORK.

I got to the office at half-past ten,
And sat on my stool and sighed;
Poor Jim grew sleek on a pound a week
In this way till he died.

I drew a moulding about a door,
And figured it two by three;
Then feeling weak, I went to seek
A neighbouring A. B. C.*

When I came back in the afternoon
That moulding looked too small;
After earnest thought, I felt I ought
To rub out door and all.

Just as I finished, the clock struck five,
And I thought, with a weary sigh,
"It's hard for you to earn your screw
In this way till you die."

*Aerated Bread Company.

THE
Architect and Engineer
OF CALIFORNIA

Issued Monthly in the interests of the Architects, Constructing Engineers and Contractors, and the Allied Trades of the Pacific Coast.

SAN FRANCISCO AND LOS ANGELES

Address all Communications to the Business Office, 215 Sansome St., S. F.

Press of THE HICKS-JUDD COMPANY, 21-23 First Street. *Halftones and Etchings by* CALIFORNIA PHOTO ENGRAVING COMPANY, First and Mission Streets, S. F.

Vol. II. SEPTEMBER, 1905 No. 2

CARELESS DESIGNING.

The architect pressed the button calling his chief draughtsman, and when that young man presented himself said: "Mr Pencilpusher, a very wealthy client, has just been in, and wishes me to prepare sketches for a large office building and six flats. The flats are a small matter and you need not spend much time on them; in fact, I promised sketches of both by tomorrow. Here is the information, so you had better drop whatever you are working on and start these."

Weary Mr. Pencilpusher takes the information, goes to the draughting room, scratches his head and pores over the data for half an hour or so. No idea forthcoming, he searches the plates for plans, etc., of buildings already erected until he finally stumbles onto something that will fit the lot he has to fill.

For the flats, well, any old thing that has been built before, is taken out of the file, altered a little here and there, a new ornament cribbed from "Meyer's Hand Book," and the sketches are complete. They are then turned over to the architect, who makes an estimate of the cost and submits the whole to the client.

After studying the sketches for a few days, the client decides to build without any alterations. Result: San Francisco has added to her already large list two more commonplace buildings; nothing original, nothing pleasing, nothing unique about them. We have seen on every street throughout the city the prototype of the flats.

It is a fact to be deplored that the above is an illustation of the way in which a number of our architectural oddities are prepared in the majority of offices throughout the city to-day. They are nothing more than a careless mixture of lines; some of them make one think the architect had a mania for drawing horizontal lines. This class of work seem to please the public, however, for every architectural office in the city prospers, even clients requesting that their residence or flat be built on the lines of some of these "juggled affairs."

Why should sketches be prepared in a rush, only to have the building delayed for months during the course of erection? Would it not create a far better condition of affairs if every architect would educate his client to wait a few days longer, letting him (the architect) have the benefit of that time for the study and consequent improvement of his plan and design. No draughtsman (and let him be the cleverest), can prepare original and careful sketches when he is rushed. Good and conscientious work springs from an inspiration backed with judgment, cleverness and time. A design that will be pleasing to the eye must have perfect proportion between its voids and solids; its horizontal divisions carefully studied, and just enough ornament to—well, just enough.

We realize the fact that a number of offices in San Francisco turn out good work, but we also realize the fact that their number is limited.

* *

BEAUTIFY THE ROADHOUSE

There is nothing in all California more uglier than the many wayside taverns which are to be found along the country roads. If we must have lager beer emporiums and soda water dispensaries let us endeavor in the future to make them as refreshing to the eye as the glass of beverage is to the parched throat.

The Pacific coast small store and wayside inn has, from pioneer days, been made but one way—a rectangular building with a gabled roof and high false square front on which is built some weak attempt at a cornice. The building is invariably covered with some hideous old style pattern of rustic and painted as conspicuous a color as possible.

The next time the architect designs a roadside inn—if we must have such things—let him try and persuade his client to allow the building something more ornate. Try the shingle cabin for instance—one of those quaint creations with a broad sloping roof, great wide eaves and an old fashioned sign in front hung with chains from a great wrought-iron bracket.

All the California roadside houses have a water-trough in front, where the tired passing horse can quench his thirst. These troughs are put there not from humanitarian motives, not because the inn-keeper is a shining light in the S. P. C. A. and does not want any poor equine to suffer the tortures of the "ancient mariner." They are placed in front in order to give the driver an excuse to stop frequently and fortify himself against a possible rattlesnake bite. But if your client must have a water trough, if he needs it in his business, see if he won't exchange the antiquated and unsightly swill trough for a more up to date round or square receptacle with a rock pile in the center coming out above the water and with a slender stream like a fountain playing up in the air and spreading its silvery drops over the mass of stone. Just tell your client how much more inviting this will look and how many more drivers will stop to water their horses and how many more rattlesnakes will be rendered innocuous.

The interior of the roadhouse is little more attractive than the exterior. There are generally four very ordinary walls, either white plastered or covered with a cheap, loud paper, a bar, a greasy table or two, and a few chairs. It is here where the inn-keeper makes his greatest mistake. One of the business maxims of the successful merchant is "Never let your customer get away," and the best way to keep him is to make everything so attractive that he dislikes to part with a place so cheerful and restful. Suppose for instance that we line our room with wide, plain boards, put big heavy beams across the ceiling and stain it all a dull, darkish color. Then build a big brick open fireplace opposite our bar with deep high backed seats on each side. Who, then, could resist sitting and resting his buggy cramped limbs and incidentally remarking, "Well—let's have another!" Now, in all seriousness, let us all try and awaken a spirit of improvement; for our road views and scenery are utterly ruined by the miserable structures which line them.

* *

THE CEMENT BLOCK INDUSTRY

With the growth of the cement block industry, the importance of turning out only first class material cannot be emphasized too strongly. It appears that in the haste to establish a business, there has been a tendency on the part of certain companies to produce an inferior block, a mistake that will not only injure the manufacturers of that particular stone, but is bound to react upon the entire industry. The people are just getting acquainted with the cement block. They are watching closely its development and serviceability. The maker seeks to create a market by proclaiming the merits of his blocks and, among other things, he argues that his goods are not only as durable and strong as real stone, but are so manufactured that it is difficult to detect the imitation from the genuine.

In connection with this particular point, it is unfortunate that there should be so much effort at imitation and too often the endeavour to produce an article cheaply rather than well.

Great quantities of so-called "rock-faced ashlar" concrete blocks are being manufactured and used in the construction of foundations or for the facing of buildings. The rock-face is clearly intended to have the appearance of stone, but the deception is too often a dismal failure.

❖ ❖

If there is any one thing connected with architectural practice that is definitely fixed and decided, it is that the contract between architect and client, whether expressed or understood, is purely a personal contract and cannot be transferred by a living architect or administered by the heirs and assigns of a dead one. That this should be the case with an architectural practice, while, in England, it is a matter of every-day traffic for a medical practitioner to sell his practice, including his connection and acquired patients, is merely curious and shows how much greater regard men have for the dollars they create than for the lives which they do not. Ordinarily, when an architect dies, it causes a good deal of trouble to his clients because of the personal nature of the contract, and unless the clients are willing to have their jobs carried on by the deceased architect's assistants they have to seek out new architects and enter on new personal contracts with them. A case has recently come up in Stamford, Conn., where the client does not seem to have had knowledge of this relation between architect and client, and because of this is involved in avoidable difficulties. Having to build a school-house, the selectmen employed an architect, and then, in place of putting the work in the hands of a general contractor, made separate contracts for the different portions of the work, the usual delays and annoyances resulting, in the midst of which the architect himself died before the job was half finished. Instead of seeking a new architect the selectmen seem to have imagined that the deceased architect's heirs and assigns would in some way care for the execution of the contract. But as no one put in an appearance, Mr. John Ennis, the contractor for the carpentry work, voluntarily assumed the role of architect and completed the building to his own pleasure and, apparently, without too careful regard for specifications and detail drawings. A new board of selectmen, when they came into power, discovered certain omissions and discrepancies, and on refusing to pay Mr. Ennis's claim are now being sued by him. The Ennis contract was for $5,350.00; he has received $3,000 on account, now claims $5,346.60 and is suing to recover $7,000.00 "damages," in which elastic term could possibly be discerned a one and a half per cent. commission for "supervision" as acting architect.—The American Architect.

❖ ❖

An English invention is that of self-heating canned goods. Upon punching holes in one end of a can of soup, for instance, violent boiling begins. At the end of five minutes the can is inverted, and after a short interval opened in the usual way, when the hot soup can be poured out. The heat is evolved from slaking lime, and the invention promises wide usefulness.

❖ ❖

American fire proofing is carrying the day abroad. In London no less than four large hotels and several warehouses are under construction besides office building, and American methods of steel frame and fire proof construction are being adopted. The British experts recently made a test of the reinforced terra cotta floor arch, and the American hollow tile people won with flying colors.

The Publisher's Corner

Travelers will tell you that Dalny is a magnificent port built by the Russians at the entrance to the Gulf of Pe-Chi-Li near Port Arthur and, before the war, was destined to become the principal City of North China.

Owing to the greater elevation of the ridges surrounding its bay, Dalny is far better protected from southeasterly gales than Port Arthur and for that reason was chosen by the Russian government as the site for its principal commercial port on the Pacific Ocean.

The City of Dalny was carefully laid out according to modern standards of hygiene and comfort, and stringent regulations prevented the crowding of houses side by side.

The Russians were very proud of Dalny and when they abandoned all hope of preventing the Japanese from capturing it they set fire to residences, stores, school houses, sheds, depots, warehouses, etc. As these buildings were built of brick and stone, the interiors and roofs only were destroyed.

The Japanese army has rebuilt the City of Dalny with Malthoid Roofing.

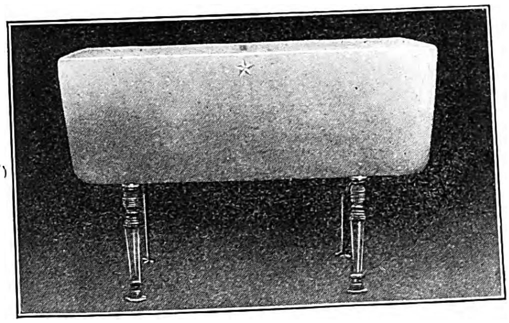
Malthoid Roofing has been used extensively by the Japanese government for several years, and has proved to be durable, long-lasting and exceptionally convenient and inexpensive for army use.

The compactness and ease with which it can be transported, together with the fact that all of the necessary nails, cement, tin caps and directions are contained in each roll enabled the Japanese army to quickly, inexpensively, and thoroughly re-roof the buildings that had been partially destroyed by fire and the devastation of war.

Through the hot Asiatic summer Malthoid Roofing stands the torrid heat without cracking, expanding, opening, running or blistering. When the fall rains set in and pour down on this sun-beaten roof, it does not leak, and later when the mid-winter cold spell comes it does not injuriously affect Malthoid Roofing in the least, for this roofing does not crack nor freeze but remains strong, durable, pliable, weather and water-proof all the year round. Samples and booklets; if you wish them write to The Paraffine Paint Company, 24 Second street, San Francisco, Calif.

✤ ✤

Mr. C. W. Blabon of 123 California street has organized a unique and original branch to his regular business of typewriting specifications from architects' and contractors' drafts of same. He has secured the services of a leading and competent draftsman of over ten years' experience in architectural work, and is now prepared to save the busy architect and contractor the trouble of composing their specifications by writing them himself direct from the drawings and plans. Mr. Blabon has the reputation of being the best specification authority among the numerous public stenographers who cater to this class of work. He has made a specialty of this class of work, and as a consequence, is now writing the specifications for nearly all the leading architects and contractors who place out their work. He has had a great many years' experience, having at one time been employed by a leading architect of this city.



J. F. Reilly & Co.'s star cement laundry trays are gaining in popularity with the San Francisco architects and builders. The tray is of superior quality and is put in under a guarantee that it will give satisfaction. The trays are not only superior to all other grades now on the market from the standpoint of durability, but they have an especially fine finish. The company has lately gotten out anew tray, apicture of which is shown in this number of The Architect and Engineer. The factory of J. F. Reilly & Company is at 23 and 25 Spencer place, San Francisco. It might be stated here that recently one of the big San Francisco architects used several of the Reilly trays as an experiment. He was so well pleased that he is now specifying the trays in all his new work. The company makes aspecialty of fish and butcher tanks.

❖ ❖

Draughtsmen who have used the Dietzgen drawing instruments have only words of praise for them. The Company's high grade drawing material are known from the Atlantic to the Pacific. The San Francisco office at 14 First street, handles a complete stock of the Company's goods, including no less than five different grades of drawing instruments.

Special attention is paid to the highest grade instruments, which include those made by the Richter people, and which are considered the very best that money can buy. The well-known "Gem Union Brand" is also carried by the San Francisco store. Each brand may be considered perfect along its own line, and the matter of selection between them must be left to the taste of the purchaser.

The materials employed in the manufacture of Gem Union instruments are German silver and steel. The finish is remarkably fine and so bright that the least flaw or fault in workmanship, form or quality of material can be easily detected. The San Francisco store makes a specialty of drawing, tracing and blue print papers.

CARNEGIE BRICK AND POTTERY CO.

(WORKS AT TESLA AND CARNEGIE, CAL.)

DESIGNERS AND MANUFACTURERS OF

ARCHITECTURAL TERRA COTTA

HOLLOW TILE FIRE-PROOFING, SEWER PIPE
PRESSED BRICK, ENAMELED BRICK
PAVING BRICK, FIRE BRICK

WRITE FOR CATALOGUE TO

Western Fuel Company

CARNEGIE SALES AGENTS

Phone Private Ex. 558 **318 California Street**

Write us for Prices on Common Brick

Architects, decorators and others who appreciate harmony of design, have always complained of the impractical arrangement by which electric shades and sockets are fastened to the fixtures they are intended to trim.

The customary way of doing this is to attach the electric socket, with all its unsightliness, directly to the fixtures, and then placing a holder or ring around it with screws to hold the shade, all in plain sight, with no attempt made to disguise their unattractiveness.

The first departure from this method was put forth by The Enos Company of New York whose advertisement appears on another page, and by the use of a special mechanism they have been able to preserve the harmony of the design throughout, suggesting the lines of the metal portion of the fixture in the frosted glass shades, these shades being held in position by a running screw cap placed inside of the shade doing away with the use of holders or screws.

Those interested would do well to call at the studio of the local representatives, 110 Geary street, where the merits of this construction will be explained in detail.

❖ ❖

It may sound a little peculiar in logic, but it seems to be a fact just the same that the way to get good out of life is to give it to others.

WHY NOT BE UP-TO-DATE

It doesn't cost any more, while you are about it, to specify the best and give the owner a gas range that is absolutely modern.

REAL ECONOMY OVENS

Are quick, even and most economical bakers. The fire is always visible and can be easily regulated from a standing position.

Why make women folk break their backs operating old-fashioned, low-oven gas ranges? REAL ECONOMY GAS RANGES have elevated oven and broiler. No stooping nor bending necessary to operate. Made in all sizes from small Flat to large Hotel. Gas Broilers, Water Heaters, etc. Ask the **San Francisco Gas and Electric Co.** to show them to you; you will be pleased.

Made by

THE ECONOMY STOVE CO., Cleveland, Ohio

Shipped from stock by

POTTER & WILLARD

PACIFIC COAST AGENTS

52 First Street **SAN FRANCISCO**

A WAY FOR YOU TO SUBSCRIBE NOW

CUT OFF HERE

THE ARCHITECT AND ENGINEER OF CALIFORNIA,
215 SANSOME STREET, SAN FRANCISCO,
142 SOUTH BROADWAY, LOS ANGELES:

Please send THE ARCHITECT AND ENGINEER for one year and until further notice to

NAME..

STREET AND NO. ....

CITY..

STATE...

SUBSCRIPTION PRICE, $1.00 A YEAR.