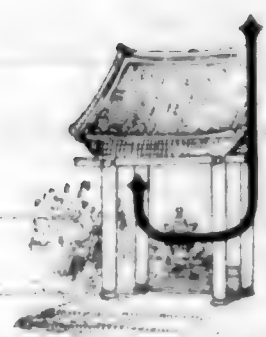


TRANS-MISSISSIPPI AND INTERNATIONAL EXPOSITION.

JUNE 1 TO NOVEMBER 1, 1898.



JUNE 1, 1898, is the date set for the inauguration of the Trans-Mississippi and International Exposition at Omaha. For five months the gates will open upon a magnificent display of the products, arts, industries and resources of the Greater West.

The Trans-Mississippi Commercial Congress, composed of delegates from every state and territory west of the Mississippi river, by unanimous vote designated Omaha as the Exposition City. The area



FINE ARTS BUILDING

of the Trans-Mississippi region is more than 2,500,000 square miles, and embraces the great granary of America, vast forests of merchantable timber, and practically all the precious minerals produced in the United States.

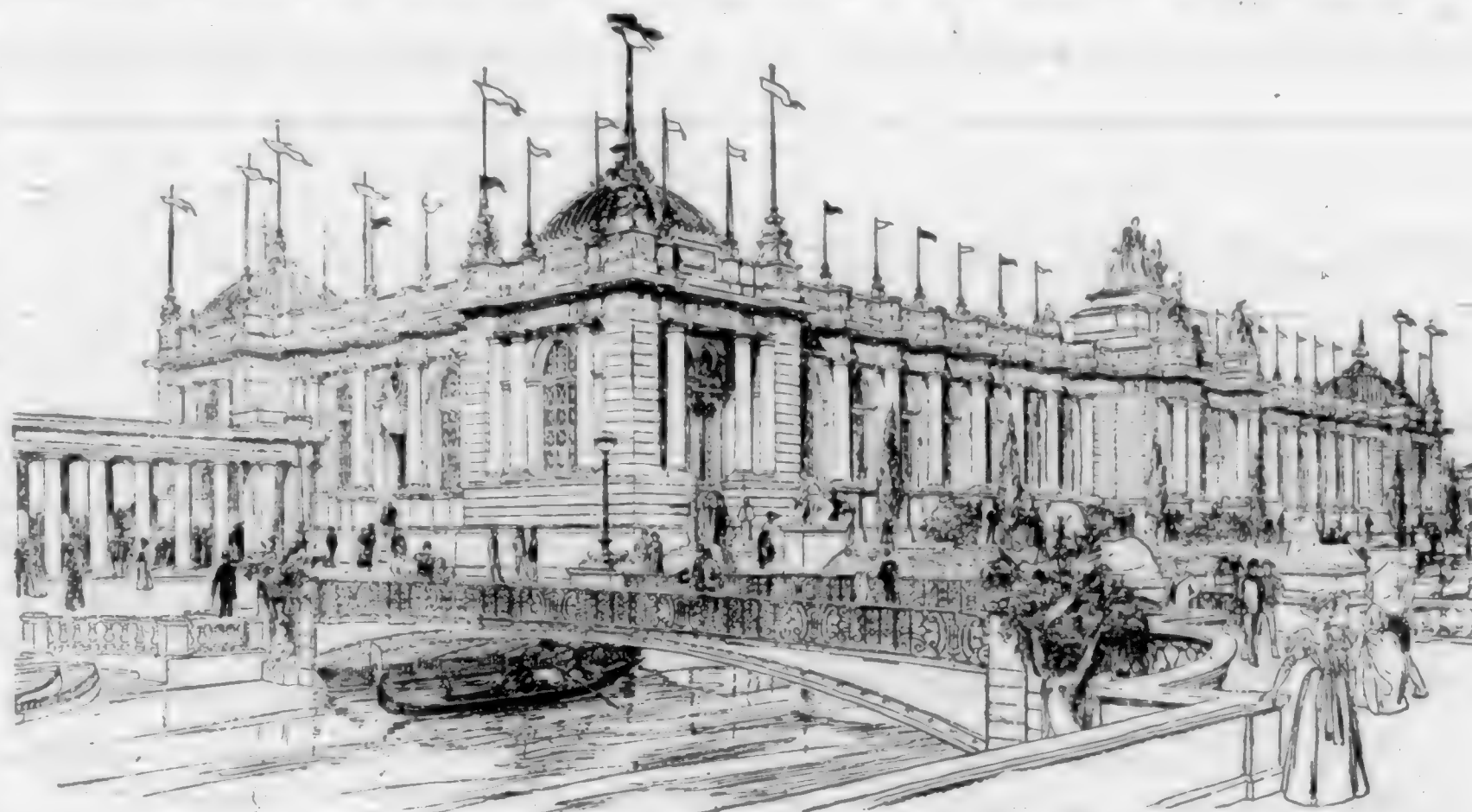
A corporation styled the Trans-Mississippi and International Exposition, with a capital of \$1,000,000, constituted according to law, is in control of the Exposition. In addition to stock subscriptions and donations, amounting to \$500,000, revenues from various sources aggregating not less than \$1,000,000 are positively assured. With these resources at command the managers are vigorously pushing the work of preparation of grounds, construction of buildings and of the development of plans to promote the enterprise. The active management of the Exposition is vested in a directory of fifty members, with an executive committee of six department managers. Each department is divided into appropriate bureaus in charge of experts in their respective branches.

The Congress of the United States appropriated \$200,000 and made further provision for a government building and exhibits at the Trans-Mississippi and International Exposition. Plans for the Government building have been approved and construction work is in progress. President McKinley has appointed a commission authorized to supervise the collection of exhibits

and to have custody of buildings and exhibits during the period of the Exposition.

Facing the Plaza directly inside the main entrance is the Fine Arts Building, in shape a parallelogram 246 feet long and 130 feet wide, the long axis parallel to the Grand Canal. It consists of two separate, symmetrical, domed buildings, connected by a peristylum or open court surrounded by colonnades. The building rests on a balustraded terrace, and is approached from the Plaza by flights of steps, and also from the avenue bordering the canal, between it and the building. One enters through the portico and vestibule to the dome, central for each building and lighted from the top, forming a suitable place for the effective exhibition of statuary. Surrounding this central feature are the galleries, all lighted by sky-lights, and so arranged as to afford the great-

est degree of wall surface for the display of pictures and to allow for the proper circulation of visiting crowds. The two separate buildings offer a better opportunity for the classification of material and at the same time, bring the scale of the architecture to its proper relation with the surroundings and in accord with the general scheme of the Exposition grounds. The colonnade connecting the two parts forms an effective architectural feature, conspicuous from the canal and opposite avenue, and affords a place for the installment of architectural fragments and models, which cannot be so effectively arranged inside the walls. A touch of landscape art lends additional interest to this court. In the exterior design a somewhat free rendering of classic motif has been adopted, the usual severe simplicity of outline being modified sufficiently to bring it in accord with the purpose of the building. The basis of the design is the Corinthian order, which is applied in two dimensions, the larger emphasizing the entrance porticos and repeated on the gables fronting the canal and opposite side; the smaller is adjusted to the height of the flanking walls and connecting peristyle, and serves as a tie to bind the separate elements into one composition. As being quite in accord with the character and purposes of the



MANUFACTURES BUILDING

building, it was determined to make a liberal use of the sculptors' and painters' art to soften the outline and bring out in greater contrast the severer forms of the architectural

May, 1898.

members. To this end the walls behind the columns of the porticos will receive a decorative color treatment, interesting in itself, and forcing into greater prominence their classic outlines. The sculptor is again called upon to crown the pediments and flanking buttresses with groups and figures representing the various arts, and holding out for those who win them, the emblems of success. Eames & Young, Architects, St. Louis.

The Manufactures building designed by John J. Humphreys of Denver, is a handsome structure of the Doric order,



AGRICULTURE BUILDING

modified to comport with nineteenth century requirements. The result is a building of simple dignity, having an air of repose considered requisite in a large building.

The facade presents a frontage of 400 feet, accentuated at center and end with pavilions, sixty-four and forty feet respectively, thereby obtaining sufficient variety of mass. The solidity of these pavilions and their strong perpendicular lines and shadows give a strong contrast of light and shade.

The height of the building to the top of the main cornice is forty feet; the height of order thirty feet, resting on stylobate ten feet high. The height of the center pavilion to the top of the crowning group of statuary is eighty-five feet, while the end pavilion is sixty-five feet to the top of the dome. The large windows, ten feet wide by twenty-four feet high, placed at intervals of sixteen feet, and the roof having a large skylight area, make the interior very bright and cheerful.

The center entrance is twenty-four feet wide by thirty-four feet high, and very rich in decoration, flanked on either side by coupled columns and their accompanying pilasters, standing six feet from the walls. The main cornice breaks around a projection of columns supporting pedestals for groups of statuary. There are also single statues between columns resting on stylobate projected out to receive them. The spandrels above the arch are decorated with bas-reliefs. The end pavilions with their entrances are crowned by shallow domes.

The entire interior elaboration will be confined to classic ornaments. The ceiling, a large barrel vault, with intersecting cross-vault, is richly coffered and elaborately decorated. On the walls it is here proposed to have mural paintings emblematic of manufactures.

The design of the Agriculture building shows a richness of ornament almost to redundancy, which not only gives it the character of an exposition building but suggests the wealth and abundance derived from agriculture. Rich and

brilliant color is an important element in the design. This color is applied to the loggias and on the plain wall surfaces, leaving the arches, columns and main architectural parts to stand out in simple, strong masses, having no color themselves but relieved against the colored background. This color treatment produces a beautiful and brilliant effect, whether seen under brilliant sunlight with the strong shadow falling across it, or in half-lights late in the afternoon, reflected in the lagoon or half-concealed by the projections of the buildings, as it is seen in the perspective. While the building is of Renaissance or classic type the decorations and ornament will be entirely modeled from agricultural products—festoons of corn and other cereals, and even the common market garden products are given proper place in this decoration. The great semi-circular niche forming the main entrance will be richly decorated in this way in color, and on either side of it there will be figures representing the "Digger" and the "Sower," taken from Millet's famous paintings, supported on either side by lesser figures and the arms of the state and nation. At each side of the great central arch will be recessed niches with rich color decoration, and crowning this central composition will be three sculptured groups, those on either side representing the zodiac and the seasons, while the central figure,

crowning the whole composition, will represent "Prosperity," supported by "Labor" and "Integrity." At the corner pavilions there will be figures representing the seasons and the favorable winds, and inscriptions relating to the subject of agriculture. Names of those who have been patrons of agriculture or who have made notable inventions in this field of labor will be inscribed upon the panels in the frieze. The outside dimensions of this building are 148x400. It has a total floor space of 84,260 square feet. The design is the creation of Mr. Cass Gilbert, Architect, St. Paul, Minn.

The design of the Liberal Arts Building is of the French Renaissance school of architecture, harmony and proportion being regulated by the conditions of the other main exhibit buildings in the Grand Court. The Liberal Arts Building is located on the south side of the Grand Canal, near the Arch of the States. The exterior presents the appearance of two stories, the first story or stylobate being low in treatment, with small windows cut into a plain wall surface. The second story is enriched by Corinthian columns, set in pairs with ornamental windows between, and the top of the build-



LIBERAL ARTS BUILDING

ing is finished with an open balustrade which adds to the general effect.

At each corner of the building are pavilions with ornamental pediments projecting sufficiently from the main line wall to show a strong corner treatment.

Above the pediments at each corner of the building are

octagonal bases on which will be set groups of statuary. Each group will be composed of four heroic figures, the main one representing the Liberal Arts will be supported by two kneeling figures suggesting industrial art, while in front of all will be a smaller figure supporting a shield on which the attributes of pottery and wrought-iron will be inscribed. An uninterrupted line along the entire front is preserved by the aid of the color-treatment between the pavilions.

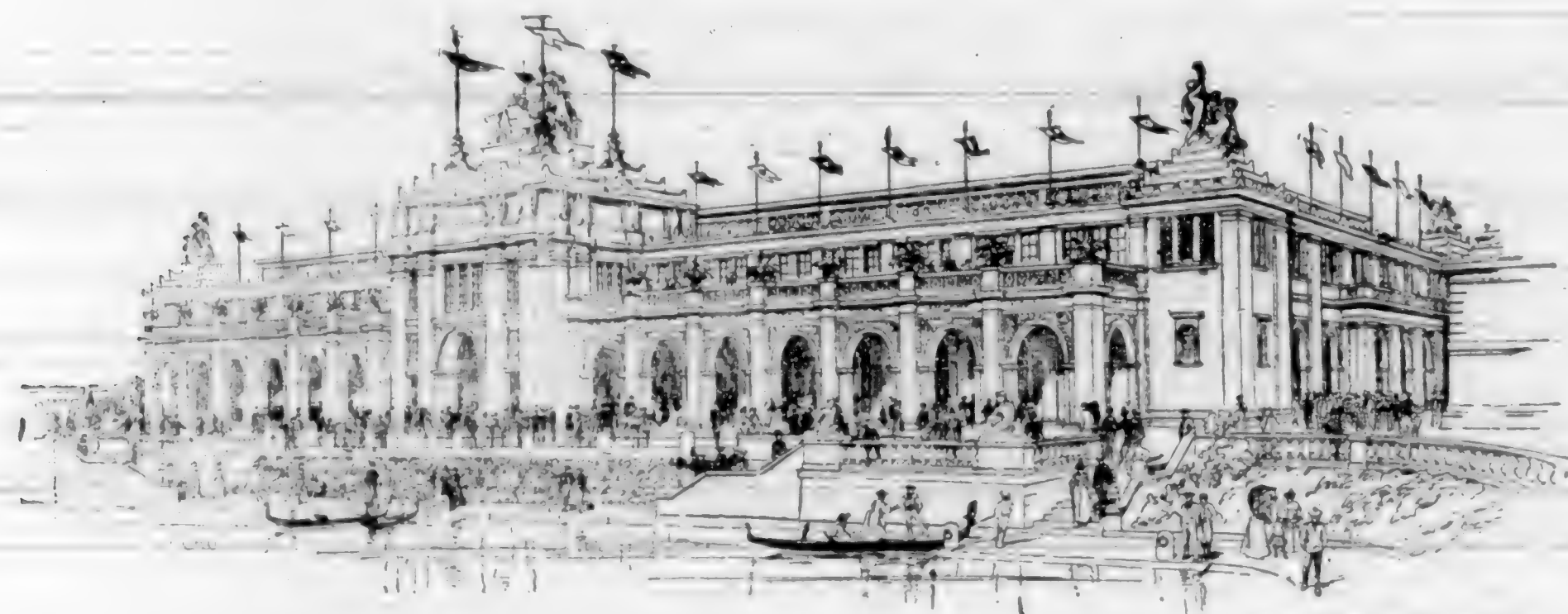
The class of exhibits for which the building is intended will be indicated by the free use of statuary and ornament on the exterior. Color will enter largely into the design and play an important part in the general effect, which will be quiet and dignified, and in strict harmony with the general grouping and masonry of the buildings in the Grand Court, which is buoyant, simple, strong.

The Liberal Arts Building is 246 feet front by 130 feet in depth. The main entrances are on the east, west and north fronts. Fisher & Lawrie, of Omaha, are the architects of the building.

The Machinery and Electricity building is 304 feet front

Men in their youth are seen subduing them for the simple purpose of escaping injury and the preservation of their own lives at the sacrifice of the natural forces. A higher supremacy is shown by the center group, which is the dominating feature of the entire design. In this, man developed beyond the youthful stage, having wisdom, takes these same untamed, unharnessed forces of nature and harnesses them to his chariot, making them do his bidding, symbolizing in a direct way the service which machinery does for man in using the powers of steam, fire, electricity and gravity.

Color enters into the design with maximum importance. The ornaments in the panels under the porticos and over the main entrances will be highly emphasized by small background spaces of strong colors. These are treated in such a way as to give great interest to the spectator near by without detracting from the general quiet and dignity of the view from a distance. The entire building will be a series of yellow and ivory tones, growing more intense as they reach the top, culminating in the dull golden statuary full of primitive vigor which surmounts the building and symbolizes its use. The building was designed by Dwight H. Perkins, architect, Chicago.



MACHINERY AND ELECTRICITY BUILDING.

DWIGHT HEALD PERKINS

by 144 feet in depth. There are triple entrances on the main floor level in the center of the main front, and similar groups in the centers of the east and west fronts, with four emergency exits in the north wall. In front of the building, flanking both sides of the main entrance, is an open portico sixteen feet wide, running the entire front of the building. The center entrance feature projects beyond the portico, thus forming the grand entrance vestibule. The main floor covers the entire area of the building. Above is a gallery thirty-two feet in width, extending around the four outer walls. The gallery is reached by spacious staircases located in the front corners of the building. This leaves a high central court 248 feet long by 80 feet wide, lighted from the skylights and clerestory windows above the roof.

The character of the exhibits sheltered by this building is shown by the decoration. The ornamental spandrels and panels receive all of their motifs and suggestions from machinery. The cresting at the top is composed of cog-wheels, this principle being carried out in all of the decorations. The underlying principle and function of machinery is symbolized by the groups of statuary on the top of the building. At each of the four corners are groups representing the early supremacy of man over the untamed forces of nature. These forces are represented by wild animals.

THE COST OF OPERATING ELEVATORS BY STEAM, WATER AND ELECTRICITY.

THE COST of operating elevators by steam, water and electricity has properly become the subject of careful investigation, in view of the extensive and growing use of these appliances. It is stated that in New York, the home of so many sky-scrapers, a larger number of persons are carried vertically in elevators than are transported horizontally by the various forms of traction. Experience with electric elevators in the United States is said to have shown the cost of carrying a useful load 1500 pounds to a height of 100 feet, inclusive of return to starting point, to be one cent. In Berlin and Vienna the cost is reported to be considerably below the figure mentioned. In the former city the cost of lifting by electricity a load of 850 pounds to a height of 80 feet, inclusive of descent, was only one-fifth of a cent.—*The Canadian Architect.*

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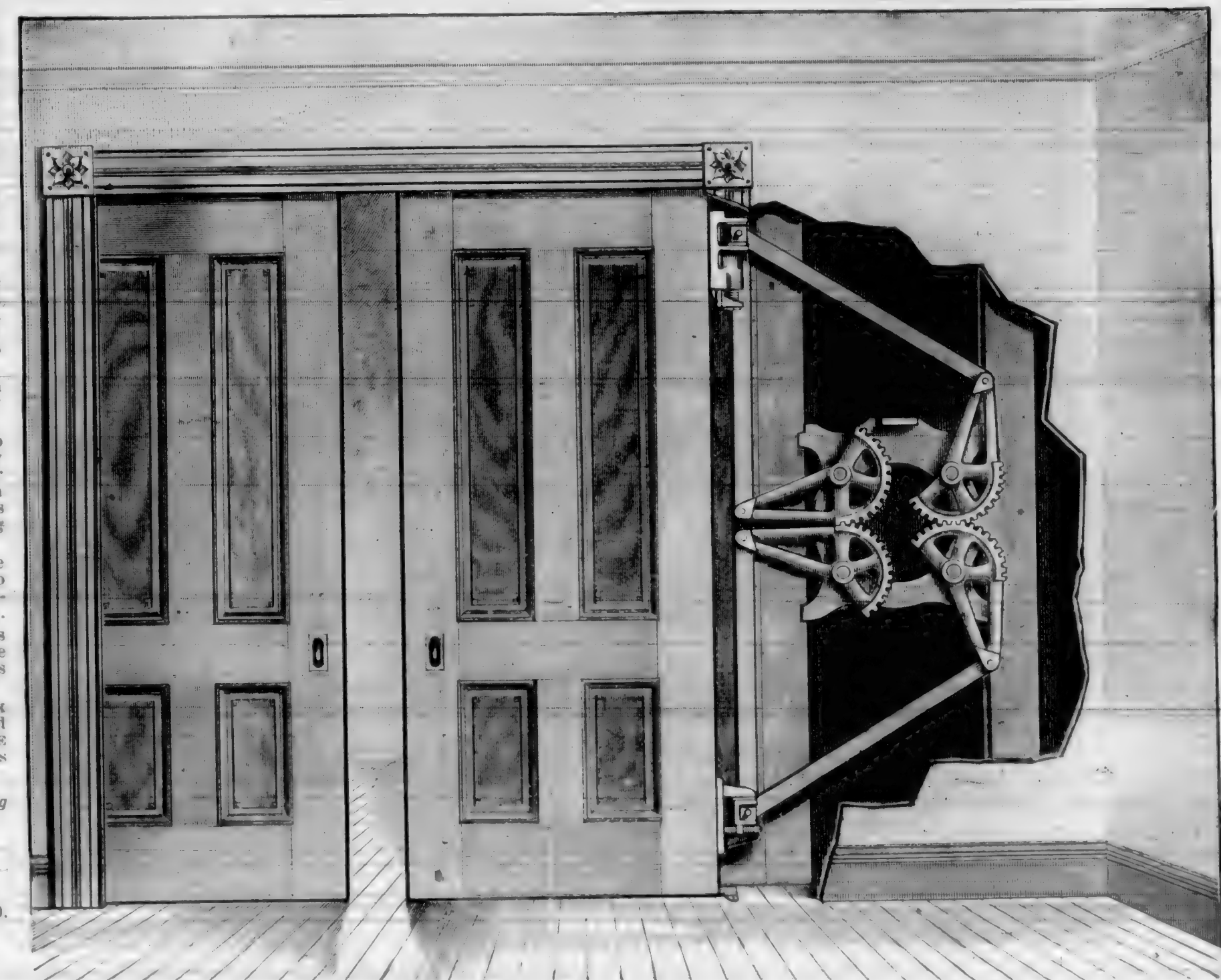
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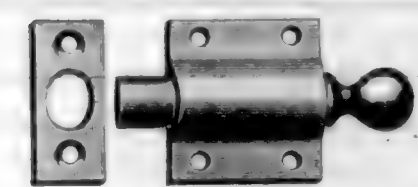
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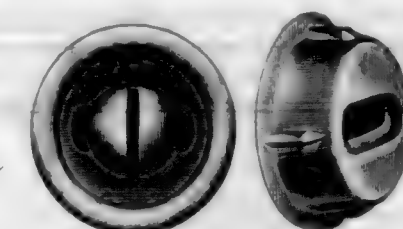
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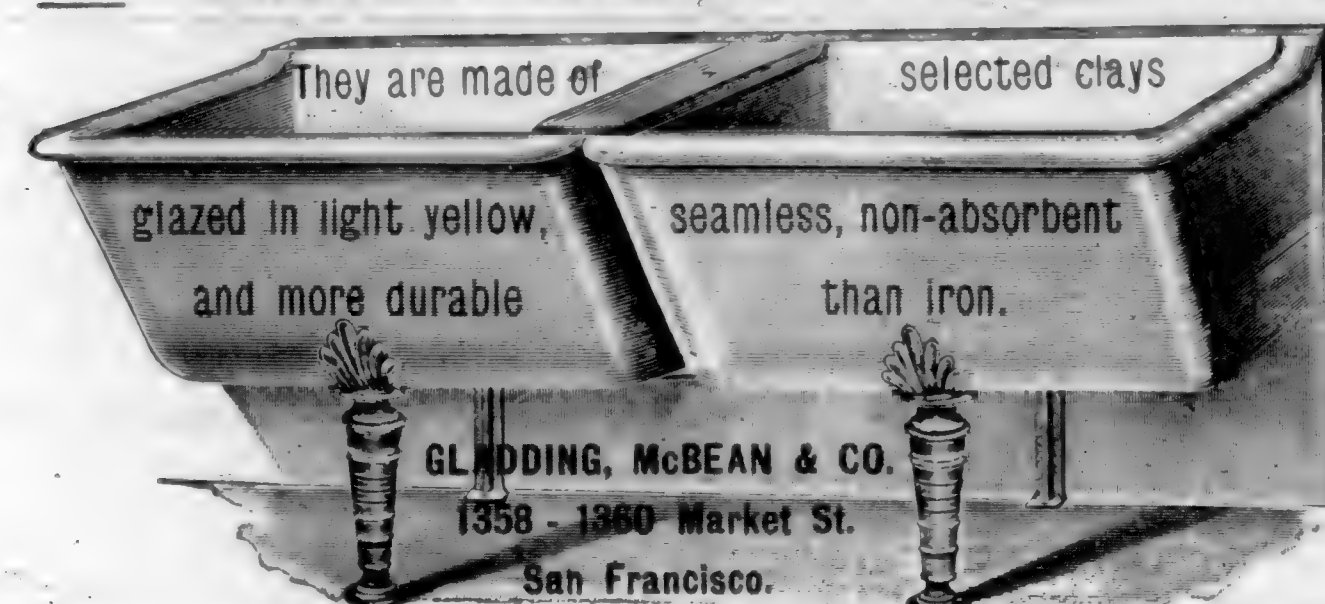
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May 19, 1898.—SEALED PROPOSALS will
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work, roof framing, etc., of the U. S.
Postoffice, Court House, etc., San Francisco,
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tendent at San Francisco, California.

JAMES KNOX TAYLOR.
Supervising Architect

BUILDING NEWS.

SAN DIEGO

Three large art glass window pieces have been
placed in the Elks' lodge rooms by W. P. Fuller &
Co. The central piece has a magnificent elk's head
blasted in the glass while each of the other two com-
panion pieces has worked in the center a large lighted
torch.

The foundations are being prepared for General
Churchill's new residence, near the Hotel del Coro-
nado.

Ralph Granger has accepted plans for an extension
of his music rooms in his house at Paradise Valley.
The addition will be 90x30 feet, and the present music
room will be used as a reception room for the new
apartment.

F. Krenner was granted a permit to build a two-
story and basement house on Fourth street, between
A and B, to cost \$1000.

F. Heinlein, architect, is seeking to recover \$750 for
drawing plans for a new stockhouse, warehouse and
other buildings for the S. D. Brewing Co.

SAN PEDRO

Plans and specifications for the construction of the
new electric railway that is to be built on San Pedro
street, with a proposed terminus at San Pedro har-
bor are now being considered in the office of the en-

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Jas. A. Wilson.	Geier, Frank A.; Market Street Planing Mills.
Thos. McLachlan.	Gillett, Secondo; artificial stone.
Thos. Elam.	Gillogley, Geo.; teaming.
E. L. Snell.	Girvin & Eyre; Importers.
J. R. Tobin.	Gladding, McBean & Co.; architectural terra cotta.
COMMITTEES:	Golden West Iron Works; Dyer Bros.
R. Herring.	Goodman, Geo.; artificial stone, etc.
Thos. Elam.	Grannis, J. G. & Co.; steam heating, etc.
MEMBERSHIP:	Gray Bros.; artificial stone and concrete works.
T. McLachlan.	Hoffman, V.; mason and builder.
G. V. Daniels.	Hammond, Philip; metal roofer.
ARBITRATION:	Hansen, A.; planing mill.
D. McPhee.	Hansen, F. L.; contractor and builder.
Gus. V. Daniels.	Hansen, M. & Co.; planing mill.
FINANCE:	Harmen Lumber Co.; lumber.
E. L. Snell.	Harris & Jones; Lumber Dealers.
Box No.	Hausstein, H.; cornice works.
Abrahamson, P.; patent ventilators.	Heldt, W.; cornice works.
Adams, John G.; contractor and builder.	Henzel, Ed. F. & Co.; electricians.
Alameda Brick & Tile Co.; brick.	Herring, R.; mill work.
Arizona Sandstone Co.; building stone.	Hills, Wm.; cornice works and doors.
Base-Huter Paint Co.; paints, oils and varnishes.	Hinds, Ed. B. & Co.; patent blinds.
Bateman Bros.; contractors and builders.	Hobson, B. Y.; painter.
Beck, Adam; mason and builder.	Hoffman, V.; mason and builder.
Beil, Wm.; contractor and builder.	Holmes, H. T.; lime Co.; lime, cement, etc.
Bibb Lumber Co., D. H.	Hooper, C. A. & Co.; lumber.
Bellingham Bay Lm' Co.; lumber.	Holzer, Carl; artificial stone and concrete work.
Boyd, Robert; mason and builder.	Hurlbut, R. P.; builder.
Brady, M. V.; mason and builder.	Ischeheimer, Samuel & Bro.; plumbers.
Brady, O. E.; mason and builder.	Ingersoll & Gore; contractors and builders.
Brennan, D. J.; mason and builder.	Jackson, P. H. & Co.; illuminating tiles.
Brennan James; plasterer.	Jackson, W. E.; curbing.
Britt, James E.; plumber.	Jesse, Geo. R.; mason and builders.
Brode, R.; iron works.	Jordan D. & Son; mason and builders.
Burden, W.; mason and builder.	Joshua Hendy Machine Works.
Burnham, Mansford Co.; planing mill.	Judson Mfg. Co.
Burrell, E. H.; building material.	Kentling, M.; Artificial Stone.
Burt, W. J.; house mover.	Kelleher, M.; house raiser and mover.
Butler, Wm. A.; mason and builder.	Kendall, A.; Pacific Coast Lumber and Mill Co.
California Art Glass Works.	Keefe, J. H.; painter and decorator.
California Electrical Works.	Kent, S. H.; contractor and builder.
California Mills; planing mills.	Kern, F. W.; contractor and builder.
Campbell, Alex. L.; contractor and builder.	Kittredge, E. H. & Co.; sash, doors and blinds.
Carey, J. E.; brick manufacturer.	Knox & Cook; contractors and builders.
Bigman and Masow.	Kuss, P. N.; painter, decorator and wood finisher.
Cartwright, D. S.; teaming.	Lang, Geo. R.; mason and builder.
Central Lumber & Mill Co.; lumber and planing mill.	Leahy, D.; plasterer.
Chatham, Wm.; contractor and builder.	Leonard, J.; Concrete and Artificial Stone.
Chemical Paint Co.	Leprohon, F.; steam and hot water heating.
Chisholm, C.; contractor and builder.	Logan, J. F.; adjuster and builder.
Clark, N. & Sons; terra cotta, etc.	Lovett, A. E.; roof repairing and painting.
Clawson, L. E. & Co.; patent chimneys.	Lucas & Co.; Gilded Glaste Mills, calcined plaster.
Coghlan, Frank; plasterer.	Lynch, M. C.; contractor and builder.
Collin & Gunn; bathers.	Macdonald & McKinnon; lumber.
Concannon Wm.; contractor and builder.	Maguire, A. B.; lime, laths, plaster, cement, etc.
Conlin & Roberts; metal roofers.	Mangelsdorf, M.; Electrical Maintenance Co.
Copplesters & Mosket; grill work.	Mansrum & Otter; heating, ventilating, tiles, etc.
Cowell, H. & Co.; lime, cement, fire brick, etc.	Market Street Planing Mill.
Crichton, Peter; contractor and builder.	McCarthy, John; mason and builder.
Crocker, Wm.; planing mill.	McClure, H. N.; teaming and grading.
Cronan, Wm.; Eagle Sheet Metal Works.	McClure, A.; contractor and builder.
Currie Donald; contractor and builder.	McClure, Henry; stair builder.
Currie, Robert; contractor and builder.	McClure, John; stair builder.
Cushing-Wetmore Co.; concrete and artificial stone.	McClure, John; stair builder.
Curry, J. M.; stone dealer.	McClure, John; stair builder.
Daniels, Gus. V.; painter and decorator.	McClure, John; stair builder.
Davies, E.; plasterer.	McClure, John; stair builder.
Davis, Geo. & Son; house movers.	McClure, John; stair builder.
Day, Thos. H. & Sons; contractors and builders.	McClure, John; stair builder.
Degan, Patrick; stone contractor.	McClure, John; stair builder.
Dillon, David; teamster and contractor.	McClure, John; stair builder.
Donovan, M. J.; painter.	McClure, John; stair builder.
Dunbar, Wm.; mason and builder.	McClure, John; stair builder.
Dunham, Carrigan & Hayden Co.; hardware.	McClure, John; stair builder.
Dunlop, Chas.; plasterer.	McClure, John; stair builder.
Dwyer, L. J.; painter and decorator.	McClure, John; stair builder.
Dyer Bros.; Golden West Iron Works.	McClure, John; stair builder.
Elam, & Knowles; carpenters and builders.	McClure, John; stair builder.
Excelior Mill Co.	McClure, John; stair builder.
Feely, M. J.; contractor and builder.	McClure, John; stair builder.
Fennell, M. & Son; masons and builders.	McClure, John; stair builder.
Feld, Wm. J.; contractor and builders.	McClure, John; stair builder.
Feld, Z. O.	McClure, John; stair builder.
Fleming, L. G.; lime and cement.	McClure, John; stair builder.
Foley, Michael; grading and teaming.	McClure, John; stair builder.

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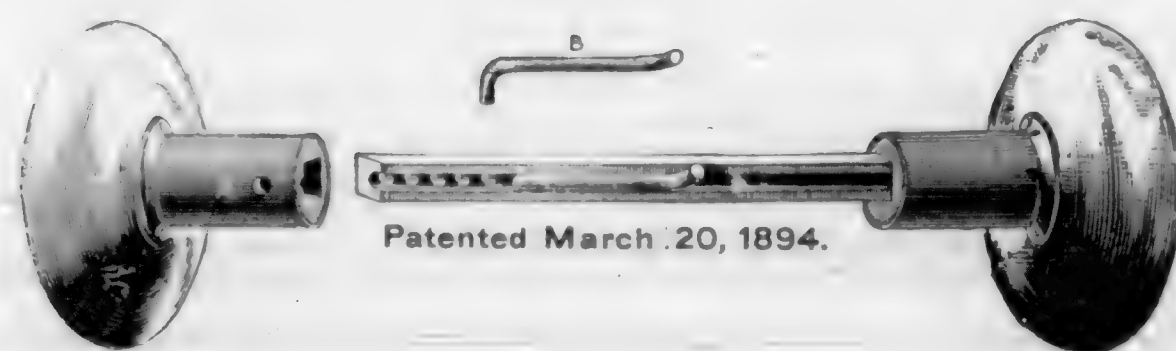
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Public notice is hereby given to architects that competitive plans and specifications for the erection of an hospital building will be received by the Board of Supervisors on MONDAY AFTERNOON, September 12, 1898.

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The said hospital building to be erected on the lot of land commencing at the most southeasterly corner of a tract of land known as and designated, on the official map of the city and county of San Francisco, as the "Almshouse tract."

The said plans and specifications to be so prepared that the cost of the building shall not exceed in the aggregate the sum of three hundred thousand (\$300,000) dollars.

The architect whose plans are adopted will be appointed architect and superintendent of the building, and will be required to give a good and satisfactory bond to insure the completion and construction of the said building for the amount of the cost as made by the said architect. The architects submitting plans determined by the Board to be second, third and fourth in merit will receive premiums of \$1000, \$750 and \$500 respectively, with the understanding that any features of said plans and specifications which may be considered useful or necessary to be embodied in the plans adopted may be used without further cost of charge.

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TREASURY DEPARTMENT OFFICE
Supervising Architect, Washington, D. C.
May 19, 1898.—SEALED PROPOSALS will be received at this office until 2 o'clock P. M., on the 23rd day of June, 1898, and then opened, for the constructive steel work, roof framing, etc., of the U. S. Postoffice, Court House, etc., San Francisco, Cal., in accordance with the drawings and specifications, copies of which may be had at this office or the office of the Superintendent at San Francisco, California.

JAMES KNOX TAYLOR,
Supervising Architect.

BUILDING NEWS.

Son May 4th for a two-story lodging house for Mrs. Simon N. San Joaquin street, F. H. Martin was the lowest bidder at \$3850.
Herbert Baldwin of this city has just broken ground for the erection of a modern cottage, which will be built chiefly by day work, Downing & Lemue are the architects.

FRESNO
All the bids have been received for W. Parker Lyon building at Fresno and the building is well under way and will cost when completed about \$9000. George Rushford of Stockton is the architect, and not Bensley & Son as was erroneously stated in our March issue.

LOS ANGELES

The building committee of the city board of education has recommended as a model for the new Pico Heights school, the Union Avenue building, with some modifications, work will commence shortly.

Architects Howard & Train are preparing plans for Alfred Ottaway of two-story eight room residence, to be built at 18th and Bush.

Arch. W. S. Gorrell is preparing plans for J. Williams, for cottage on Winfield st. near Union ave.

Arch. L. B. Vail & son are preparing plans for Johnson, Keeney & Co. for 3, 7-room 2-story residences Spanish and Italian style; to be built on Lone Star tract and on 38th at near Vermont ave.

J. R. Vogel, 701 South Broadway is taking bids on the erection of a 3-story business block to be built on the northeast corner of Temple street and Broadway.

Competitive plans are being made for the Edison Electric Co., for their proposed new building, East Fourth between Main and Los Angeles.

BUILDING NEWS.

STOCKTON

Bids were opened on the 16th in the office of Geo. Rushforth, architect, for a cottage for Mrs. Elizabeth Wermuth to be built on Commerce near North, the contract was awarded to Lewis Todd & Co. the lowest bidders, price \$1271.

The same architect is preparing plans for a residence for Jerome Haase to be erected on N. Stanislaus street the brick foundation is now constructed, the house complete will run to \$4000.

Bids were opened in the office of Chas. Beasley &

gineer, F. W. Wood. It is expected that work will be commenced in a week or so. In the meantime architects are working on the plans for the buildings to be used in connection with the enterprise.
SAN JACINTO

The Riverside county hospital, at South San Jacinto has been destroyed by fire. The building was valued at \$20,000, and was covered by \$10,000 insurance. Losses on other buildings destroyed at the same time will amount to \$5000. Efforts will be made to rebuild at an early date.

W. J. Cuthbertson,
Architect,
Flood Building, Room 93,
Cor. Market and Fourth Sts.,
SAN FRANCISCO.

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W. Curlett
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Pissis & Moore,
Architects,
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R. H. White,
Architect,
104 Flood Building, Market and Fourth Sts.,
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B. McDougall & Son,
Architects,
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Seth Babson,
Architect,
408 California Street, Rooms 12, 13,
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John Cotter Pelton.
Architect,
Temple Building, Bush St., Room 52,
SAN FRANCISCO.

John M. Curtis & Co.,
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SUCCESSOR TO HUERNE & EVERETT,
Architects,
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Architects,
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and Taylor Streets, San Francisco.
Branch Office, 507 Central Bank Building,
Oakland Cal.

Havens & Toepke,
Architects,
FLOOD BUILDING, Room 55,
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Wm. H. Armistage,
Architect,
319-321 Phelan Building, Market Street,
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M. J. Welsh,
Architect,
Office, 1564 Market St., Cor. of 4th. Rooms 7-8,
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Emile Depierre,
Architect,
334 KEARNY STREET,
SAN FRANCISCO.

T. J. Welsh,
Architect,
Room 95, Flood Building, Corner Market and
Fourth Streets.

Chas. J. I. Devlin,
Architect,
Supreme Court Building,
N. W. Cor. McAllister & Larkin Streets,
SAN FRANCISCO.

Fred. B. Wood,
Architect,
214 PINE STREET, Room 57,
San Francisco.

Jas. E. Wolfe,
Architect,
FLOOD BUILDING Room 31,
San Francisco, Cal. Take Elevator.

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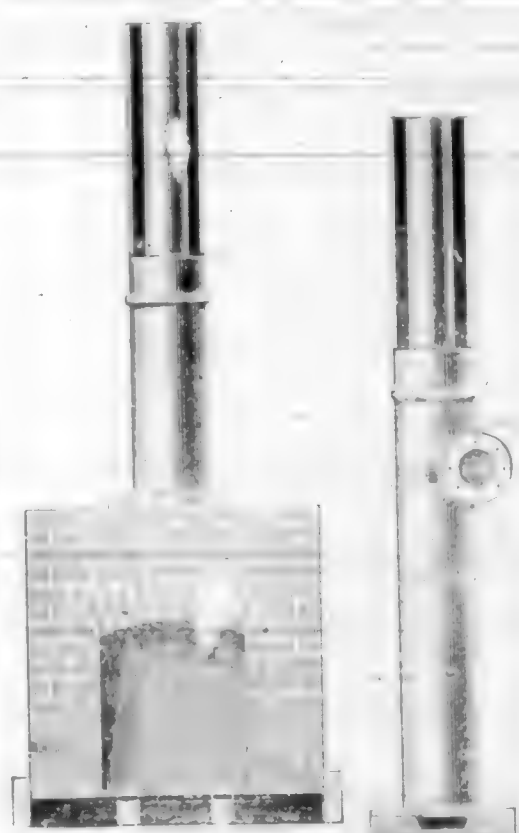
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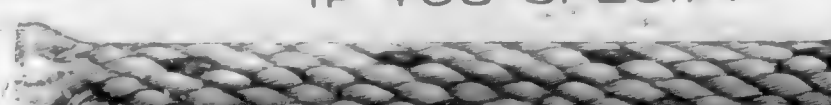
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\$3.00 PER YEAR

VOLUME XIX. No. 6.

JUNE, 1898.

CONTENTS

Index to Advertisers.....	VI
Pressure Wanted From the Board of Fire Underwriters of the Pacific.....	62
Hertz' Experiments on the Electromagnetic Theory of Light.....	63
Changing Form of Stone by Pressure.....	64, 65, 66
An Office Building With Features of Construction and Sub-Construction Work That Involve Special Design and Arrangement.....	67
Illustrations.....	68
Iron Shutters.....	68
Valuable Information Culled from our Exchanges.....	69
Fire-Proofing.....	70
Birmingham's Building Curiosity.....	71
Keely Motor Up-To-Date.....	72

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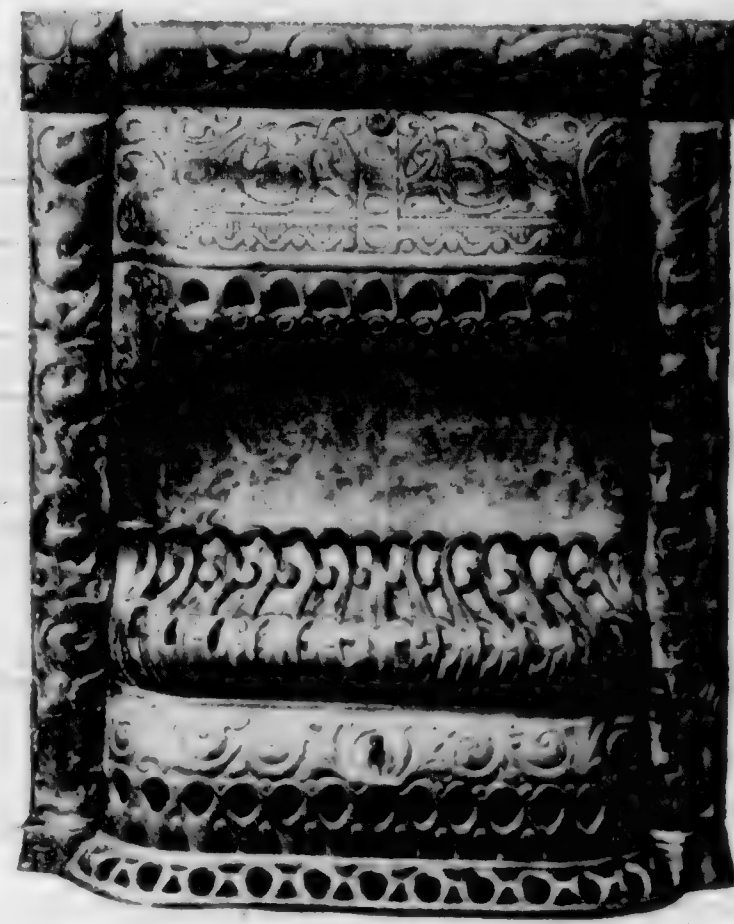
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BUILDING NEWS.

Marlington near Miguel. One-story frame; o. J. Schauer; a. L. G. Bergren; c. L. G. Bergren; signed, May 17; filed, May 18; cost \$1800.

Berry near 4th. Additional story to warehouse; o. Theodore F. Payne and Warren R. Payne; o. Curlett & McCaw; c. F. W. Kern; signed, June 18; filed, June 17; cost \$9540.

Broadway near Dupont. Carpentry work, etc.; o. Annie Jennings and Isabella Flower; a. Jules Godart; c. Hawkins & Lindsay; signed, June 1; filed, June 2; cost \$2525.

Broadway near Webster. To build; o. Julius Gall;

BUILDING NEWS.

a. Percy & Hamilton; c. F. H. Moscow; signed, and filed, June 2; cost \$3485.

California and Battery. Removal of old brick work and all work except plumbing, etc.; o. Gray's Harbor Commercial Co.; a. N. Blaisdell; c. Hawkins & Lindsay; signed, May 8; filed, June 2; cost \$1184.

Devilsadero near Golden Gate. To build except plumbing, etc.; o. Miss Mary J. Dunn; a. Martens & Coffey; c. Belt & Ahlgren; signed, May 20; filed, June 8; cost \$3920. Plumbing, etc.; c. E. Kraus; signed, 24; filed, June 8; cost \$600.

Devilsadero near Hayes. To build; o. Wm. Mocker;

BUILDING NEWS.

a. R. Zimmermann; c. C. Kreeker; signed, June 7; filed, June 9; cost \$6700.

Eddy and Mason. Metal lathing, etc.; o. F. Nigro; a. Wm. Mooser & Son; c. Campbell & Pettus; sub-c. Western Expanded Metal Co.; signed, April 2; filed, April 20; cost \$5790.

Eddy, No. 123. Elevator work; o. A. M. S. M., E. D. and C. W. Rosenbaum, Julia and Virginia Strassburger; c. W. H. Holman; signed, May 27; filed, May 28; cost \$3850.

Ellis near Franklin. All work except plumbing, etc.; o. David Cohen; a. P. Schwerdt; c. Val Franz; signed and filed, May 28; cost \$450.

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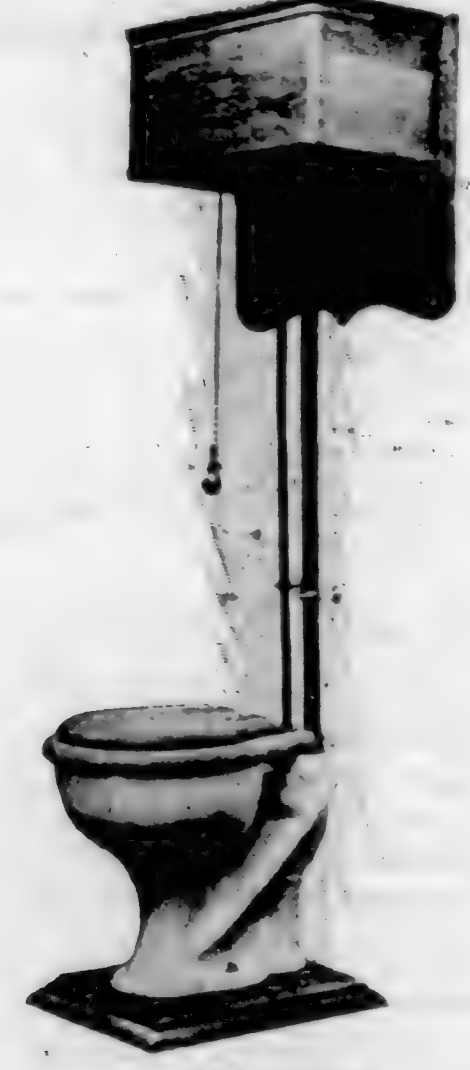
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BUILDING NEWS.

Ellis near Franklin. All work except plumbing, etc.; o. Rose and Julie Lazarus; a. Sullivan & Kohlberg; c. L. T. Greth; signed, June 3; filed, June 4; cost \$230.
Seventh Ave. o. Nellie Boeger; a. L. A. Matthys; c. Fred J. Maurer; signed, April 18; filed, June 6; cost \$140.
Fifteenth near Church. Cottage; o. Henry J. Er; c. Philipp Schwartz; signed, May 14; filed, May 19; cost \$350.
Reka near 18th. Cottage; o. Amelia M. Eggers; c. G. Hughes; a. P. L. Brooks; signed, May 23; May 24; cost \$315.
Hert and Taylor. Three-story frame; o. Ernest J. W. O. Banks; c. H. Behrens; signed, June 10; cost \$430.
Hert near Jones. To build; o. John Doelger; c. Weisman; cost \$350.
Secon near 4th. School house; o. Archbishop P. J. O'Connell; c. Henry Munster; signed, May 18; filed, May 19; cost \$780.
Secon near Howard. Four-story brick; o. Jane E. and L. M. Elishaw; c. J. W. Wiesinger; signed, June 3; filed, June 6; cost \$7,750. Brick work; sub. c. A. Wilson; cost \$825.
Fifteenth Ave. near P St. To build; o. D. B. and M. J. Tull; a. Townsend & Wacker; c. W. H. Es; signed, May 18; filed, May 21; cost \$230.
Golden Gate Ave. near Lyon. Alterations; o. Es Clyde; a. R. H. W. O'Connell; c. D. H. Matheson; signed, May 18; filed, June 3; cost \$197.
Eight and Scott. Additions and alterations; o. Es. F. Boehring; a. Sullivan & Kohlberg; c. K. Eker; signed and filed, May 18; cost \$104.
Jackson and Octavia. Carpentry, mill work, etc.; o. Ernestine Ross; a. J. E. Kraft; c. C. Chisholm; signed, June 6; filed, June 13; cost \$10,000. Painting, etc.; c. Wagner Bros; cost \$250. Plumbing, etc.; c. Ickelheimer Bros; cost \$700. Electric lighting, etc.; c. Pacific Coast Electric Co; cost \$104.

Jackson and Jones. Excavation, brick work, etc.; o. John Shirley; a. C. A. Meussdorff; c. Miller & Beck; signed, May 17; filed, May 18; cost \$307.

Jackson and Jones. All work except plastering, etc.; o. John Shirley; a. C. A. Meussdorff; c. Frank Steinman; cost \$12,300. Plumbing, etc.; c. H. Williams.

BUILDING NEWS.

son Cor sized and filed, June 4; cost \$228. Painting, etc.; c. G. Schmeier; signed, June 2; filed, June 4; cost \$340.
Jackson near Pierce. Painting, etc.; o. Mrs. Camilla Sisson; a. Sullivan & Kohlberg; c. Kuss & Storz; signed, June 10; filed, June 18; cost \$1000.
Jersey near Sanchez. Cottage; o. Dan et Harley; c. Douglas & Co; signed, May 16; filed, May 20; cost \$142.
Kearny and Morton. Carpenter work, etc.; o. M. A. Gunst & Co; a. Hermann & Swain; c. Peterson & Person; signed, May 19; filed, May 19; cost \$980.
Kearny and Morton. Plumbing, etc.; o. M. A. Gunst & Co; a. Hermann & Swain; c. Ickelheimer Bros; signed and filed, May 20; cost \$1528.
Kearny and Morton. Painting, decorating, etc.; a. Hermann & Swain; c. G. A. Peterson; signed and filed, June 13; cost \$975. Brass grill work, etc.; c. F. Kinsman; signed and filed, June 13; cost \$800. Cabinet work, etc.; c. Peterson & Person; signed, L. & E. Emanuel; cost \$920.
Lyon near Bush. To build; o. Mrs. M. E. Demerand; a. Nathaniel Blaisdell; c. Edward C. Birch; signed, June 15; filed, June 17; cost \$2075.
Market and Sacramento. Brick and granite work, etc. for 4-story brick; o. Mrs. Emily E. Pope; a. Pessis & Moore; Richardson & Gale; signed, May 18; filed, May 20; cost \$2087. Carpentry, etc.; c. S. H. Kent; cost \$2200. Sand stone; c. Colusa Stone Co; cost \$380.
Market near Golden Gate Ave. Excavations, etc.; o. James D. Phelan; a. Carlett & Metaw; c. Z. O. Field; signed, June 10; filed, June 11; cost \$1500.
Market near Golden Gate. Two-story brick; o. J. R. Whinn; a. Lenzen & Son; c. Z. O. Field; signed, May 12; filed, May 31; cost \$1940.
Main near Market. Electric elevator; o. E. Kronenberg; a. W. L. Holman; signed, June 2; filed, June 4; cost \$400.
Mission near Ellis. Addition; o. Harriet McCarty; a. Shue & Shue; c. Campbell & Pettus; signed, June 16; filed, June 20; cost \$804.
Mission and 2d. Heating and ventilating; o. Wells, Fargo & Co; a. Percy & Hamilton; c. Geo. H. Tay & Co; signed, June 3; filed, June 11; cost \$950.

BUILDING NEWS.

Mission near 21st. Two-story brick; o. John Sheehy; a. Shue & Shue; c. J. W. Coburn; signed, June 9; filed, June 10; cost \$385.
Montgomery and Sacramento. Seven-story brick; o. Pacific Mutual Life Ins. Co; c. C. R. no Elevator Co; signed, Jan 4; filed, May 23; cost \$935.
Morton near Stockton. Six-story brick; o. V. Menesini; a. C. R. Wilson; c. J. McCarthy; J. R. Elerath; signed, May 20; filed, May 21; cost \$574.
North Beach near Hyde. Two gas furnaces; o. Equitable Gas Light Co; c. P. E. Dundon; signed, April 20; filed, May 23; cost \$397.
North Point near Hyde. To build; o. Dorsolina Cuneo; c. Henry Weiss; signed and filed, June 1; cost \$400.
Octavia and Walnut. Painting, etc.; o. Mrs. Sarah Morris; a. Sullivan & Kohlberg; c. Fred Wagner; signed, June 7; filed, June 18; cost \$650.
Octavia near Sacramento. All work except mill work for three-story brick; o. Adolph Mark; a. Newman & Meyer; c. Malloy & Swenson; signed, June 9; filed, June 11; cost \$12500. Plumbing, etc.; c. Ickelheimer Bros; cost \$1355. Painting, tinting, etc.; c. Kuss & Storz; cost \$1400.
Pacific near Leavenworth. To build; o. J. St. Denis; a. Pissis & Moore; c. L. B. Perrinmont; cost \$475.
Pierce near Haight. Plumbing, gas fitting, etc.; o. Emma Scholl; a. Keintzer & Barth; c. H. Munster; cost \$200.
Post near Octavia. Alterations and additions; o. Mrs. Amy Crooks; superintendent J. J. Crooks; c. Thos. Rideout; cost \$370.
Post and Laguna. All work except mason work; o. Mrs. Rose Kahn; a. J. J. Lafatue; c. Z. O. Field; signed, June 10; filed, 17; cost \$853.
Powell and Eddy. Painting, etc.; o. W. Bogen; a. Havens & Toepke; c. Busch & Wacker; cost \$2200.
Point Lobos Ave. near 5th. Additions to French Hospital; o. La Societe Francaise de Bienfaisance Mutuelle; a. Emile Depierre; c. H. Bernis; cost \$2750.
Sanome and Bush. Addition; o. Murphy, Grant & Co; a. Frank S. Van Trees; superintendents, Mahoney Bros; cost \$20,000.
Scott near Haight. To build; o. Hugh Keenan; c. Charles Keenan; cost \$6500.

Continued on page xli.

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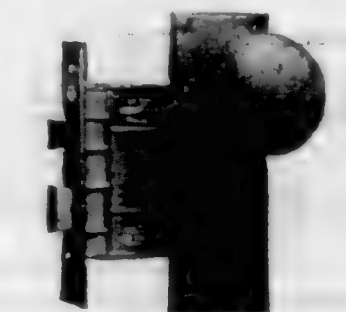
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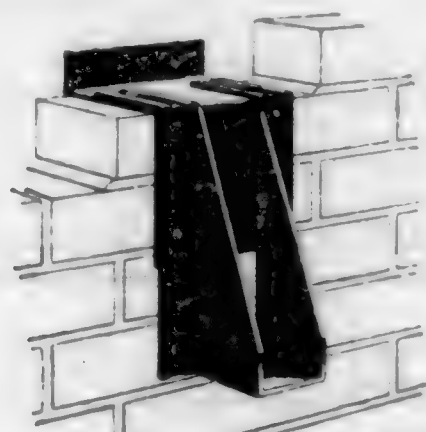
CLASSIFIED INDEX.	CLASSIFIED INDEX.	CLASSIFIED INDEX.
Architects. xiv	Iron Hangers. vi	Sash Locks. xiv
Artificial Stone. xii	Iron Works. x	Sewer Pipes. xi
Boilers. xiv	Iron Cornices. vi	Sewer Traps. xiii
Building Supplies. ix	Iron Works. x	Sash Lines. xxi
Building and Loan Assn. xv	Lumber. xiv	Shingle Stains. xiii
Brick Preservative. xiii	Mantles Tiles, Etc. xiv	Sidewalk Lights. xiii
Cement Trays. viii	Metal Lath. xiv	Sliding Door Hanger. ix
Chimneys Patent. xii	Mortar Color. xiii	Stone. v
Door Opener. viii	Paint. xiii	Terra Cotta. xi
Engineers. xix	Paraffine Paint Co. xii	Tin Roofing. xi
Filters. x	Paper. xiii	University. xvi
Furniture and Upholstery. xv	Plaster. xiv	Ventilators. ii
Hardware. v	Plumbers and Gasfitters. xiv	Water Closets. iii
Heating and Ventilating. xii	Plumbers and Gasfitters. xiv	Window Cord. xxi
		Wood Preservative. xii



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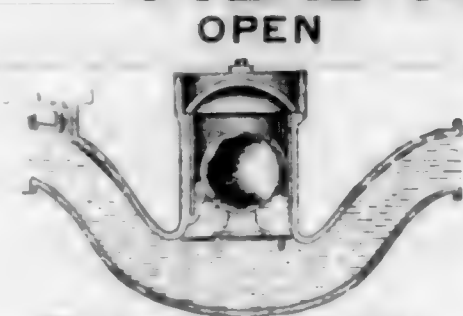
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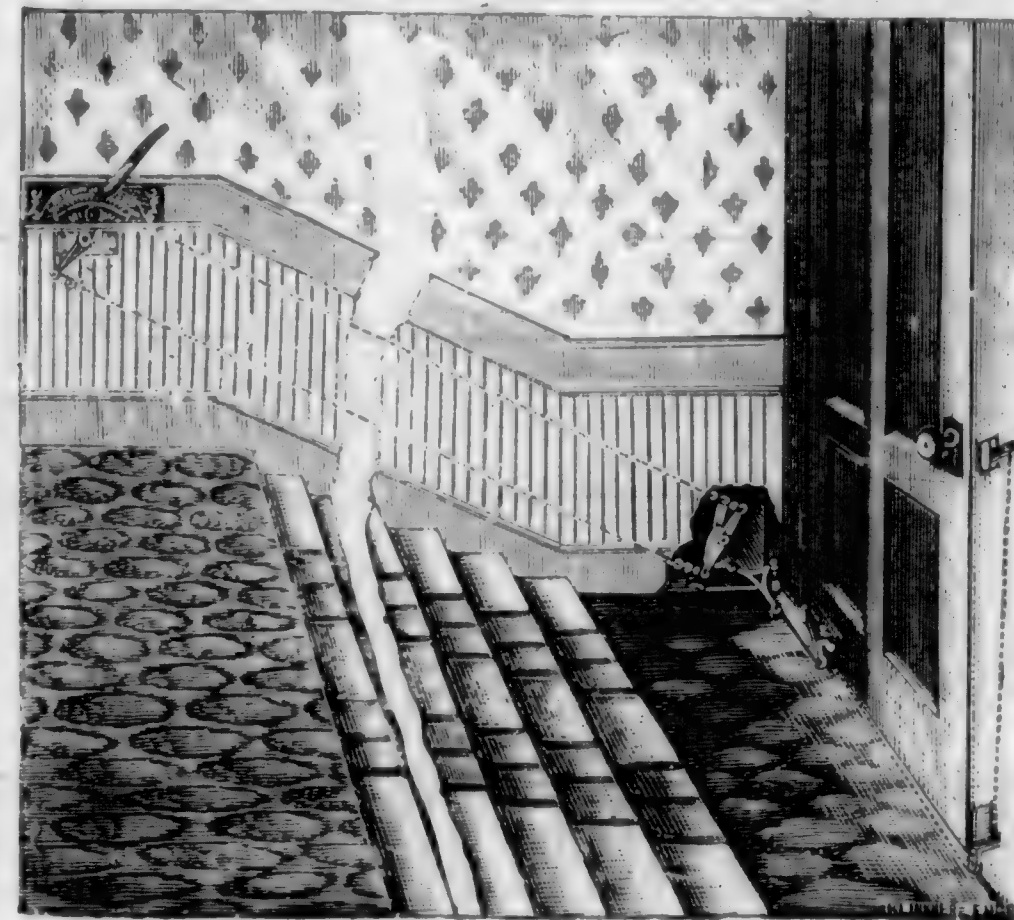
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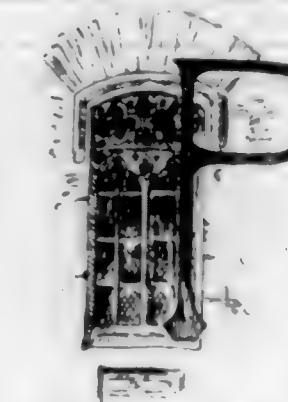


VOLUME XIX.

JUNE 20th, 1898.

NUMBER 6.

A MONTHLY JOURNAL DEVOTED TO THE ARCHITECTURAL INTERESTS OF THE PACIFIC COAST.



PLANS and Specifications for Economical Dwellings, Farm Buildings, Etc. published by the Continental Fire Ins. Co., New York. A copy will be sent to any property-owner who intends to build, (and will insure his property in the Continental), upon written request to the New York or Chicago office. Also contains proper forms of contracts with builders and architects. Plans are for dwellings costing from \$500 to \$2500.—Coast Review.

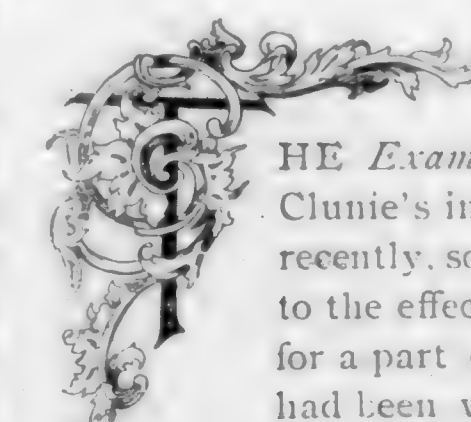
We are sure that architects throughout the country who have read the writings of Mr. F. C. Moore, President of the Continental Fire Ins. Co., of New York, on Slow Burning Construction, Fire Proofing and kindred subjects, will feel as much in sorrow as in anger, while reading the foregoing announcement. Sorrow, because that is the feeling that comes easily and naturally to all intelligent men when first made aware that one of their number has fallen from his place among men, stricken, as is the case in this instance, by the greed of gain.

As a class, architects are men above the average in intelligence and education, and they will hereafter rate Mr. Moore and his insurance company at their true value.

After the feeling of sorrow has passed, anger, righteous in this case, and deep resentment will have their sway. Then will arise a just demand for retaliation, and the vibration of this demand will be felt wherever architects congregate, as clubs, as unions, in Chapters, or in Institutes.

Mr. Moore is the guiding spirit of the Company but neither will be able to escape the consequences of this act, which can only be classed with methods that are rated by

high class commercial bodies as irregular, being looked upon as the exclusive preserves of vendors of corn and union plasters, jewelry that is without jewels, dispensary specialties and a thousand other charlatane devices, that are offered every day to a gullible public by a class that are purely fakers.



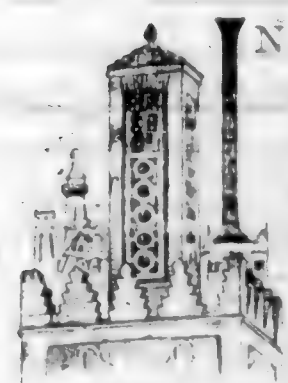
THE Examiner via Insurance Commissioner Clunie's inside rout, gave to its readers, very recently, some specially constructed information to the effect that, the great fight by the State, for a part of the Foreign Companies revenues had been won after a hard battle, solely by the tactful generalship of the Commissioner. But this item of news from Clunie's seat of war, like some other Examiner war dispatches, is pure fiction. The real status of the case appearing the same day, in the columns of the *Evening Bulletin*, which was to the effect, on the authority of the *New York Times*, that "Clunie would keep up the fight" having broken off all negotiations, looking toward a peaceful settlement.

So the Commissioner can be safely rated from this on to the end of his term of office, as a "warrior among quakers and a quaker among warriors" and to be feared accordingly.

Our "tumtum," to the doughty warrior would be: Come home and become an Economist—Robin Hoods are out of date.

PRESSURE WANTED FROM THE BOARD OF FIRE UNDERWRITERS OF THE PACIFIC COAST.

TO COMPEL SOME LOCAL ELECTRIC LIGHT AND POWER COMPANIES TO COMPLY WITH "RULES AND REQUIREMENTS" OF THE NATIONAL BOARD.



IN THE April issue of the Architect considerable space was devoted to an *expose* of the underground wiring and service system that had been put in force in this city by The Mutual Electric Light Company limited. In that article the attention of readers was particularly drawn to the danger to be apprehended from explosions and fire, from the installation of this company's Red Wood Plank Conduit System, at the underground points of connection with consumers premises, in the down town congested districts. The incident of the Alma Keith fire in the Phelan Building, was illustrated to prove that the fire was the direct consequence of serving electric current through wooden conduits dumped on the underground shifting sands and having raceways for the lead covered cables that were unsealed at the ends. When damages and accidents arise from such an outfit there should be no trouble in convicting the company establishing it, of criminal negligence. But, bad as the M. E. L. Co.'s methods are they have a rival in their badness in the Central Light and Power Company, "me too," limited. This company also has a system that is productive of fires in the raceways for electric conductors, which only demonstrates the fact more fully that for underground distribution of electric current there are but two systems which are safe, i. e., Edison tubes or lead covered cables insulated in fire-proof ducts.

But to get back to the methods of this Central Company, which was first organized to dispose of the surplus current that the Emporium plant could produce, and finding this part of the business profitable, the Company decided that by enlarging the plant and extending the system they would be in a better position to accomplish the real purpose of their creation. So they enlarged, and since that time have made a practice of installing wires covered with simple cotton braid dipped in a compound known as "Weatherproof" insulation, which in reality is but insulation in name. This kind of wire being made for aerial work only. Such a covering offers no impediment to the passage of current from one conductor to another, or in some cases to the ground. The fire in question was caused by this lack of precaution in not providing proper insulation covering for their conductors, thereby allowing the current to leak from one side of the system to the other setting up an arc which in turn burned away the copper cables, and an entire section of the raceway.

As was stated in the April issue there is always a possibility of these open ducts collecting gasses which might be exploded by a fire of this description causing great damage to adjacent property.

Another source of great danger from fire is a practice by these Companies of installing converters, transformers or pressure reducing devices within or upon walls of buildings or in basement under sidewalks. In the event of the coils burning out within the case a great amount of heat is generated, which soon heats up the boxes to such an extent that in

most cases, no matter how it has been installed, the adjacent work will be ignited. The proper, and in fact the only places where transformers should be located are upon poles of companies who distribute by means of overhead conductors or in manholes located in the streets for companies who use the underground system of distribution.

There should be a municipal law enacted at once prohibiting the installing of transformers within or upon buildings. In the meantime owners and tenants should see to it that no transformers are allowed to be installed either within or upon the buildings they occupy, while insurance Companies should prohibit such criminal practice by restrictions in their policies.

Rule No. 13 a of the Code of the National Board of Fire Underwriters says that *transformers must not be placed inside of any building unless by special permission of the Inspecting Department having jurisdiction.*

Equally as stringent and fully as important is the enforcement of the National Code Rules governing the use of cut out switches and entirely at the discretion of the Board of Fire Underwriters of the Pacific. Yet, notwithstanding this fact, the rules are only partially enforced while some of the Companies are permitted to follow a "go as you please" policy.

Now as the rule is enforced in some instances, the question naturally arises why is it not enforced in all? And as this is one of those "purely a matter of dollars and cents" cases with the Board, it is time that a little home pressure was brought to bear in the right quarter. If the "home pressure" was made out to read something like this: "All Electric Light and Power Companies in this jurisdiction, shall and must on and after July 1, 1898, be compelled to place a double pole or triple pole quick break switch at point of entrance of *All* installations, the switches would be so placed."

A word to the wise is generally quite as effective as the proverbial pound of prevention.

HERTZ' EXPERIMENTS ON THE ELECTROMAGNETIC THEORY OF LIGHT.

BY DR. CHAS. A. PERKINS.

PROFESSOR OF PHYSICS AND ELECTRICAL ENGINEERING—UNIVERSITY OF TENNESSEE.



THE Industrial applications of electricity have had an astonishing growth within recent years, but the enlargement of our knowledge of the nature of electricity itself, and its relation with various physical forces, has been no less remarkable.

Faraday was the first to prove the intimate connection between electricity and light, showing that the plane of polarization of light is rotated by an electric current, somewhat as it is rotated when passing through a sugar solution. Faraday further ventured the suggestion that light itself might be an electrical vibration, and that electrical and magnetic forces might be exerted by means of the luminiferous ether. "for it is not at all unlikely that, if there be an ether, it should have other uses than simply the conveyance of radiations." These ideas of Faraday were submitted to mathematical tests by Maxwell, who found them

capable of explaining and accounting for the facts, and upon them he based his well known electromagnetic theory of light.

Everyone who has used a telephone is familiar with the fact that when variable electric currents are passing along a wire, currents are thereby set up in the parallel telephone wire. Maxwell showed that if such a disturbance traveled as a wave from one wire to the other through the air, it should travel with the velocity of light. Maxwell's theory is, in short, that light is itself such a wave of magnetic induction. According to this theory, light is produced by rapidly alternating currents in the luminous body, the direction of the currents being reversed about one thousand million million times per second. Several of the optical properties of bodies can be explained by this theory, especially the extreme opacity of metals; and so strong was the

evidence in its favor that the theory was considered by sparks were seen at this break whenever they occurred between the conductors, showing that the electrical vibration had the same power as an electrical current to induce a current in a neighboring wire. Having calculated the number of vibrations per second in these wires, the next question was whether the induction traveled as a wave, or whether the current was produced by the electrical vibration acting directly and instantly upon the wire.

A large sheet of zinc was hung upon the further wall of the room to reflect the wave of induction, if it were a wave, and as a result it was found that at regular distances from the sparking conductors, the induced spark in the wire could not be obtained, while at intermediate points it was intensified, just as when waves upon the surface of water are reflected back, there are certain points where the surface is at



LECTURE-ROOM IN THE TECHNICAL COLLEGE AT CARLSRUHE, WHERE HERTZ PERFORMED HIS EXPERIMENTS.

scientists to be highly probable, even in the absence of direct experimental proof. Indeed, currents of such a high rate of alternation are not to be measured by any ordinary electrical apparatus, nor is it easy to experiment upon the velocity of a wave which travels (as does light) with a velocity of 186,000 miles in a second.

Direct experimental evidence was first obtained eight years ago by Prof. Hertz, in the following way:

Two conductors were placed very near each other and connected, one to each electrode of an induction coil, so that when the coil was in operation sparks should pass from one conductor to the other. Under these circumstances the electricity does not simply jump across the gap and come to rest, but vibrates back and forth in a series of sparks which follow each other at a rate depending upon the shape and size of the conductors used. For those first employed by Hertz they succeed each other at the rate of one hundred million per second. Of course there are not one hundred million sparks—perhaps half a dozen, but these follow each other at this rate. On holding near these sparking conductors a ring or rectangle of wire in which was a break at one point,

rest, while between these points the water rises and falls in a wave more vigorous than before.

Hertz thus found evidence of the existence of a wave of induction, and succeeded in measuring its length, and from the wave length and the number of vibrations per second, he calculated its velocity. This velocity proved to be, as nearly as his experiments would show, equal to the velocity of light.

To further study the similarity between this electrical wave and light, Hertz made two large parabolic mirrors of sheet zinc. In the focus of one of these he placed the two conductors which were in connection with the induction coil; in the focus of the other he placed two similar conductors, between which a spark would jump when they passed between the first pair.

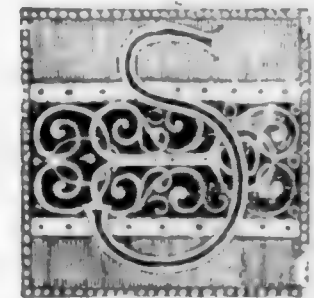
The mirrors were placed facing each other and acted perfectly as reflectors, concentrating the wave and causing a vigorous sparking in the second pair of conductors. Metallic screens placed between the mirrors showed that the wave traveled in a straight line. By a large prism of pitch the wave was bent out of its course as a beam of light is refracted.

so complete was the similarity of the electrical wave to that of light, that not a doubt remains in the mind of any physicist as to the identity, or at least the close connection, of the two.

The extreme interest and importance of these experiments led the writer of this article to desire a picture of the lecture room in the Technical college at Karlsruhe, Germany, where the experiments were carried on. The room has been restored, as far as possible, to its condition at the time of the experiments, and such of Prof. Hertz' apparatus as still remains intact is shown in the cut. The large reflectors are shown in position, with the prism of pitch placed between them, to determine its refractive power. The circles and rectangles of wire, reflecting sheets of metal, a large wooden frame on which are strung wires for experimenting on the "polarization" of the wave, are all shown. The man who is represented holding this large frame in his hand is Mr. Amann, who assisted Prof. Hertz in carrying out his measurements. The picture also shows the stoves and iron columns at the sides of the room, which Prof. Hertz afterward believed had introduced certain errors into some of the measurements. — *The University Scientific Magazine.*



CHANGING FORM OF STONE BY PRESSURE.



SOME very remarkable experiments in geology and mineralogy are going on at the present moment in the Workman Engineering building at McGill University, Montreal, Province of Quebec, under the direction of Professor Adams, of the Faculty of Arts and Prof. Nicholson, of the Faculty of Applied Science. These experiments tend to show that a substance so hard and brittle as marble may, under certain conditions be moulded like clay. The experiments in brief consists of placing miniature columns of pure Carrara marble, or stone, in sheaths of iron and submitting them to graduated but long continued pressure, with the result that the marble shortens and bulges so as to swell the iron sheath. The iron being cut away, the marble, no longer cylindrical, but greatly altered in shape, remains as solid and brittle as before. No increase of temperature or other agency than the pressure is applied in producing the above change. The experiments so far conducted have been highly successful, and it has been proved beyond the shadow of a doubt that marble by long continued pressure, may be greatly altered in size, shape and appearance, yet remain in as solid condition as it was before the alteration took place.

These experiments, remarkable in themselves, have implications that make them of peculiar interest to geologists and mineralogists, and incidentally, to sculptors. For the

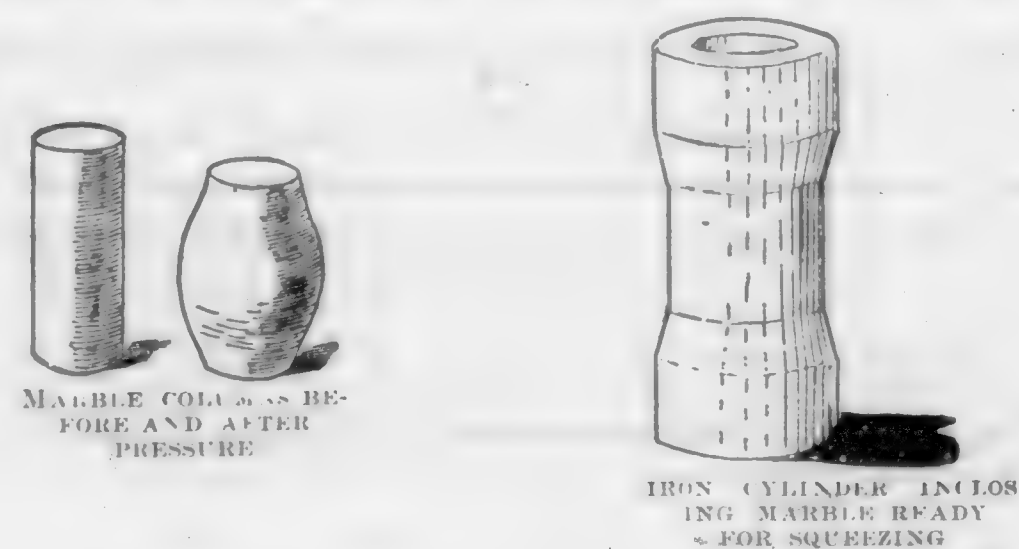
geologist the interest in the proof of the plasticity of marble rests on the light the experiments thrown on certain obscure formations of the earth's crust. They prove that under the conditions of pressure existing deep in the crust, stones may be moulded into new shapes without being melted. In point of fact the moulded marble of these experiments, when examined under the microscope, presents many striking resemblances to certain natural rocks whose peculiar cleavage has heretofore been difficult to explain. The recent discovery at McGill, however, shows that, however brittle a rock may seem to be, it is in reality a plastic substance, capable of flowing into new shapes as surely, if not as readily, as putty or dough is moulded.

In commencing these experiments three years ago, Professors Adams and Nicholson wished to ascertain whether it was possible, by subjecting rocks artificially to pressure under the conditions which obtain in the deeper parts of the earth's crust, to produce in them the deformation and cataclastic structures exhibited by the folded rocks of the interior of mountain ranges or of the older formations of the earth. They took into consideration the three factors which combined to bring about the conditions to which rocks are subjected in the deeper parts of the earth's crust: (1) Great pressure from every direction; (2) high temperatures; (3) the action of percolating water.

In the several experiments which have taken place at McGill, the attempt has been made to reproduce only the first of these conditions. In subsequent experiments the endeavor will be made to reproduce all three of them.

The experiments so far conducted have been made chiefly with pure Carrara marble, and the process followed is thus described in detail by Prof. Adams: Columns of marble, two centimeters and two and one half in diameter and about four centimeters in length, are very accurately turned and polished. Heavy wrought iron tubes are then made, imitating the plan adopted in the construction of ordnance, by rolling long strips of Swedish iron and welding the strips to the bar as they are rolled around it. When this welding process is completed, the core of soft iron, around which the Swedish iron has been wound, is drilled out, leaving a tube of welded Swedish iron six millimeters thick, and so constructed that the fibers of the iron run round the tube instead of being parallel to its length. The tube is then very accurately fitted on to a column of marble. This is accomplished by giving a very slight taper to both the column and the interior of the tube, and so arranging it that the marble will pass only half way into the tube when cold.

The tube is then expanded by heating so as to allow the



marble to pass completely into it, and at the same time leave about three centimeters of the tube free at either end. On allowing the tube to cool, a perfect contact between the iron and marble is obtained, and it is no longer possible to withdraw the latter. Any very slight failure to fit at any point

PREVENTION OF CORROSION.

FROM A PAPER READ BEFORE THE WESTERN SOCIETY OF ENGINEERS BY GEN. WILLIAM SOOY SMITH.



THE USE of combustible materials in buildings of all kinds endangers life and property to an extent realized only when we are startled into thinking by some great conflagration or appalling destruction of life by fire. If the great aggregate of destruction of life and property by fire during a single year could be carefully and accurately made up, the world would stand aghast at the horrible revelation. While such wonderful progress has been made during the latter half of the nineteenth century in the development and application of physical science, is it not passing strange that so little has been done to mitigate this stupendous evil? The term "fire-proof" is only relative, for there is scarcely anything that will resist the highest known temperatures if applied for a few hours only. And the best and cheapest materials used in buildings do not belong to this class of very refractory substances. The subject of buildings is of vital interest to all mankind. Our convenience, comfort, health and safety depend largely upon the character of our dwellings and of the buildings in which our labor is done and our business transacted. It is especially requisite that the materials employed and the modes of construction of buildings shall be such as to make them strong, durable, safe and economical. They should also be as nearly as possible proof against destruction by fire, or by fire and water combined, as they are generally exposed to the joint action of the two in cases of conflagration.

The "skeleton construction" now so common in large cities for tall buildings is about as faulty and objectionable as it can be when exposed to this combined action. The expansion of the steel the buildings contain is at the rate of a tenth of an inch per foot for a change in temperature of one thousand degrees (red heat). The other materials, stone, brick, terra cotta, etc., each has its own rate of expansion differing from each other and from that of steel. They all differ also in their conductivity of heat. If these materials and steel are raised in temperature equally throughout their whole length, the increase in length will differ in each material, and taking the conditions as they occur in almost all burnings of buildings, the steel will, on this account, be heated much more quickly, and throughout a much greater part of its length, than any of the other materials present. The differences in the total dimensions of the several parts of the building resulting from these causes is so great as to bring about a destructive war between them. This is not mere theory, although it is correct. Close observation of the effects of fire on buildings discloses the same facts.

When a fire is in progress in a building and its parts heated to a high temperature, the fire engines throw powerful streams of cold water on the heated materials, and most of those now commonly employed fly to pieces under this joint action of fire and water. So says chief Swenie, of the Chicago fire department, and all who have become familiar with the effects of fire and water on building material. This is especially true of the light integument of terra cotta built around the steel columns of a skeleton building.

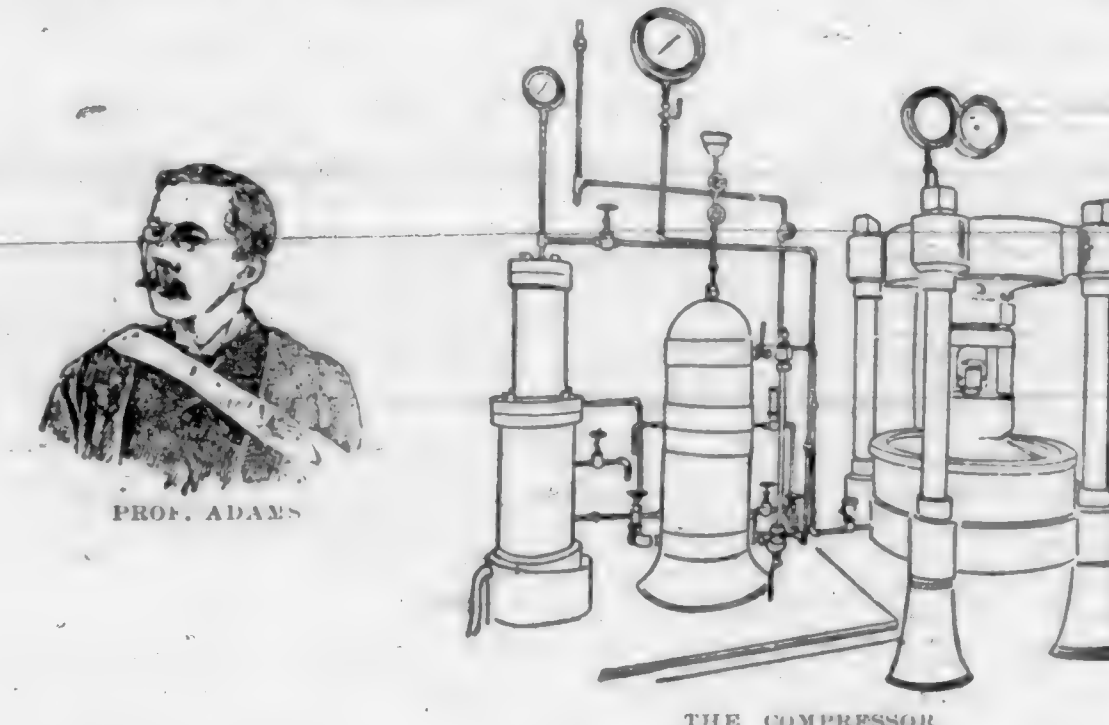
Iron and steel being the strongest materials used in the

if such a failure exists in any case, is rendered harmless by the fact that under a comparatively low pressure, the limestone is found to be sufficiently elastic not only to fill up any such minute space, but even to stretch the tube, and, on the pressure being relieved, to contract again to its original form, so that it will drop out of the tube which has been thus enlarged.

When the marble has been firmly placed in position in the tube, an accurately fitting sliding steel plug is inserted in either end, and by means of these the marble is submitted to a pressure far above that which would be sufficient to crush it if not so inclosed. The machine employed in obtaining the pressure is so arranged that it (the pressure) might be maintained for weeks, or even months, if required. Under these circumstances the conditions of pressure to which the marble is subjected are those to be found in the "zone of flow" of the earth's crust.

Under the pressure which is applied gradually, and in some cases continued for several weeks, the tube is found to slowly bulge until a very marked enlargement of the portion surrounding the marble takes place. The tube is then cut longitudinally, by means of a milling machine, along two lines opposite to one another.

When thus cut the marble within is found to be firm, so much so in fact that it holds the respective sides of the iron tube, separated as they are, so tightly together that it is impossible without mechanical aids to tear them apart. By the means of a wedge they can be separated, but the force of



the blow frequently has the effect of splitting the marble through longitudinally.

In one experiment conducted by Professors Adams and Nicholson, the column of marble was reduced from 40 to 21 millimeters in height.

The deformed marble differs somewhat from the original rock in having a dead white color, the glistening cleavage faces of calcite being no longer visible. Although not so hard as the original rock, it is still firm and compact, especially so when its deformation has been carried out very slowly. No accurate measurements as to its strength have yet been made, but it will withstand a very sharp blow, and fragments of it weighing ten grams have been allowed to fall from a height of over eight feet onto a wooden platform from which they have rebounded without breaking. Thin sections of the deformed marble, when examined under the microscope, show that the calcite individuals composing the rock have, in many cases, been twisted and flattened, and, in the majority of cases, a very fine polysynthetic pressure-twinning has been induced in them, with movement along gliding planes, as well as several other structures seen in nature in highly deformed rocks.

To be Continued.

construction of buildings, and in proportion to the service to be performed one of the cheapest, have deservedly come to the front rapidly as a building material, particularly in the United States, for the very high buildings that have been erected in the business districts of large cities in which the high prices of lots make it advisable to secure the greatest rentable space practicable on a given area. The experience previously gained in the construction of iron and steel bridges throughout the world prepared the way for the use of these metals in buildings, and to some extent developed correct methods of proportioning and connecting their parts. But it seems remarkable, in view of this experience, that such radical defects still creep into details of iron and steel framing in buildings—such as the flimsy lug and bracket connection of beams and girders with the columns, the eccentricity of loads on the columns, and the want of provision for expansion and contraction of the parts of the skeleton of a building. These defects are easily remedied.

And now supposing that all the metal parts of a building are properly shaped and connected, and all the loads and strains which the skeleton frame is to sustain are amply provided for, two great dangers threatening the safety and durability of the building still remain, viz: the weakening and destruction of the metal members by corrosion or by heat. These dangers are actual and obvious. But the precise rates of weakening by heat, and destruction by corrosion under different circumstances are not as accurately known as they should be. A column of iron or steel, such as those now commonly used in high buildings, would hold little more than its own weight when red hot; and it is well known that there is a dangerous weakening effect of heat at much lower temperatures. The metal while heated loses much of its strength to resist tension and compression, and also loses in greater degree its resistance to lateral fixture, and so the entire skeleton of a building may be deprived of a stiffness necessary to its stability.

It also happens that while the columns, beams and girders are weakened, they are also expanded by heat and unequally, as the degree of heat to which the different members are exposed varies. The unequal expansions of the horizontal beams and girders push the columns out of vertical into buckling positions, rendering almost certain a collapse of the whole structure. This has already occurred in many instances, and is likely to occur whenever fire attacks a skeleton building in which the metal parts are not absolutely protected by proper fireproofing. It also frequently occurs that the horizontal expansions of the beams and girders crack and shove out the walls against which their ends abut.

Many buildings having skeletons of iron and steel imperfectly protected by so-called fire-proofing have failed when heated by fire either in these buildings themselves, or in some instances from the burning of an adjacent building even at a considerable distance away, notably in the case of the Manhattan Savings Bank building, corner of Bleecker street and Broadway, New York, which was ignited by the burning of another building forty feet away and practically destroyed, and the three skeleton (so-called) fireproof buildings ruined by fire in Pittsburg, Pa., on May 3, 1897.

Many other instances may be cited, all teaching the same lesson, viz., that while steel at ordinary atmospheric temperatures is the cheapest, strongest and best building material known, it can only be considered safe and durable when thoroughly protected from high heat and corrosion. The rate of corrosion of iron and steel varies greatly under different circumstances. In pure water, containing no free air,

with an airtight covering of paint or imbedded in quicklime, it scarcely corrodes at all, but when in the open air, particularly when alternately wet and dry, it rusts quite rapidly, and when exposed to steam and sulphurous fumes, it is eaten away by corrosion at the rate of one-eighteenth of an inch per annum, as was the case in the floor system of the viaduct in Milwaukee avenue, Chicago, under which locomotives were passing frequently; and corrosion at the same rate occurred in a portion of the western approach of the Eads bridge at St. Louis, where the same circumstances exist.

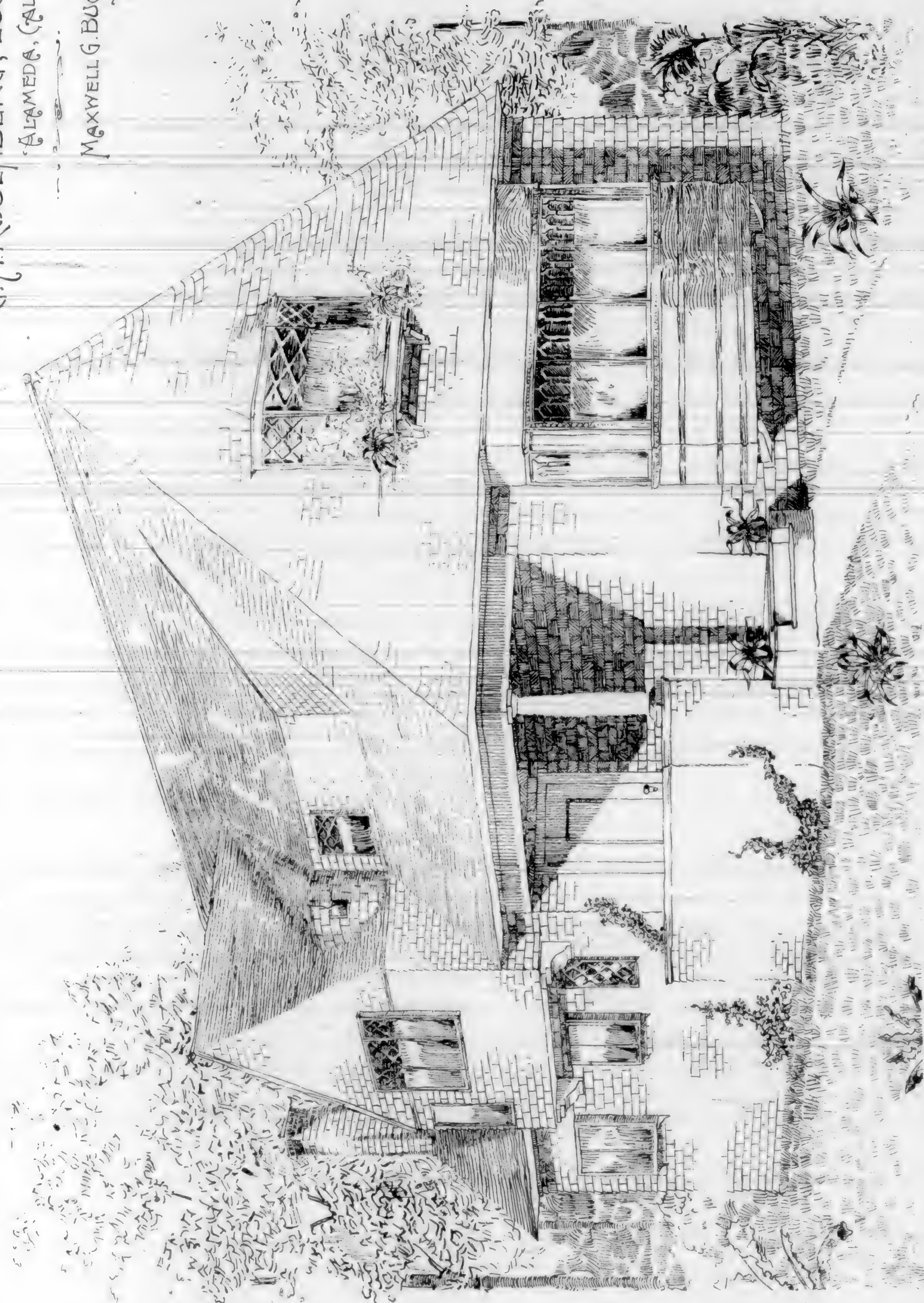
As the metal in a steel column is usually not more than one-half inch thick, corrosion at the above rate would make a steel building unsafe in less than twenty years. In an iron or steel skeleton building the columns starting at the basement floor, or at the floor at street level, extend to the top of the building. They are hollow and painted only on the outside, and this with paint that is so perishable that it will afford no protection from corrosion after the first five or ten years. The girders are nearly as much exposed as the columns, while the beams are generally bare on the top and bottom surfaces of the flanges, and sometimes over a considerable part of the webs.

Wherever the surfaces inside or outside are left uncovered they are exposed to corrosion that will be more or less rapid according to the temperature and hygrometric conditions of the air surrounding them. And in many instances, particularly in factories, there are destructive elements in the atmosphere, such as sulphur and chlorine, which may cause rapid wasting away of the metal, and which are the more dangerous, as they are apt to escape notice. A steel or iron skeleton building can be made safe and durable only by thorough knowledge of the nature of these metals and careful provision against the dangers that threaten it under all the conditions of their use. Supposing that the structural details are correct, care must next be taken to prevent corrosion. This may be done by covering all metallic surfaces, both inside and outside, with an indestructible coating of a material that will absolutely prevent corrosion. This having been done, all the metal parts must be inclosed in a fire-proof and fireproofing material that will not only resist the heat of a conflagration, but so shield the metal from attack by heat as to prevent any considerable changes of its temperature. And this may be best and most certainly accomplished by having an eye to the fireproofing of each individual member.

Slow combustion of buildings can be secured by carefully whitewashing the inside and outside with fireproof material laid on with a brush. And fire departments claim that they can extinguish almost any fire if it is only prevented from spreading too much until they can bring their engines into play. If it of the utmost advantage to protect each building from the danger of ignition in the case of the burning of its neighbors, and this can be at least measurably done by the whitewashing suggested, and by putting fireproof shutters on all windows and openings of every kind. Where there is an open court in a building some sort of fireproof covering should be put upon all parts of such court, and the same protection should be given to stairways and elevator shafts.

The essential characteristics of a fireproofing material for buildings are: First, it must itself be incombustible; second, it must be as nearly as possible a non-conductor of heat; third, it must be strong and durable. While there are very many so-called fireproofing materials in use for which these qualities are claimed, up to a very recent period there

Residence of
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CALIFORNIA ARCHITECT & BUILDING NEWS
SAN FRANCISCO

BRITTON & REY, PHOTOGRAPH

VOL. XIX No. 6 JUNE 1898

A DESIGN
FOR A CHURCH



CALIFORNIA ARCHITECT & BUILDING NEWS
SAN FRANCISCO.

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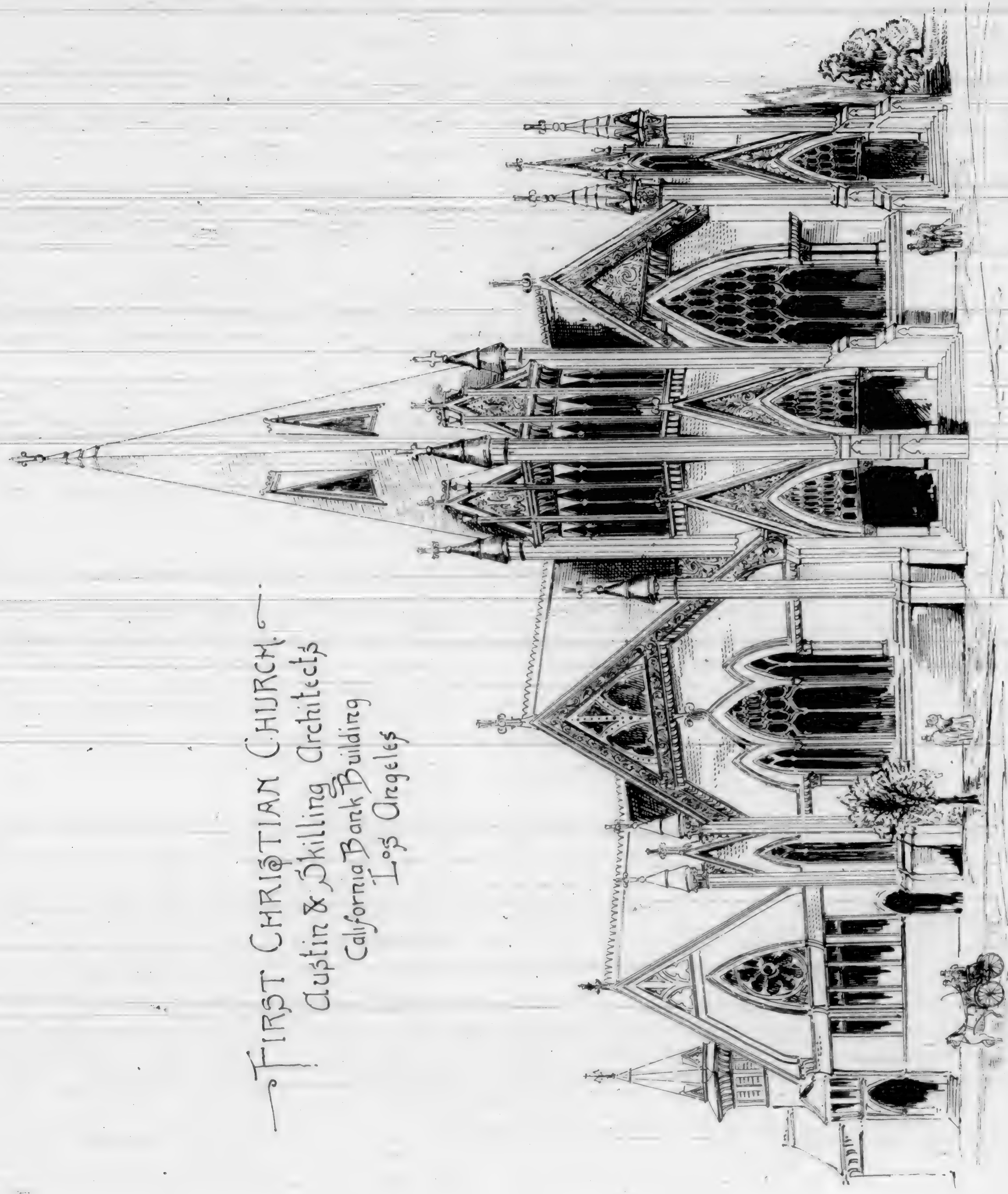
VOL XIX N°6 JUNE 1898

C. A. MEUSDOERFER,
Architect.



A STUDY

FIRST CHRISTIAN CHURCH
 Austin & Skilling Architects
 California Bank Building
 Los Angeles

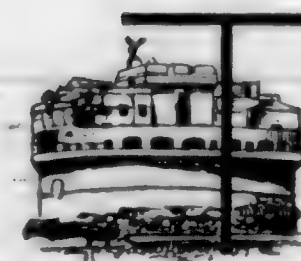


was not one of them that was a good non-conductor of heat, that would stand heating to redness, and being plunged into cold water while red hot, without flying to pieces. Within a few months, after years of careful experimenting, and testing the material, "asbestic" was discovered, which possesses all the requisites above enumerated, as proven by severe tests on a large scale at Montreal, New York, Washington and Chicago.

The requirements of a building are that it shall be strong enough to carry all its loads and resist wind pressure and all other strains to which it may be subjected as a whole or in any of its parts. That it shall be nearly as possible fire and weather proof, and that it shall be durable and not unreasonably costly. Supposing that steel is used for the framework of the structure as being preferable to any other for the frames of large buildings, and that proper shapes and sizes of all parts of such frames have been carefully and correctly determined, and the disposition and connections of these parts have been properly made, it only remains to cover the skeleton of a building inside and outside, roof included, with an integument that shall be fireproof, strong and durable; and, if possible, light, tough and elastic and a good non-conductor of heat and impervious to air or water. Such covering can be made of fireproof plaster of any necessary or desirable thickness, and suitable cornices and mouldings can be worked out of the same material.

As soon as the skeleton is erected every part of it should be covered with a thick coat of the fireproof material laid on with a brush. The metal lathing should then be put on, strengthened where necessary by angle or tie iron covering all parts of the frame and leaving an air space between the lathing and every part of the frame. The great weight of tile, brick and stone now used would thus be dispensed with and the much lighter construction described substituted. A very great saving of weight in the frame itself would be saved and the cost of the necessary foundations of the buildings be greatly reduced. There would be so many other important advantages realized that we need not describe them here. Enough has been said to invite the careful and unprejudiced study and criticism of engineers and architects, and out of this kind of investigation there may come a new system of building that may be the ideal one of the future.—*The Construction News.*

AN OFFICE BUILDING WITH FEATURES OF CONSTRUCTION AND SUB-CONSTRUCTION WORK THAT INVOLVE SPECIAL DESIGN AND ARRANGEMENT.



THE Singer Building, a modern iron and brick office building now approaching completion, is located on the northwest corner of Broadway and Liberty streets, New York city. It is about 60 by 111 feet in size and twelve stories in height. It is designed and will be equipped for office requirements, and although not of unprecedented dimensions nor requiring the elaborate foundations of some of the recent tall office buildings, several features of its construction involve special design and arrangement. Although the columns and floor beams of this building are of iron and steel and the floors, partitions, walls, etc., are of fireproof construction, the steel cage system has not been strictly followed, inasmuch as the ends of floor beams are supported

by the brick walls. It was not considered necessary to provide independent steel wall columns, because it was determined to give the walls such dimensions as would insure their thorough stability for the moderate height to which they are carried, and this provision independently developed sufficient strength to make them abundantly adequate to carry the floor loads also.

The position of the columns were, as frequently happens, such as to concentrate heavy loads so near the lots lines as not to be coincident with the geometrical centers of the grillages through which their loads were distributed upon the surface of the sandy soil, at a depth of about 25 feet below the curb. The party walls themselves imposed so heavy a pressure upon their foundation courses that they could not be safely carried by the area of soil directly underneath. Therefore the weights of these walls and some of the adjacent columns were distributed over the grillages by means of an unusual arrangement of cross girders. These enabled the grillages to be set in convenient positions and of suitable dimensions, measurably independent of the center lines of columns and wall, excepting that they were chiefly included between them. The columns were set on short, heavy, multiple-webbed girders that are supported on the converging ends of radial beams, which spread out to support the bottom of the wall overhanging the transverse grillage beam upon which they were laid, and transmitted their loads for distribution upon the soil. In other cases sets of distributing beams were placed diagonally across the corners of the walls to support both sills, and were balanced upon the grillage without receiving any column reactions. In still other places openings in the foundation walls were built over sills composed of steel beams parallel to the axis of the wall, which projected beyond each side of the opening and distributed the weight from these portions of the wall to the grillage across the open space. The distributing beams were heavy sections of the deepest steel girders rolled, while the grillages themselves were composed uniformly of 12-inch steel I-beams, and both grillages and girders were set in solid masses of concrete, which extended 6 inches beyond the metal in every direction and was composed of Portland cement, sand and 2-inch stone in the proportions of 1, 3 and 5. It was well rammed into place, and extended between the grillages to form a continuous floor 6 inches thick over the entire area, with a solid filling of concrete carried down around every column to join the foundation beds.

About the time that work was begun on this building a land slide occurred immediately after a violent rain storm, which carried nearly all of the adjacent surface of Liberty street into the excavation and required a large amount of excavating and back filling. Immediately after the accident the street surface was restored by means of a temporary heavy wooden platform or bridge extending from the front of this building over its vaults, across the street through the front of another large building, which was being simultaneously erected on the opposite corner, thus allowing the foundations, retaining walls, etc., to be built at leisure. The retaining walls of the sidewalk vaults were constructed of special design.

These walls consisted of a core formed by two ring brick arches, with vertical axes built between the flanges of 8-inch vertical steel I-beams, spaced about 5 feet apart and bedded at the bottom in a concrete footing. These tops were joined by 6-inch horizontal I-beams and braced laterally by the sidewalk beams 5 feet apart. The arches themselves were

segmental with a rise of about 6 inches, and were built up solid against an 8-inch straight outside face wall. A 4-inch plain curtain wall was built inside against the flanges of the vertical beams inclosing segmental air spaces behind each arch. This construction was carried around the entire vault perimeter, although obviously the arch principle was not needed on the corner where the curved wall itself formed one long arch, but it was maintained for the sake of uniformity and to continue the sidewalk framework.—*Exchange.*



The management of this journal desires to extend a cordial invitation to all architects on this coast and elsewhere to contribute designs for publication.

Drawings should be made with perfectly black lines on a smooth white surface. Good tracings, if made with black ink, answer the purpose.

The designs selected will be published without charge. All drawings, whether accepted or not, will be returned to their authors, who must bear express charges both ways.

A DESIGN for Church, Reid Bros., Architects.

A STUDY, C. A. Meussdorffer, Architect.

RESIDENCE for G. A. Rosenberg, Alameda, M. G. Bugbee, Architect.

FIRST Christian Church, Los Angeles, Austin & Skillings, Architects.

IRON SHUTTERS.

CHIEF Bonner, of the New York fire department, has rudely shaken the faith of those who have hitherto placed their trust in iron doors and shutters as the only proper safeguards against the incursions of fire. He says:

"It is claimed that iron shutters are nearly as good as tin-covered wood shutters, if properly made. This is a mistake. Iron shutters, from my experience, have never withstood fire as the 'Underwriter' shutter has; and they are deceptive in many cases, and have possibly caused more damage by permitting an extension of fire than is generally known. In the case of the Cohnfield fire some years ago, at the corner of Greene and Bleecker streets, iron shutters pro-

tected the side of the building on the south side of the Cohnfield building, as well as in the west wall of the Bleecker street building; but, when the flame from the rear of the Cohnfield building took possession of this yard and its surroundings, it opened those iron shutters as if they were unclapped mechanically from the outside; and this is a measure was responsible for the extension of the fire to each of the buildings. I felt confident previous to the opening of those shutters, that the department could hold the fire in check and confine it to the building in which it originated, and I felt some little confidence in the fact that the shutters on both buildings were closed; but I was sadly mistaken, for the first great volume of flame which passed out of the Cohnfield building opened the shutters, as I have already stated, without the slightest trouble, exposing both buildings at the same time to the mercy of the flames. From that time to this I have not taken any stock in iron shutters, and I believe they are deceptive and should not be used where the risk is of any account.—*Fire and Water.*

VALUABLE INFORMATION CULLED FROM OUR EXCHANGES.

A CASE at law in which architects generally are interested is now being tried in New Hampshire. It seems that some two years ago certain trustees invited four architects to prepare competitive sketches for a town hall. Subsequently the plans were received and the trustees reported that the plans came within the required estimate and the competitors were instructed to prepare plans and estimates. These were delivered by the competitors at the time specified. About this time the trustees were induced to admit other competitors and an expert was engaged to adjudicate the competition. The four architects immediately claimed a break in the contract and the trustees were instructed to carry out the original agreement and give the work to one of the four competitors. This they refused to do and awarded the design to another architect. Now one of the original competitors sues for damages.

C. C. Hall, a St. Louis man, brought to Alexandria, Ind., to take charge of the Union Steel Co's chemical laboratory, has made a most remarkable discovery whereby he is enabled to convert limestone into mineral wool; in making experiments lately in hopes of finding a chemical solution needed at the steel mill he found that certain kinds of limestone were converted into a lava when subjected to chemical preparations and heat, instead of becoming brittle. On this he began to work, and has succeeded in making the purest white mineral wool that could be found. In a refined state it can be used in the finer textures, and in the rough state it partakes of the nature of asbestos.

UNDER a new city ordinance, Chicago contractors will hereafter have to pay the city a small annual fee, and file a bond of \$10,000 every year to indemnify the city for damages to sidewalks in the laying of foundations. Standpipes and metallic fire escapes must be placed on all buildings, old and new, four stories or more in height. When a

staircase surrounds an elevator shaft there must be a fireproof wall between the shaft and the stairs, and electroglazed prisms are favored for shutters for windows in alleys, as they withstand heat, and at the same time are broken more easily than iron or wire, if the firemen wish to enter the building.

A REPORT of the assistant secretary of the United States Navy on fireproof material makes the recommendation that no wood at all be used on torpedo boats. The fireproofed wood which has been tried on some ships has, he states, a tendency to corrode steel with which it may be in contact. Further, the treatment weakens the wood and renders it hard to tool. Laid on decks it wears badly, and if subjected to constant wetting appears to lose its fireproof properties. From these considerations the secretary recommends that the material shall not be used for decking, but thinks it has advantages for interior joiner work, which is less exposed to the action of water.

THE responsibility of the architect for faulty construction has been greatly increased during the past few years. This is especially true of architects in Illinois. The passage of the state law licensing architects and regulating the practice of architecture as a profession increased the moral burden of responsibility for faulty construction with the legal rider of a revocation of the architect's license if he shall endanger life and property by criminal carelessness or malpractice. The recently revised building ordinances of Chicago have drawn the bonds of responsibility of the architect closer than heretofore, and the recent fires in this city, coupled with the loss of life, will result in a closer and more literal enforcement of the provisions of the new laws. Not only do the Chicago ordinances state that any person or persons violating the provisions of the building ordinances shall be each fined in a sum of not less than one hundred dollars, but it specifies that "any architect, having charge of such building, who shall permit it to be constructed in violation of this ordinance, shall be liable to the penalties herein provided and imposed." The stopping of the work of the reconstruction of the Holbrook building at 312 Wabash avenue may be taken as evidence of increased vigilance upon the part of the city building department, and a careful perusal of the new ordinances may save the architect future unpleasant complications.

FIREPROOFING.

READ BEFORE THE WESTERN SOCIETY OF ENGINEERS BY
FRANK B. ABBOTT.



QUR MODERN steel skeleton building marks an era in the history of architecture. In times prehistoric, in the Druidical epoch, if I may be permitted the term, the architect practicing without a license but still building wisely and well according to his light and with the primitive materials then available, set up on end, at regular in-

tervals, rough hewn or nature shaped posts of stone. Upon these posts and spanning the intervening spaces he laid other pieces of stone, upon these horizontal pieces he laid wooden poles covering the whole with leaves and grass, and right here the simple principles underlying all architectural form was born, the column and the lintel. Through all the ages that have intervened we have not improved much upon these principles. We have varied them it is true, we have used various materials from which to construct these two primary members, we have embellished them, we have placed a basket with some acanthus leaves growing around it on top of the column, we have inscribed the names of dead heroes on the lintels, but the column is a column still and the lintel is still a lintel, and while some of our profession seem never to have heard the old adage, "Ornament construction but do not construct ornament," and in this violation of the adage have at times almost concealed the true functions of column and lintel, still the two supporting members remain and will remain until the end of time or until nature rearranges its laws. These two members are about all there is in a building aside from the finish and embellishment, for the beams and girders are only ramifications of the lintel, and struts and pilasters only undeveloped columns.

It is only a question of time when all buildings will be of steel construction, residences, churches, warehouses. Our navy to-day is all steel from keel to turret, and our residences and business buildings will be all steel in the near future and not fire traps for the destruction of life and property. The word "fire" reminds me that I was not expected to talk about architecture, or about steel construction of buildings, but about fireproofing, but as you have undoubtedly perceived, the preceding remarks are intended as a preface to the subject matter, and, it is needless to say, that fireproofing wooden construction is a paradox and a delusion, and fireproofing stone absurd, therefore it is assumed that when we speak of fireproofing, we mean protecting steel and iron from the attacks of fire, for while steel is the best building material, it has an enemy, yes, it has two enemies, and in the light of recent investigations it is difficult to say which is the greater.

Investigations recently made by the American Society of Mechanical Engineers as to the condition of the steel in the frames of modern office buildings, reports of which investigations were published in volume 15 and 16 of their transactions, show that in many instances the metal had been seriously attacked by corrosion, and there is small room for doubt that were the tile and terra cotta coverings removed from the steel skeleton of our great modern buildings, we should find that rust has set up its dangerous work in many places. Putting a covering over the metal and calling this covering fireproofing does not insure the metal against corrosion, and sometimes unfortunately not against fire. Fire and corrosion then, are the enemies of steel, the one bold, flagrant, irresistible, the other unseen, silent, insidious. Now if we can keep these two enemies at bay we have a perfect and enduring building.

To prevent the corrosion of the metal is not, however, a difficult matter, as it is only necessary to keep out oxygen or moisture, but I wish to remark in passing that painting the metal is but a short-lived protection, as wherever air currents occur along the steel members, as is frequently the case where hollow air spaces are left between the fireproof covering and the steel, particularly where these air currents

originate in basements or areas where there is moisture and warmth combined, the painting will protect the metal at best but a few months.

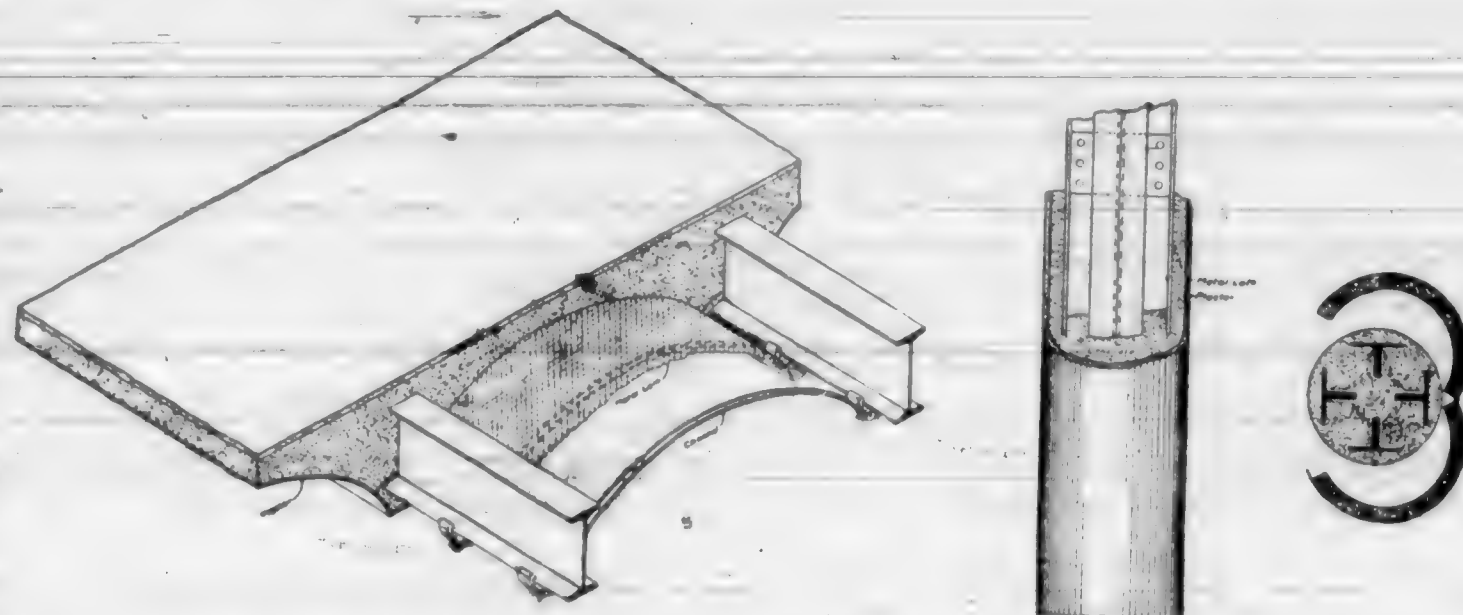
Now a fireproofing material of whatever kind it may be to properly perform its work must entirely cover the metal on every side, wholly envelope it, and be of such nature and thickness as will prevent the transmission of heat. This being so, it follows as a natural sequence that if this fireproofing material has the further quality of being impervious to air or moisture, we then can successfully resist the two enemies of steel, in buildings, with one material. So far as history is concerned, it shows that iron embedded in cement and concrete is preserved from rust, as, for example, iron cramps laid in cement joints and used to hold together the lintels of the Parthenon have been found intact, and anchors embedded in the concrete of the walls of the Coliseum of Rome when brought to light are as bright and untarnished as when new, and coming down to our own times, we bury the steel beams of foundations in concrete to prevent the action of rust and the inside of the bottoms of the steel ships of our navy are protected from rust by a covering of Portland cement.

Therefore, if our fireproof material is concrete and wholly protects the metal from fire, it will preserve it from rust. The proposition advanced herein then is to surround every column, beam, strut, or other structural member with concrete, and not only surround the metal but envelope it on every side, leaving no air spaces externally or internally. What kind of concrete is best for the purpose? My experience shows that the best concrete is: First, one that is a fire resistant; second, one that will not expand under the action of heat; third, one that is light; fourth, one that is sufficiently strong for the purpose; fifth, one that is high in lime. There is a number of substances which mixed with mortar or cement, will make concrete which will conform in the main requirements to that above described, but they are more or less dense and therefore heavy. In the 10-story manufacturing building, 171-173 Canal street, Chicago, the concrete fire and rust proofing is made of four of cinders to one of cement. These floors weigh about 25 pounds per square foot.

The lime of commerce is one of the best fire resistant known and concrete for fireproofing purposes is best that contains the greatest proportion of this ingredient, consistent with strength. In the Druecker warehouse now being built, the columns will be protected by concrete made of one part natural rock cement, one part lime putty and four parts cinders. This concrete material will be rammed into the internal cavities as well as entirely surrounding the columns, the nearest approach of the metal to the air being 4 inches when the column is finished. After the concrete is set it will be covered with a metal lath, on which will be spread a thick coat of dense, hard mortar. Wooden cylinders 4 inches long and made of 2-inch staves hinged so as to open in the direction of their length will be set around the columns and the concrete rammed into place from the top. As soon as one 4-foot section is constructed on top of the first, and this process continued to the top of the column before floors are put in, thus securing a continuous envelope to the column, without joints from basement to roof. The metal

lath is used to provide a better key for the mortar finish and to protect the concrete from possible injury under high temperatures.

The steel will have no painting whatever, but will be cleaned of mill scale and other foreign substances at the building, before concreting, since nothing should be put upon the steel to prevent the perfect adhesion of the cement to the metal, as the cement in the concrete settles about the metal and deposits upon its surface a coating while the concrete is being rammed into place. The external columns will be covered with hollow bricks and the spaces inside this



SECTIONS SHOWING APPLICATION OF CONCRETE.

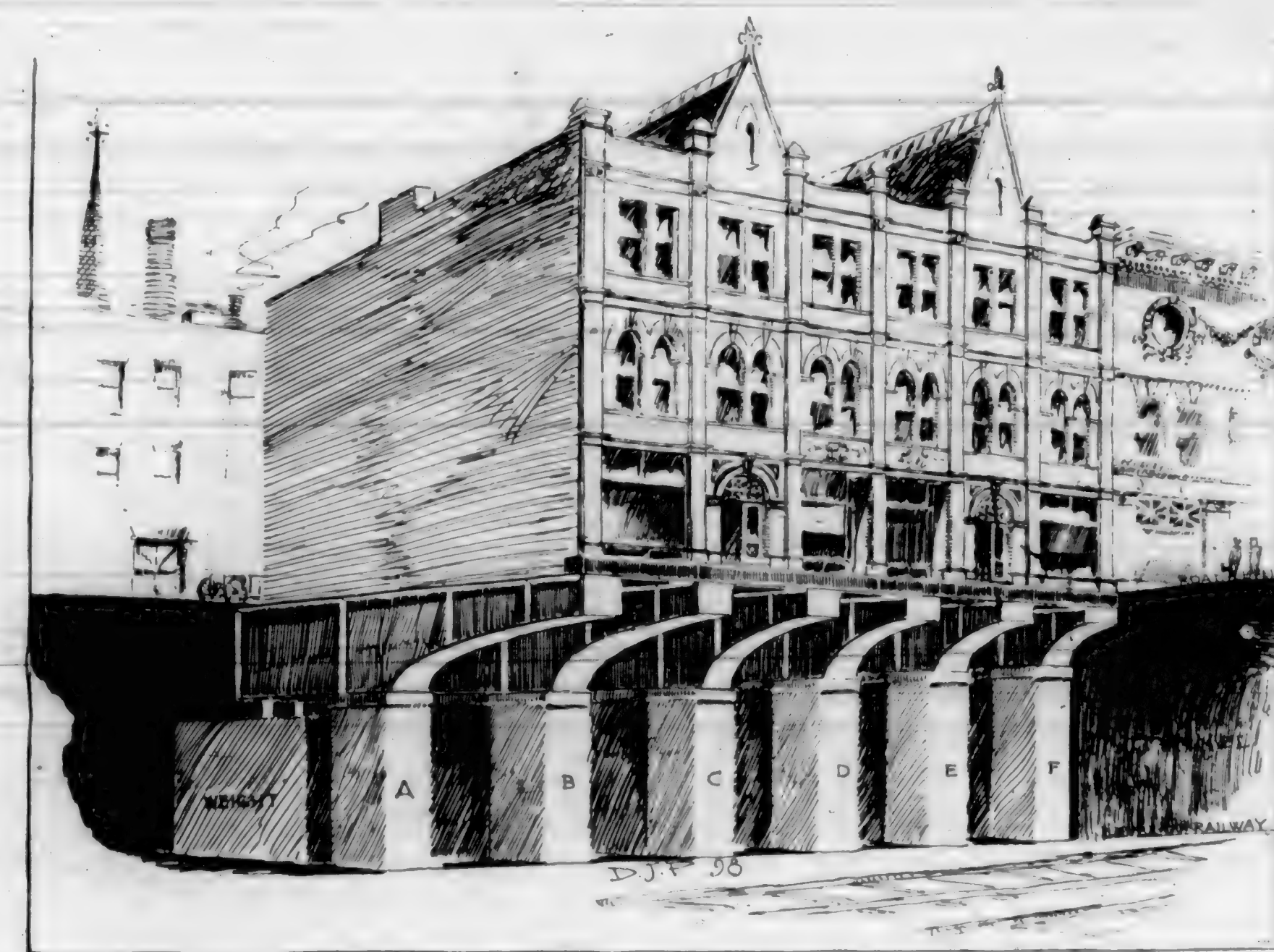
outside covering filled with concrete material, the same as other columns. In any building during a fire the point most fiercely assailed by the heat and flames is the floor construction directly above the fire, and there has been plenty of evidence to support the statement that if the floor construction of any building is impregnable to fire, which may occur or originate in any story, then the damage from fire in such a building will be slight so far as the building itself is concerned. The fierce heat generated in burning buildings is caused by the floors burning away and thereby creating a draught through several stories.

In a private test made on several pieces of cinder concrete in a furnace under a boiler, the test lasting about forty minutes, the temperature was raised to the fusing point of wrought-iron without showing any serious injury to the concrete blocks. These concrete blocks were 5x8x10 inches and various grades of concrete were used. The concrete being made of one part cement, one part lime, 4 parts cinders.

W. H. Birkmire, in his recent work, "The Planning and Construction of High Office Buildings," says on page 129: "Of the use of concrete in construction little need be said. It is a conceded fact by those authorities who have given the subject the most thorough and careful study that concrete as a fire-resisting material is unequalled. After the great conflagration in Chicago the committee who examined the effects of this fire reported that concrete was the most thoroughly fire-resisting material that had passed through the ordeal. Iron and steel when completely embedded in and protected by the concrete which forms around it in a homogeneous cast, is undoubtedly better protected from the effects of heat and corrosion than would be possible by any other method. In Europe where concrete has been used in building construction for centuries past, its efficiency is better understood than in this country. More buildings are standing in Europe to-day which were constructed of concrete more than 500 years ago, and which have withstood the attacks of cold and heat for all these centuries and are yet in a good state of preservation."

The relation that fireproofing bears to insurance is an intimate one, and the insurance companies are close observers of condition during fires, and their discernment of the value of fireproof material is constantly being sharpened by destructive fires. Comparisons are odious but facts are stubborn things. In the Felix & Marston warehouse, built about four years ago, which building was fireproofed with cinder concrete in general manner, as shown by details of construction exhibited here, the rate of insurance made by the insurance companies on the building was 45 cents, and that, too, on a building filled from cellar to roof with a very inflammable material, namely, wooden and woolen ware. This is the lowest rate in Chicago on a warehouse stored

by those who have visited the spot under the impression that they would find a building hanging in the air, "suspended" by goodness knows what! The drawing mentioned will assist in making clear our description. The problem was to deal with a valuable site, with an equally valuable frontage, rendered almost valueless because the tunnel of the Great Western Railway passed under the whole of the frontage, and that so near the surface as to preclude the use of cross-girders. Various architects and engineers had attempted to solve the knotty question of the utilization of the land, but none of the many plans submitted would the engineers of the railway company accept, Mr. Ingles, the engineer of the company, laying it down as a sine qua non that not the slightest weight should rest upon the tunnel. To meet this difficulty, Mr. Ralph Heaton, the architect engaged, has devised a system of cantilevers, as illustrated, to support the three story erection of warehouses and offices designed to cover the space. The building from front to



A BUILDING CURIOSITY IN CARR'S LANE, BIRMINGHAM.

with this nature of stocks. Mill construction has proven a great disappointment to the architect, the owner and the insurance companies, and while Mr. Atkinson may have been able to produce first-class revenue for the New England mutuels, he has not told us how to arrest the progress of a fire that has once gotten under headway in a mill constructed building. This type of construction in large cities will undoubtedly soon become obsolete.—*The Construction News*.

BIRMINGHAM'S BUILDING CURIOSITY.

THE INTEREST of the general public in matters of engineering difficulty is not usually marked, but we give from the *Birmingham Post* a sketch that will help to make clear the nature of an undertaking at present in its early stages in Carr's lane which may arouse considerable interest.

This novelty has been described as "suspending a building"; but the term is hardly correct, and disappointment has been expressed

back is 44 ft. deep. At the A cantilever the building overhangs the tunnel 25 feet, which leaves only nineteen feet, resting upon a solid foundation. This cantilever supports 270 tons of the building, and as the front or over-hanging part is so much longer than the other, a gigantic weight in the form of a concrete block some 16 ft. by 15 ft., and weighing 160 tons, is suspended from the short end of the cantilever by steel rods 22 ft. long. The cantilever, B, supports the greatest load, 375 tons, and overhangs 21 ft. C supports 360 tons and overhangs 14 ft, the overhang gradually diminishing to 4 ft at F.

The drawing will convey an idea of the entire arrangement and the substantial nature of the building to be erected, although it is not entirely accurate with regard to the cantilever A, which for clearness is shown below the roadway, while, as a matter of fact, it will be some 2 ft. above the footpath; and from it will really be "suspended" the paved carriage way that leads to the rear of the building. By this ingenious device will at last be utilized a site which has long been a puzzle to many. The larger cantilevers are at present being placed in position, and when once the ground line is reached and the mystery of the foundations covered in the curious features of the building will be entirely lost to sight.—*Copy of drawing from the Illustrated Carpenter and Builder, London, England.*

THE KEELY MOTOR UP TO DATE.

PROCEEDINGS OF ENGINEERS' CLUB OF PHILADELPHIA.

BY E. J. SCOTT, ACTIVE MEMBER.



HE Keely motor has been a matter of greater or less public interest for twenty-five years, and yet there is now as little general knowledge of what it is as when it was first announced. Probably no other enterprise making as little actual progress was ever kept alive so long. Certainly no other enterprise ever enlisted so much capital without showing more substantial reasons for investing it.

Keely has carefully guarded his secret; even the courts could not extract it from him. In fact the secret constituted the entire property of which Keely was the treasurer, and even the company formed to exploit his supposed invention, has never been able to wrest it from him. Any effort on the part of the stockholders to do so has been met with the objection that Keely controlled the situation and the value of their property depended upon keeping on good terms with him.

Many investigators, scientific and otherwise, have seen his experiments; United States Government officials and experts have witnessed them; capitalists, with millions at their disposal, have sought to control his inventions, yet there has always been an unreadiness on the part of the inventor to do anything practical; he was always just within reach of the goal, but never got there. He is now over seventy years of age, and the possibilities of his secret dying with him have aroused those who have supplied him with funds to the desirability of having him communicate his knowledge to someone who could continue his work.

With this idea, Mrs. Bloomfield H. Moore, who has for many years been his staunch supporter through evil and good report, and who, with Keely, controls the enterprise, made an effort to find a suitable person to fill that role. Well-known scientists who were invited to investigate the subject, courteously declined. This was not surprising, for no person had even been given a fair opportunity to observe the operation of Keely's apparatus, and it was a mere waste of time to visit his workshop.

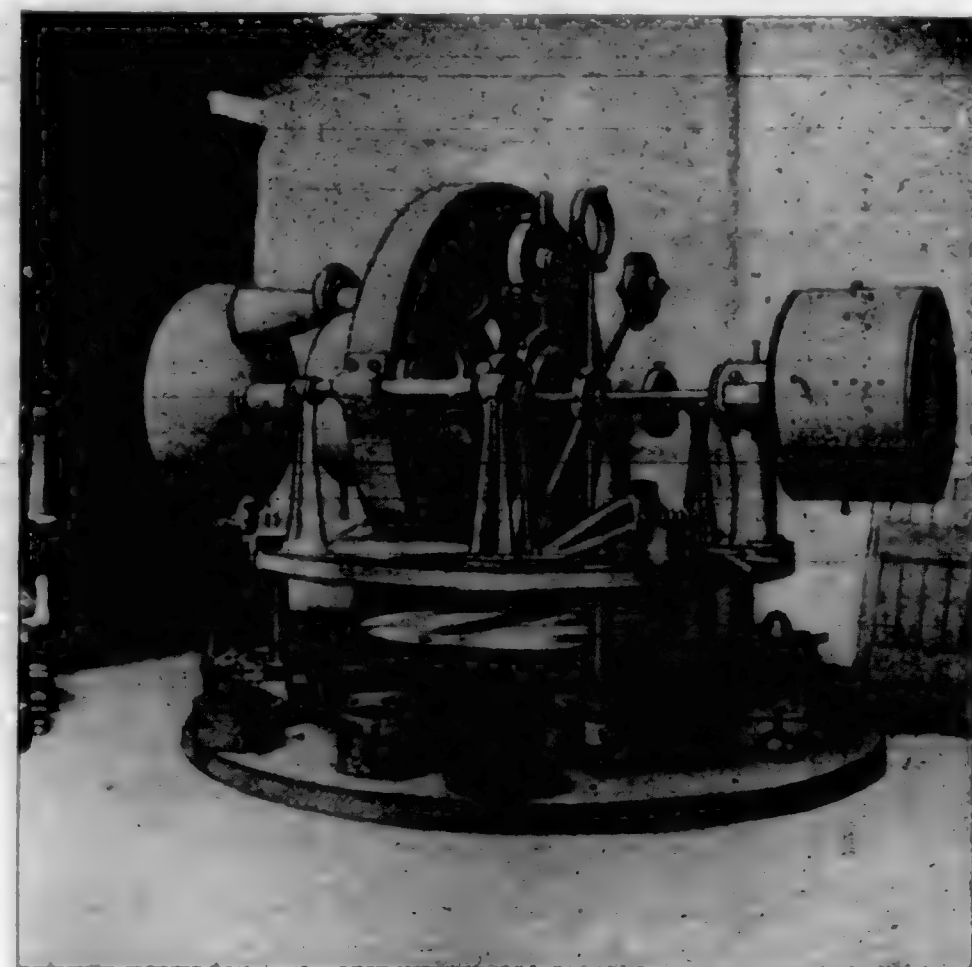
In the fall of 1895, Mrs. Moore, who had but a few weeks before returned from Europe, where she had resided for many years, asked Mr. E. A. Scott to make a visit with her to Mr. Keely's laboratory. She was desirous that someone qualified to speak should see enough of what Keely had done to be able to say that he had discovered a force hitherto unknown, and that he had, to some extent at least, succeeded in harnessing it. Mr. Scott had interviewed Keely on the subject in 1894, and was familiar with the results of former attempts to discover the secrets of Keely's laboratory, which had all been negative because of lack of suitable facilities for observation. He was also familiar with the views of the Government experts who witnessed some experiments made by Keely at Fort Lafayette in 1886.

The visit was made November 9, 1897, and the afternoon of that day was pleasantly spent with Keely at his workshop. The impression which the inventor made upon his visitor,

which the latter published at the time in a semi-serious article, is given here in a brief extract from that article:

"John W. Keely is sixty-eight years old, although he looks much younger. He is a large, powerfully built man, with a large head, square shaven jaws, with heavy, dark side-whiskers, tinged with gray, and dark eyes which move rapidly. His movements are nervously quick and his speech is extremely rapid, as though it could not catch up with his thought. He impresses one with the belief that he is absorbed in what he calls his life study, that time is short, and that every nerve must be strained to accomplish practical results while life remains."

A very little conversation satisfied the visitor that he must abandon all preconceived notions of natural philosophy if he thought to make any progress in the study of the new power. The laws of gravity, as laid down by Newton; magnetism, as formulated by Faraday, Henry and others; light and heat, as outlined by Lord Kelvin, and the correlation of forces had to give way to this mysterious force, which practically creates something out of nothing, if we may unquestionably adopt the discoverer's theories.



AERIAL PROPELLER.

At this first interview enough was seen to satisfy the visitor that some, at least, of the experiments witnessed did not depend for their explanation upon any hitherto unknown force. He did not then, nor at any other time, give Keely any reason to think that he did not implicitly believe that the moving force was "Apergy," the name given to this as yet undemonstrated force. Among the experiments witnessed on that first afternoon were (1) The continuing vibration of a short bar of steel which had been "vitalized." (2) The suspension of a heavy weight by simple contact with two small strips of steel, and dropping it by striking a tuning-fork. (3) The levitation experiment, by which heavy weights rise and fall in water in response to notes produced on certain pitches. (4) The constant revolution of a small brass wheel after having been put in step with the vibratory force called "Apergy."

To be continued.

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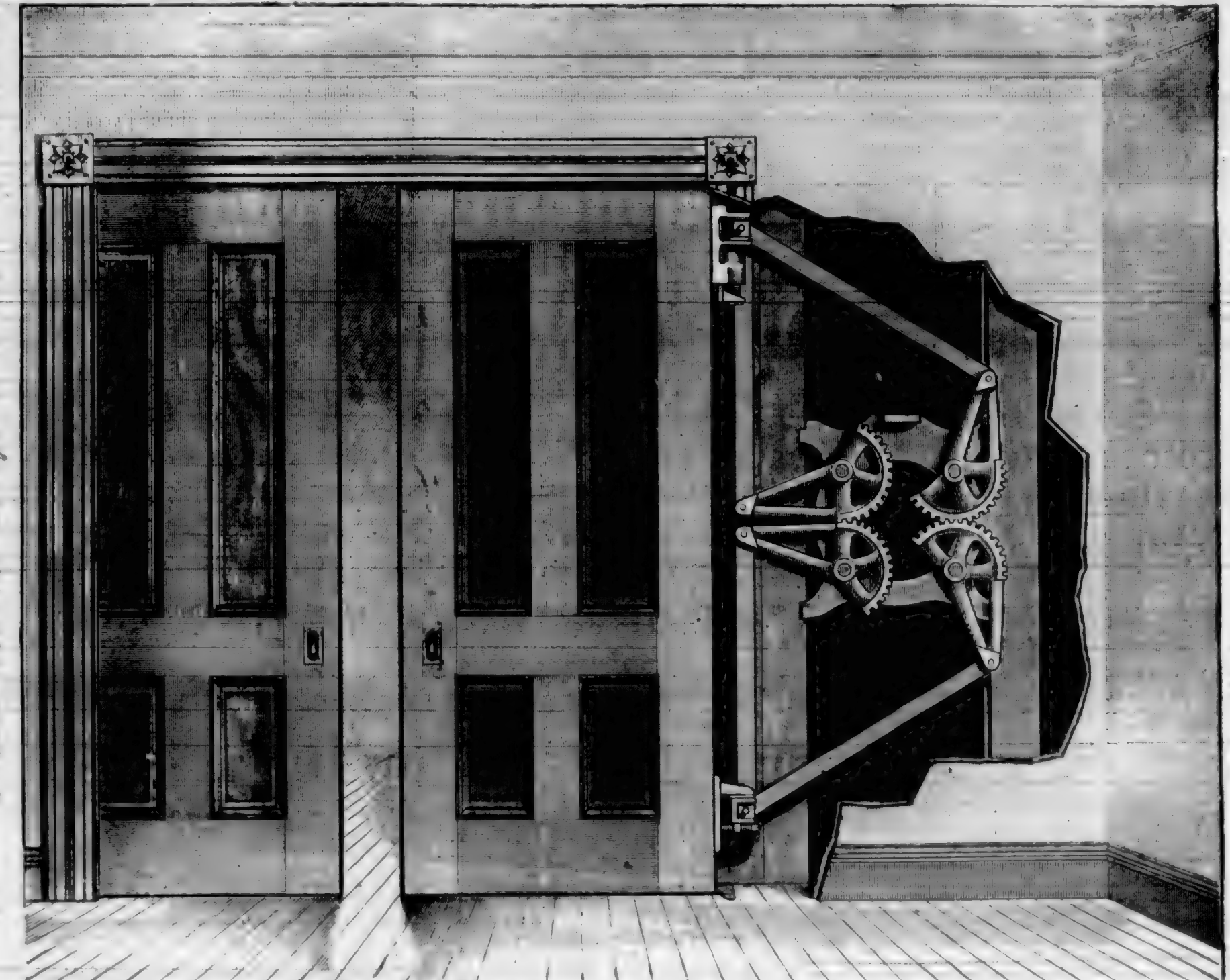
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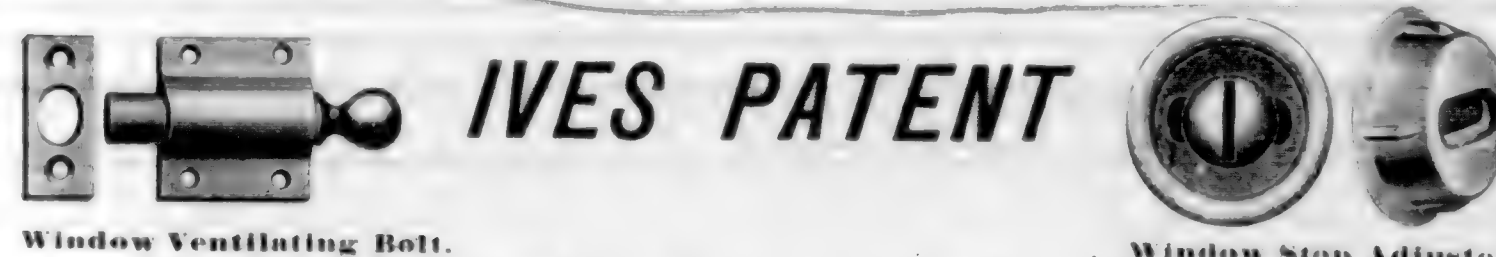
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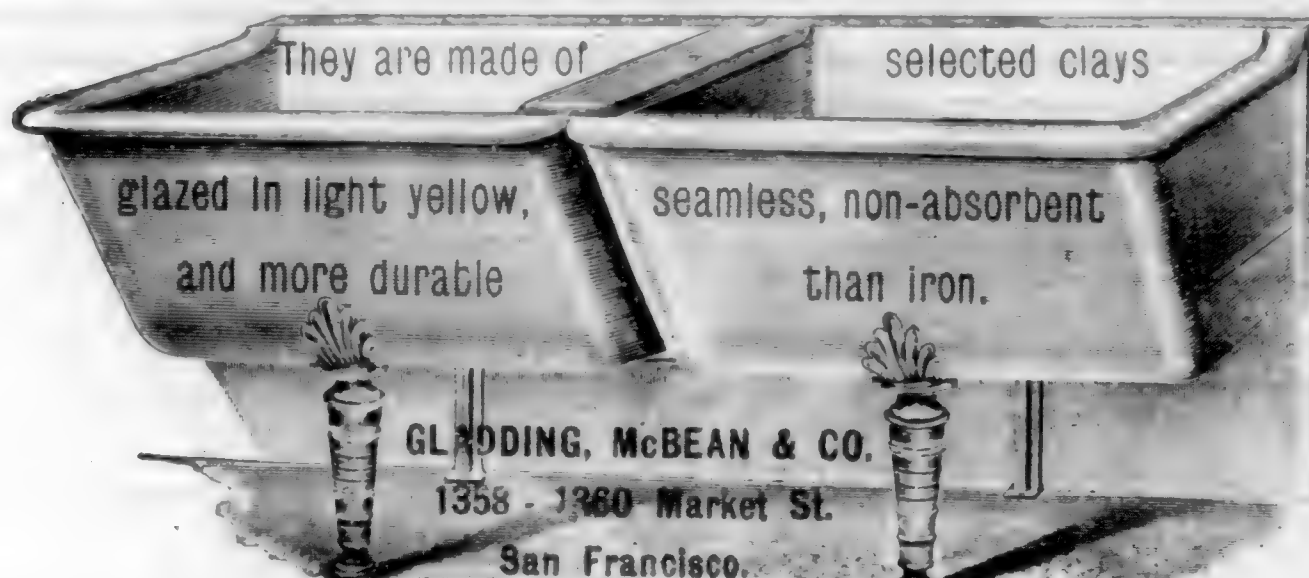
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J. R. Tobin,	Gladding, McBean & Co.; architectural terra cotta.	Paraffine Paint Co.; roofers, building paper.	144
COMMITTEES:	Golden West Iron Works; Dyer Bros.	Patent Brick Co.; brick.	172
ROOFS:	Goodman, Geo.; artificial stone, etc.	Pearce & Batchelor; masons and builders.	122
J. R. Tobin,	Grannis, J. G. & Co.; steam heating, etc.	Peterson Brick Co.; original red pressed brick.	98
R. Herring,	Gray Bros.; artificial stone and concrete work.	Petersen, H. M. & Co.; concrete.	245
MEMBERSHIP:	Griese, Carl; artificial stone and concrete work.	Phlogst, F. L.; hardwood.	76
T. McLaughlin,	Hammond, Philip; metal roofers.	Plense, Henry; mason and builder.	299
G. V. Daniels,	Hansen, A.; planing mill.	Pool, Jas. R.; house mover and raiser.	217
ARBITRATION:	Hansen, F. L.; contractor and builder.	Ree, James; stone contractor.	156
Jas. A. Wilson,	Hausen, M. & Co.; planing mill.	Rickson Iron Works; contractors for stone work.	175
D. McPhee,	Harmann Lumber Co.; lumber.	Reichley Geo.; contractor and builder.	109
Gus V. Daniels,	Harris & Jones; Lumber Dealers.	Reigle & Jamieson; machine white washing.	240
D. McPhee,	Haustein, H.; tiles.	Reinhold Brick Co.; pressed stock and common	375
Box No.	Heidt, W.; cornice works.	Richardson & Gale; masons and builders.	328
123	Henzel, Ed. F. & Co.; electricians.	Richmuller, Geo.; door opener.	355
270	Herring, R.; mill work.	Riley John P.; masons and builders.	329
170	Hille, Wm.; cornice works.	Ringrose, R.; mason and builder.	25
326	Hinds, Ed. B. & Co.; patent blinds.	Robinson & Gillespie; contractors and builders.	11
138	Hobson, R. V.; painter.	Rocklin Granite & Granite Work.	96
236	Hock, T. & Son; masons and builders.	Rosenbaum, Fr. H.; glass.	219
11	Hoffman, V.; mason and builder.	Ruffino & Bianchi; marble.	219
75	Holmes, H. T.; Lime Co.; lime, cement, etc.	Sacramento Transportation Co.; patents and stock	352
241	Hooper, C. A. & Co.; lumber.	S. F. Lime & Mortar Co. C. Bennett.	246
241	Huber, Wellington; bay door, Cor. lumber.	San Francisco Lumber Co.	157
77	Harburt, R. P.; builder.	San Francisco Novelty and Planing Works.	12
34	Iskelheimer, Samuel & Bro.; plumbers.	San Francisco Planing Mill; Wm. Crocker.	12
360	Ingerson & Goss; contractors and builders.	San Joaquin Brick Co.; brick.	228
150	Jacks, Henry; contractor and builder.	San Jose Brick Co.; brick.	5
36	Jackson, P. H. & Co.; illuminating tiles.	Saunders, J. S. W.; contractor and builder.	250
240	Jackson, W. E.; curbing.	Schroeder, Wm.; art glass.	63
28	Jesse, Geo. H.; stair builder.	Smith & Van Arsdale Lumber Co.	163
148	Jordan D. & Son; masons and builders.	Sessions, M. P.	384
296	Joshua Hendy Machine Works.	Smith, J. W.; carpenter.	71
255	Judson Mfg. Co.	Smith & Young; building supplies.	374
63	Kentling, M.; Artificial Stone.	Smith & Quimby; street contractors.	101
225	Kendall, J.; Pacific Coast Lumber and Mill Co.	Snell, E. L.; lime and plaster.	372
300	Keefe, J. H.; painter and decorator.	Snook, W. S. & Son; plumbers.	372
105	Kent, S. H.; contractor and builder.	Soule Bros.; carpenters.	61
282	Kern, P. W.; contractor and builder.	Steiger, A.; stone architectural terra cotta.	184
10	Kittredge, E. H. & Co.; sash, doors and blinds.	Stevens, F. M.; patent chimneys.	297
34	Knox & Cook; contractors and builders.	Stockton Brick & Terra Cotta Co.	297
62	Kuss, P. N.; painter, decorator and wood finisher.	Stratton, Jno. S.; house mover.	382
817	Lang, Geo. H.; mason and builder.	Sullivan, J. E.; painter and decorator.	1
41	Larsen, H. H.; mason and builder.	Sullivan, Tim; carpenter.	63
280	Leahy, D.; plasterer.	Sullivan, M. F.; grading and teaming.	148
91	Leahy, D.; plasterer.	Sweeney, Daniel; carpenter.	325
114	Leahy, D.; plasterer.	Sweeney, T. C.; plumber.	135
24	Leahy, D.; plasterer.	Tacoma and Roche Harbor Lime Co.	289
90	Leahy, D.; plasterer.	Tay, Geo. H. Co.; plumbers supplies.	321
389	Leahy, D.; plasterer.	Tobin, J. R.; plasterer.	173
12	Leahy, D.; plasterer.	Towle & Broadwell.	296
313	Leahy, D.; plasterer.	Towler, John; contractor and builder.	296
143	Leahy, D.; plasterer.	Tupper, O. M.; lime.	291
218	Leahy, D.; plasterer.	Tuttle, John; teamster, plasterers' supplies.	79
35	Leahy, D.; plasterer.	Union Lumber Co.; lumber.	335
42	Leahy, D.; plasterer.	Vermont Marble Co.	284
283	Leahy, D.; plasterer.	Vulcan Iron Works.	284
131	Leahy, D.; plasterer.	Wagner, Henry F.; painting and decorator.	312
139	Leahy, D.; plasterer.	Wagner, J. Ford; mason and builder.	181
34	Leahy, D.; plasterer.	Walker, George H.; carpenter.	267
121	Leahy, D.; plasterer.	Warren, C. A.; grading.	272
177	Leahy, D.; plasterer.	Washington Street Planing Mills.	48
202	Leahy, D.; plasterer.	Waterhouse, C. J.	78
64	Leahy, D.; plasterer.	Watson, W. C.; plasterer.	98
232	Leahy, D.; plasterer.	Western Granite & Marble Co.	316
72	Leahy, D.; plasterer.	Western Iron Works.	171
180	Leahy, D.; plasterer.	White Bros.; carpenters.	257
58	Leahy, D.; plasterer.	White Bros.; hardwood lumber.	145
80	Leahy, D.; plasterer.	White, H.; mason and builder.	60
128	Leahy, D.; plasterer.	Williams, F. A.; contractor and builder.	176
53	Leahy, D.; plasterer.	Wilson, Bros. & Co.; lumber.	334
254	Leahy, D.; plasterer.	Wilson, W. F.; plumber.	228
		Wilkie, Andrew; planing mill.	365
		Wilkie, Andrew, Jr.	125
		Worrel, C. R.; mason and builder.	2
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BUILDING NEWS.

Second and Mission. Cabinet work; o. Wells, Fargo & Co.; a. Percy & Hamilton; c. W. Taint; R. M. Veitch signed, June 1; filed, June 2; cost \$14,800. Rough carpenter work, etc.; c. W. T. and R. M. Veitch; cost \$4,500. Plastering, etc.; c. C. C. Morehouse; cost \$800. Marble and mosaic tiling; c. Ruffalo & Bianchi; cost \$650.

Seventh and Townsend. Excavations, etc., for 2-story brick; o. J. L. Flood and J. W. Mackay; a. Percy & Hamilton; c. Cushing, Wetmore Co.; signed, May 27; filed, May 28; cost \$400. Carpentry, roofing, etc.; c. F. H. Moscov; cost \$28,574. Brick and iron work; c. Miller & Beck; cost \$12,835. Plumbing, etc.; c. W. F. Wilson; cost \$2420.

Sixth near Clement. Cottage; o. Alexander W. McDonald; c. W. Horstmeier & Co; cost \$3,125.

Taylor near Broadway. All work except plumbing, etc.; c. W. J. Gray; a. Martens & Coffey; c. C. Schmitt; signed, June 2; filed, June 8; cost \$150. Plumbing, etc.; c. H. Ernst; cost \$90.

Twentieth near Guerrero. To build; o. Mrs. Joseph Muller; a. T. J. Welsh; cost \$3197.

Third near Stevenson. Carpentry work, etc.; o. D. Kell; a. Edward Swaine; c. John W. Hensbrough; John M. Robertson; signed, May 28; filed, June 1; cost \$28,000. Plumbing, etc.; c. W. F. Wilson; cost \$2190.

Union and Davidson. Carpentry, etc.; o. Mrs. E. G. Baldwin; a. Tharp & Holmes; c. Moore and Cameron; cost \$6373.

Union near Hyde. To build; o. Dennis Collins; a. W. O. Peterson; c. Wren and Peterson; cost \$3000. Concrete work; c. C. T. McGuire and Co; cost \$830.

Valencia near Hermann. Additions and alterations; o. Julia A. Moraghan; a. James Wolfe; c. Blanchard and McKenzie; cost \$848. Painting, etc.; c. Kuss and Storz; cost \$175. Plumbing, etc.; c. J. Siebert; cost \$1135.

Van Ness Ave. and Post. Alterations; o. Mrs. A. E. Hecht; a. J. E. Kraft; c. S. C. Murray; cost \$689.

Vallejo near Pierce. To build; o. Mrs. F. M. Herlihy; a. G. Everett; c. J. E. Bundy; signed May 27; filed, May 31; cost \$3238.

Walnut Ave. and Octavia. To build; o. Mrs. Sarah M. Morris; a. Sullivan and Kohlberg; c. Peter Erickson; cost \$12,100. Gas fitting, etc.; c. Leckelheimer Bros; cost \$199.

Washington near Walnut. Concrete work; o. James M. Allen; a. W. F. Smith; c. Carl Greiser; cost \$2175. Carpenter work; c. Thos. H. Day and Son; cost \$8156. Plumbing; c. James and Wm. Shepard; cost \$1400.

BERKELEY

Bancroft Way and Dana. Church; o. First Unitarian Church; a. A. C. Schwienfuth; c. Kidder and Cooper; cost \$4065.

Hilllegass property lot 15. To build; o. Jane Birdsall; a. Cunningham Bros; c. B. C. Allen; cost \$2978.50.

BUILDING NEWS.

Plans for a \$5000 addition to the State University, to be used as a Mining Laboratory, have been prepared by architect Van Treas.

DECOTA

Two-story brick. Owner, Masonic Orphans Home; a. W. H. Little; c. R. P. Hurlbut; signed, June 2; filed, June 3; cost \$16,300.

EAST OAKLAND

East 18th. To build; o. C. H. King; a. W. J. Mathews; c. C. Christensen; signed, June 13; filed, June 14; cost \$9897.

Ninth Ave. near Clinton. Wood and iron; o. Mrs. Mary R. Smith; a. W. J. Mathews; c. F. W. Knight; cost \$2,88.

HAYWARDS.

Main near St. Johns. To build; o. H. and Emma Reimers; a. J. L. Wellby; c. John H. Haar; cost \$4836.

LIVERMORE

Olea Vista Tract. Cottage; o. Marie T. Mel; c. A. R. Donke, Jr; cost \$760.

Olea Vista Tract. Gate; o. Phebe A. Hearst by F. Clark; a. Frank S. van Trees; c. Williams Bros; cost \$1650. Machinery, etc; engineers, Cobb and Hesselmeier; cost \$1855.

OAKLAND

Apex near Grove. To build; o. Marcel Lemer; c. W. Hutson; cost \$3075.

Webster near 14th. Alterations and additions; o. Mrs. D. H. Ward; a. Tharp & Holmes; c. Z. O. Field; cost \$2748.

Thirteenth near Washington. Three-story brick; o. E. R. Turt; a. F. D. Voorhees; c. J. C. Caldwell; cost \$7420.

Jackson and Lake. Re-modelling and additions; o. M. W. Kaies; a. J. M. Curtis; c. W. T. Veitch & Bro; cost \$7000.

LOS ANGELES

Interior store fittings, etc. Owner Coulter Dry Goods Co; a. John Parkinson; o. Home Mfg. Co; cost \$12,623.

BUILDING NEWS.

Third and Spring. Woodwork; o. estate of Thos. D. Timson; a. Reid Bros; c. Campbell and Pettus; filed, ay 31; cost \$40,454.

Architects McCarthy and Mendel have prepared plans for H. L. Hovey; of an eight room, colonial, two story residence, to be built at Glendale.

Architects Howard and Train are preparing plans for E. S. Rowley; for two story nine room residence, to be built on Menlo avenue.

Architects Bradbeer and Russell are preparing plans for Mrs. W. W. Brooker; of 65 Hope street, of an eight room cottage; on Blaine and Ninth.

Architect Preston is preparing plans for Mr. Rowley two two-stories; on West Twenty-fifth.

Architects Eisen and Hunt have prepared plans for J. M. Elliott and F. A. Gibson, for two cottages at Terminal Island.

Frank Spaulding has secured another church.

The special election to be held in this city is for the purpose of voting on the proposition of incurring a bonded indebtedness of \$100,000 for the acquisition of certain lands, the erection of buildings thereon for fire engines and apparatus.

Milo M. Potter, has just let the contract to Murphy and McLennan, for sixteen more flats to be built on Ninth and Hill.

Architects Bradbeer and Russell are preparing plans for Dr. Jones for two flats to be erected on Olive street.

Architects Greene and Greene, of Pasadena, have prepared plans for W. B. Fay for two-story frame, to be built on South Euclid ave.

Architect C. H. Brinkhoff has prepared plans for H. D. Thomson, of the Thomson-Boyle Co, for a two-story and basement frame residence, stable and carriage house to be built on corner of Bonnie Brae and Sixth streets.

The same architect is also preparing plans for L. W. Lowenthal, a capitalist, for a stone and brick mansion to be erected in Pasadena.

Architect B. B. Bisby is preparing plans for C. J. Fox for a two-story ten room house to be built on north side of Seventh street.

Plans have been drawn for Mrs. Amelia Smead for a two-story frame to be built on west side of Eldon avenue; H. W. Steward is the builder.

Architects Krause and Jenkins are preparing plans for Mrs. Mary R. Conway, for extensive alterations and additions on the corner of Second and Los Angeles streets.

Architect Brinkhoff has prepared plans for residence for G. W. Cox to be built on Orange street.

Plans and Specifications Invited for an Hospital Building.

Public notice is hereby given to architects that competitive plans and specifications for the erection of an hospital building will be received by the Board of Supervisors on MONDAY AFTERNOON, September 12, 1898.

The proposed building to be of modern design and to be constructed of stone or brick, or of both, with all the latest scientific improvements.

The said hospital building to be erected on the lot of land commencing at the most southeasterly corner of a tract of land known as and designated, on the official map of the city and county of San Francisco, as the "Almshouse tract."

The said plans and specifications to be so prepared that the cost of the building shall not exceed in the aggregate the sum of three hundred thousand (\$300,000) dollars.

The architect whose plans are adopted will be appointed architect and superintendent of the building, and will be required to give a good and satisfactory bond to insure the completion and construction of the said building for the amount of the cost as made by the said architect. The architects submitting plans determined by the Board to be second, third and fourth in merit will receive premiums of \$1000, \$750 and \$500 respectively, with the understanding that any features of said plans and specifications which may be considered useful or necessary to be embodied in the plans adopted may be used without further cost of charge.

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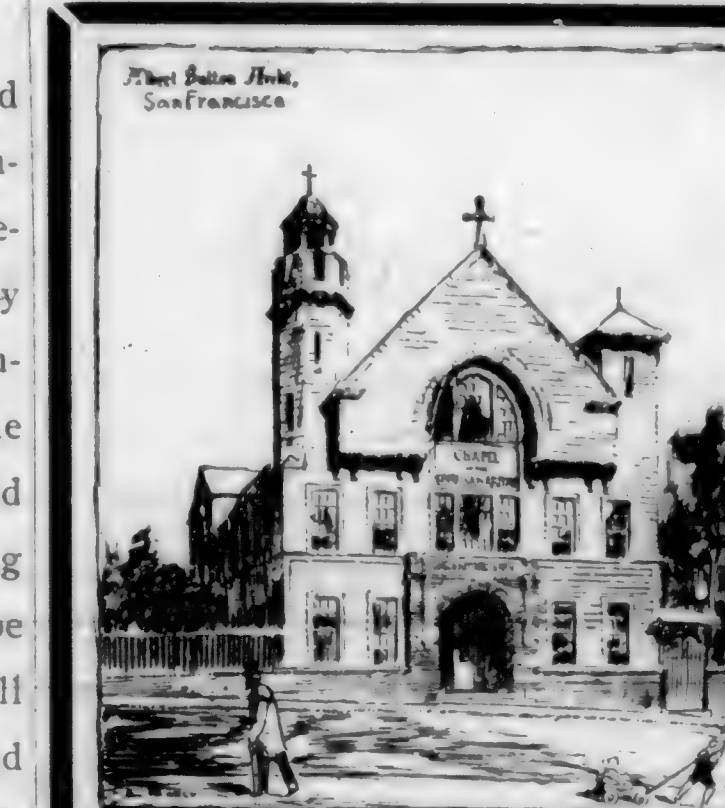
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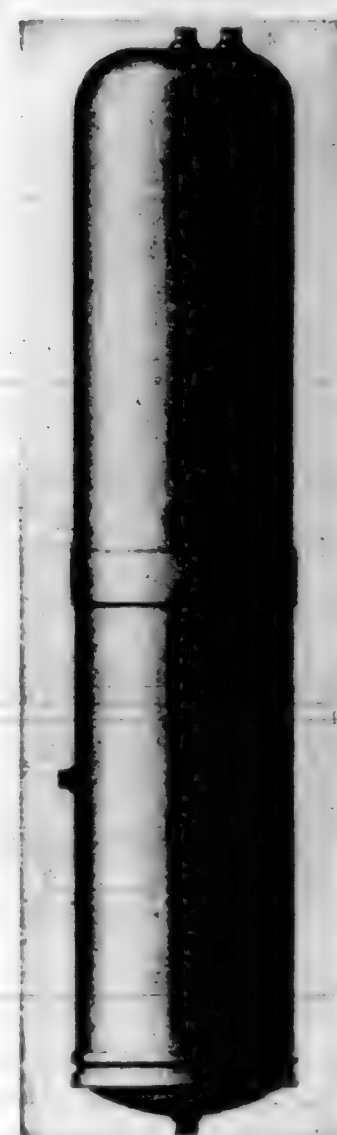
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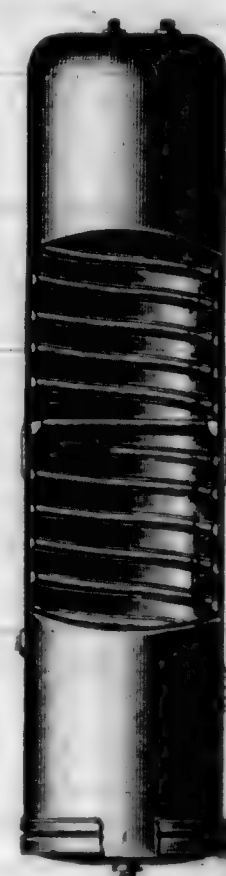
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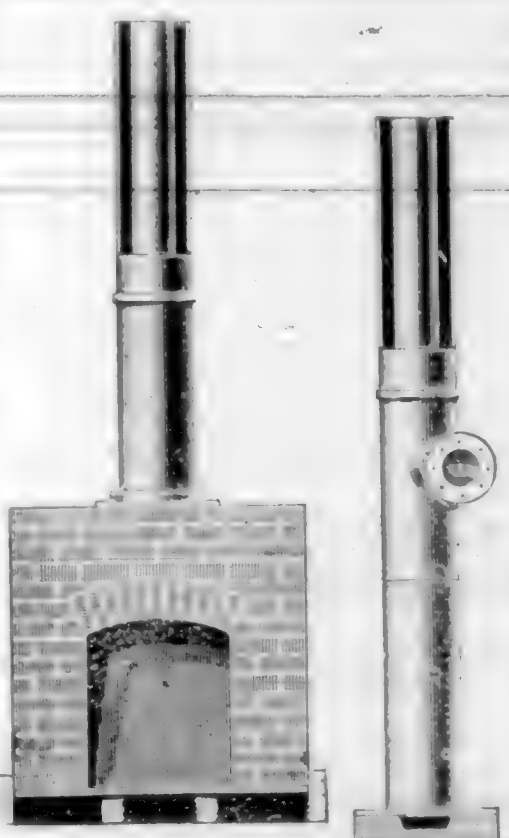
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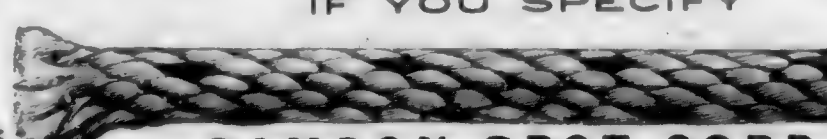
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THE CALIFORNIA ARCHITECT AND BUILDING NEWS

\$3.00 PER YEAR

VOLUME XIX, No. 7.

JULY, 1898.

CONTENTS:

Index to Advertisers.....	V1
The Critic and the Architect.....	71
Cresco Work.....	75
Changing Form of Stone by Pressure.....	76, 77
Illustrations.....	78
Valuable Information Culled From our Exchanges.....	79
The Action of Sea-Water Upon Hydraulic Cements.....	80
Semi-Annual Summary of Building Operations.....	80
Another Building Disaster.....	81
Correspondence.....	81
For Steel Construction.....	82
The Survival of the Fittest.....	82
Cabot's Shingle Stains.....	82
Good Locks.....	83
The Keely Motor Up-To-Date.....	84

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July, 1898.

THE CALIFORNIA ARCHITECT AND BUILDING NEWS.

iii

BUILDING NEWS.

Alms House Tract near Chapel Building. One-story frame library; o. James D. Phelan; a. Curlett & McCaw; c. Z. O. Field; signed, June 21; filed, June 28; cost \$3850.

Broadway and Laguna. Two two-story frames; o. Florence N. Ward; a. Coxhead & Coxhead; c. Hannah Bros; signed, June 30; filed, July 2; cost \$6595.

Bryant near 16th. Cottage; o. J. E. Nieland and wife, Katharina C. Douglass & Co; signed, July 2; filed, July 5; cost \$1200.

Chenery near Palmer. Two one-story cottages; owner and contractor, A. Christensen; cost \$3200.

Commercial near Montgomerys. Repairs to brick building; o. Howard Estate; superintendent, Mr. Smith; cost \$7000.

Clementina near 4th. Two two-story brick building; o. H. E. Holmes & Co; a. Fred B. Wood; c. J. M. and C. B. Abrams; signed, July 1; filed, July 5; cost \$2250.

Crescent Ave. Cottage; o. Fred C. Douglass; c. Erik Boes; signed, July 11; filed, July 13; cost \$1370.

Folsom near 18th. Repairs; o. Klopstock & Co; cost \$1200.

Dehon near 16th. Cottage; o. Aerman Quast; c. Horstmeier & Co; cost \$1345.

First Ave. near Clemon. To build except brick work, painting, etc; o. Samuel McKelvey; c. Ed. Guiney; signed and filed, June 5; cost \$1295.

Fifteenth and De Haro. Alterations and construction; o. Sanitary Reduction Works; a. Thomas J. Welsh; c. G. H. and S. Walker; signed, June 22; filed, 22; cost \$1743.

Fremont near Howard. Two-story brick; o. W. F. Whittier; a. Edward R. Swain; signed, June 20; filed, June 22; cost \$997. Plumbing, etc; c. W. F. Wilson; cost \$2400.

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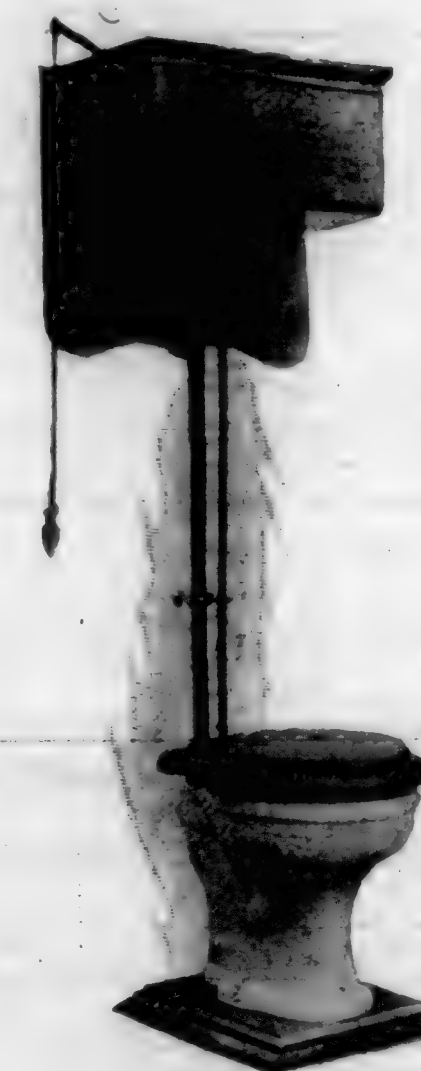
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BUILDING NEWS.

Haigh near Scott. Acceptance of building; o. Charles F. Doehring; a. Sullivan & K. H. Berg; c. C. Kreeker; accepted July 3; last recorded July.

Hayes near Laguna. To build; o. Jas. J. and Mary Silver; a. T. C. Cochrane; c. J. Pavert; signed, June 28; filed, June 30; cost \$6700.

Hyde near Jackson. Two-story frame; o. Thos. E. Dunne; a. A. J. Barnett; c. W. Paterson; signed, July 9; filed, July 11; cost \$4818.

Jackson near Taylor. All work except plumbing; etc; o. Isabella W. Tindal; a. R. H. White; c. J. G. Adams; signed, July 7; filed, July 11; cost \$11,161. Concrete work; etc; o. L. M. Zimmerman; signed, July 7; filed, July 11; cost \$1029. Plumbing; c. G. C. Sweeney; signed, July 7; filed, July 11; cost \$1449. Painting, etc; c. Gus. V. Daniels; signed, July 7; filed, July 11; cost \$1234.

Jeckson No. 2380. Alterations and additions; a. F. A. Van Trees; c. T. O'Connor; signed, June 6; filed, July 11; cost \$2700.

Jones near Lombard. All work except mantels, etc; o. Dennis P. Sullivan; c. Philip Rive; signed, June 28; filed, June 28; cost \$1600.

Jones and Telegraph Ave. To build; o. J. E. Wagner; a. Cunningham Bros; c. Anderson & Stockholm; signed, July 7; filed, July 12; cost \$1200.

Liberty near Church. Two-story frame; o. A. W. Wallace; c. W. A. Hicks; signed, June 28; filed, July 9; cost \$1855.

Market and Hayes. Alterations and additions; o. Bartlett and C. F. Doe; a. Edward R. Swain; c. Robinson & Gillespie; signed, July 6; filed, July 7; cost \$8835.

Mason near Pacific. Alterations and additions; o. Mrs. Annie Drossel; a. Kenitzer & Barth; c. C. Kreeker; signed, June 27; filed, June 28; cost \$1065.

Main near Harrison. Labor to tear down and cart to new location. Post Office building (East of Market street and build tool house; o. J. McArthur; a. J. W. Rowell; c. Moore & Cameron; signed, July 14; filed, July 15; cost \$1250.

Natoma and Russ. To build; o. Theresa Murphy; a. M. J. Welsh; c. A. McDonald; signed, July 11; filed, July 13; cost \$4400.

Ninth Ave. near Clement. All work except plumbing and painting; o. Frank de Courtou; a. W. H. Armitage; c. A. Dahlberg; signed, June 22; filed, June 23; cost \$3290.

Pacific Ave. near B. Elliott Alley. Two-story brick; o. Bartholomew Brignoll; c. D. Straub & Son; signed, June 16; filed, June 24; cost \$8400.

Page near Baker. Carpentry, plastering, etc; o. Louis Hockele; a. Julius E. Kraft; c. Anderson & Greig; signed, July 6; filed, July 9; cost \$3300.

Post and Laguna. Plumbing, sewerage, etc; o. Mrs. Rose Kahn; a. J. J. Laferme; c. Schanz & Grundy; signed and filed, June 27; cost \$1179.

San Bruno Road lot 33, gift map 4. To build; o. Richard and Robert Sternitzky; a. H. Gellfuss; c. W. Horstmeier & Co; signed and filed, July 11; cost \$2600.

Seventh and Mission. Structural iron and steel work; o. United States Government; a. U. S. Architect at Washington; c. Marshall & Co; cost \$154,715.

Second and Miss on. All roofing work; o. Wells, Fargo & Co; a. Percy & Hamilton; c. Paraffine Paint Co; signed, June 30; filed, July 8; cost \$1325.

Second Ave. near Clement. Cottage; o. J. M. Talbert; c. Philip Rive; signed, June 21; filed, June 22; cost \$1775.

Stevenson near 14th. One-story frame; o. Hugh Cavanagh; a. J. T. Kidd; c. Johnson & Secor; signed, June 21; filed, June 24; cost \$1439.

Seventeenth near Castro. To build; o. Mrs. F. R. Mannell; a. M. J. Lyon; c. George Elder; signed, June 18; filed, June 23; cost \$3200.

Sickels Ave. and Sears. Cottage; o. Jas. J. Casserly; c. Douglas & Co; signed, July 11; filed, July 12; cost \$1245.

Stevenson near Ridley. Three-story frame; o. Paul Strickert; a. Salfield & Kohlberg; c. Ph. Schweizer; signed, June 25; filed, June 28; cost \$2905.

Third and Stevenson. Carpentry, mill work, etc; o. F. and A. Baruch; a. Percy & Hamilton; c. D. B. Munroe; signed, June 28; filed, June 30; cost \$13,577. On site, stone and brick work, etc; c. Pencock & Butcher; signed and filed, June 24; cost \$10,600.

Third near Stevenson. Six-story brick and stone; o. Philip and Leah Meyer; a. M. J. Lyon; c. G. H. Moore; signed, June 11; filed, June 28; cost \$13,147.

Third near Stevenson. Electric elevator; o. David Kelt; a. Edward H. Swain; c. W. L. Holman; signed, July 15; filed, July 20; cost \$2240.

Twenty-second near Douglas. Cottage; owner and contractor, Jacob Heyman; cost \$1600.

Union near Webster. To build; o. John Muldoon; a. Shea & Shea; signed, June 20; filed, June 22; cost \$3500.

Webster near Hayes. Alterations; o. Edward Leopold; c. W. R. Grant; signed, June 21; filed, June 23; cost \$1025.

ALAMEDA

Central Ave. near Union. Alterations and additions; o. J. J. Crawford; a. W. H. Lillie; c. C. P. Christensen; signed, July 8; filed, July 14; cost \$4500.

AUBURN

The following work is under construction here. Central California Electric Co. is building a new plant; Bell Electric Co. is building a new plant.

BERKELEY

Addition to Mining laboratory on grounds of University of California; donor, Thebe A. Hearst; a. F. S. Van Trees; c. Chas. and Walter Williams; signed, July 7; filed, July 8; cost \$10,845.

Garber near College Ave. To build; o. Kate, Annie and Bell Forester; a. F. M. May; c. O. G. May & Co; signed, June 11; filed, June 21; cost \$1900.

OAKLAND

Broadway and 13th. Alterations and additions; o. Mrs. Ernestina Delger; a. Kenitzer & Barth; c. Ingerson & Gore; signed and filed, June 29; cost \$10,300.

Knox Park. To build; o. Jas. Coakley; a. W. Kirk; c. P. J. Brophy; signed, June 29; filed, July 2; cost \$2225.

Becketts 2d addition. To build; o. R. P. Bromley; a. A. W. Smith; c. C. M. McGregor; signed and filed, July 11; cost \$1900.

EAST OAKLAND

Marion Tract. Cottage; o. Malinda Woodward; c. A. L. Whitney; signed and filed, July 19; cost \$1367.

Continued on page xii.

The Yale & Towne Mfg. Co.

LOCAL OFFICE:

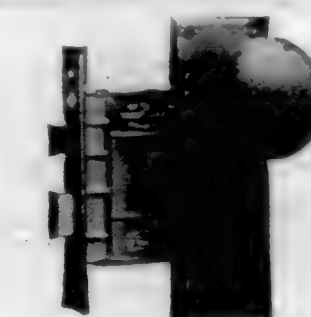
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GENERAL INDEX OF ADVERTISEMENTS.

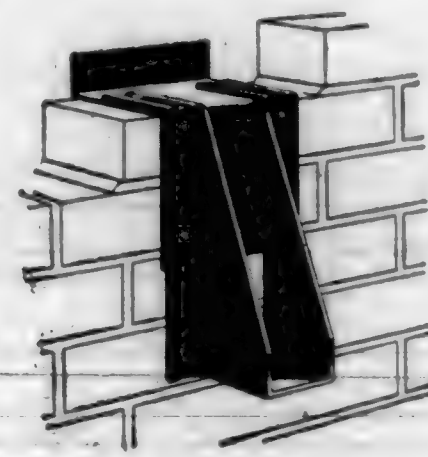
CLASSIFIED INDEX.	CLASSIFIED INDEX.	CLASSIFIED INDEX.
Architects. Goodman, Geo..... xli	Iron Hangers. Van Dorn, Chas. J. Waterhouse, Agent..... xli	Sash Locks. Ives, H. B. & Co..... xli
Artificial Stone. Goodman, Geo..... xli	Iron Works. Western Iron Works..... x	Sewer Pipes. Gladding, McBean & Co..... xli
Boilers. Randolph & Clowes..... xli	Iron Cornices. Cronan, Wm..... xli	Sewer Traps. Ballmore, G. C..... viii
Building Supplies. Smith & Young..... ix	Incandescent Lamps. General Electric Co..... xli	Sash Lines. Samson Cordage Works..... xvi
Building and Loan Assn. Gunsburger, Emil..... xv	Lumber. Scott and Van Arsdale..... xli	Shingle Stains. (Cabots)—C. J. Waterhouse—Agent..... xli
Brick Preservative. Cabot's..... xli	Mantles Tiles, Etc. Montague & Co., W. W..... xli	Sidewalk Lights. P. H. Jackson & Co..... xli
Cement Trays. Bradley, Bros..... viii	Metal Lath. Western Expanded Metal Lath and Fire Proofing Co..... iv	Sliding Door Hanger. Dunham, Carrigan & Hayden..... ix
Chimneys Patent. Clawson..... xli	Mortar Color. Cabot's Mortar Color..... xli	Stone. Raymond Grady Co..... v
Door Opener. G. Rischmuller..... viii	Paint. L. R. Butler and Co..... vii	Terra Cotta. Gladding, McBean & Co..... xli
Engineers. Tilton, Chas. S..... xli	Paraffine Paint Co. Fuller & Co., W. P. & Co..... xli	Tin Roofing. N. & G. Taylor Co..... ii
Filters. Rapid Safety Filter Co..... x	Paper. Zellerbach & Sons..... viii	University. Harvard..... vi
Furniture and Upholstery. Bateman, W..... xv	Plaster. Lucas & Co..... xli	Ventilators. N. & G. Taylor Co..... ii
Hardware. Yale & Towne Lock Co..... v	Plumbers and Gasfitters. Hobbs, W. D..... xli	Water Closets. John Douglas Company..... iii
Heating and Ventilating. W. Morgan & Co..... xli	Wood Preservative. Cabot's..... xli	Window Cord. Samson Cordage Works..... xvi



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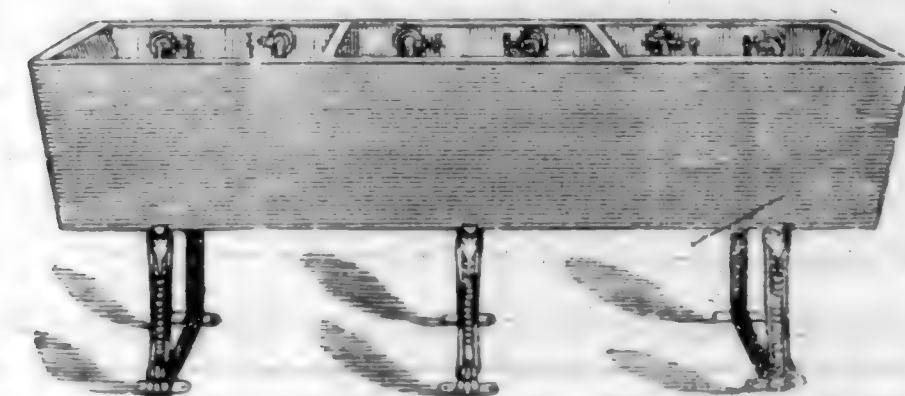
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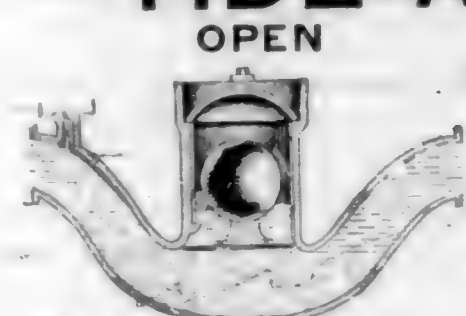
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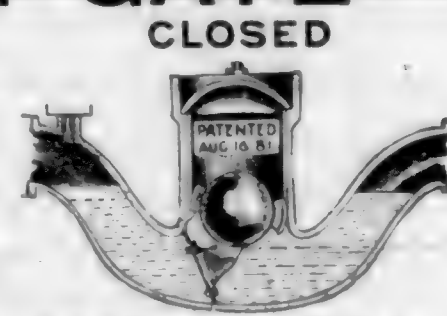
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VOLUME XIX.

JULY 20th, 1898.

NUMBER 7.

A MONTHLY JOURNAL DEVOTED TO THE ARCHITECTURAL INTERESTS OF THE PACIFIC COAST.



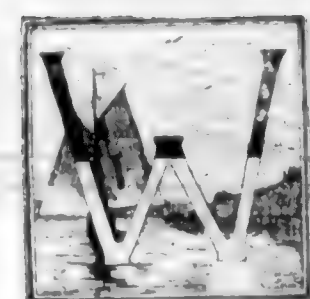
ON U. S. Grant in the capacity of an aspirant for the Senatorship from California in presenting his views on public questions to the people of this State comes out boldly as an advocate of "Expansion" as the true future course of the nation.

Of local benefits to be derived by such a national policy Mr. Grant expresses himself as follows:

"It is my belief that California, and indeed the nation, stands at the threshold of a new and most promising era. The national tendency toward expansion must benefit the West to an extent beyond all our calculations. We have before us a struggle and a hard struggle. This State must

control and must be supreme on this Western coast, and to California must come the vast trade that will properly belong to it, with the new doctrine of expansion. The Northwest will enter the contest for the trade which is to come from the Orient and the isles of the sea. The importance of close and intelligent attention to this subject seems to me to be of the highest importance. Our share of this trade, the definition of our status with respect to it, must be settled early after the present war ceases."

Here at least there will be common ground where the unity of interests will have so much in common and, so much in unity, that the combined forces shall be practically irresistible, and we of the far West should see to it that this policy of "expansion" become irrepressible.



WE HAVE published the following communication from Mr. B. J. S. Cahill relative to a notice appearing in the *Architectural Review*, Vol. IV. No. VII. The critique is undoubtedly an unjust one and well merits a reply. The architect explains that stress of work did not permit his giving the subject his attention earlier. — EDITOR.

In discussing the above alternate designs for a church appearing in outline transcript form in the *CALIFORNIA ARCHITECT* the critic of the *Architectural Review* solemnly delivers himself of the following announcement—"A church first and foremost should have a certain dignified, religious air, which" he goes on to say with more conviction and less truth "unfortunately this design" (No. 1) "does not possess."

Permit me to parody this profound statement. Any criticism first and foremost should have a certain air of justness and intelligence about it which quite fortunately for me, this criticism does not possess.

For instance, Mr. Critic says, with the only flash of dis-



cernment anywhere enlightening his review, "The general style is somewhat Mexican in its treatment," but then instead of logically following up the clue and seeing the architect's development of his theme in this light, he goes on to make the extraordinary assertion that "whatever ornament the edifice has, seems to recall rather the Masonic emblem than the motives usually observed in church architecture." The ornamental motives are Mexican truly enough, but I challenge anyone to show a single feature that has a Masonic rather than an ecclesiastical character.

The next statement of the critic is equally unfortunate. He says "the window openings are unstudied." As a mat-

ter of fact the window openings are very carefully studied throughout with reference equally to their size, portion, detail and diversity.

In the upper stories of the towers they are studiously ornate, those in the Bell tower being studiously different from those in the Baptistry tower. The large central window opening is studiously odd in its Mexican contour and is large because it faces south and illumines the entire church, while the windows in the towers at each side are small and quite studied in their position proclaiming as they frankly do that they light a stairway and not an aisle. That the low position of these front tower windows necessitates a large space of plain wall surface above is a matter that needs neither correction nor apology. Finally the square shaped window openings in the basement story of the towers, are studied in the massive simplicity peculiar to the Spanish American style. They are small, since, where little light is needed little light is shown.

The critic could not of course be supposed to know it, but the problem the architect had to solve was this. A Roman Catholic Church had to be planned to seat 800 people on a restricted lot. The building was to be so designed that it could be roofed in and ready for use at the least possible outlay. At the same time when the towers were added it should not be lacking in appropriate beauty and impressiveness.

This problem of combining Finance with Fine Arts seemed to the architect to be happily solved by adopting a Mexican or Spanish American style. This style permitted a solid simplicity of treatment up to the main roof line. It justified the candid use of stucco where plain wall surfaces occurred in the front as well as on the side. It dispensed with the costly exactions of ordinary classic and easily allowed a logical harmony of treatment to clothe the entire body of the building and so redeem it of the vulgar error of being a mere show facade of stone architecture with the balance of the walls in bare brick. With these advantages in the way of inexpensive simplicity in the first portion built the style demanded that the towers to be built afterwards should exhibit and express the full value and efflorescence of the architectural motives so sternly repressed in the lower parts. To further compensate for the severity of superficies throughout it was thought that the introduction of a red tile roof over aisles and porches would supply a pleasing note of color in contrast with the cream colored stucco and buff sandstone finish found in the main body of the church. Finally, the regulation Spanish green casings sash bars and grilles, and a gilded weather vane, orb and cross surmounting the towers would complete an effect not only admissible, but pictorially suitable and historically appropriate under the blue sky and in the strong sun light of California.

But all this is lost upon the critic whose next objections are that "the grotesque twisted columns of the front porch are not in scale with the entablature above, and the capping of the dome of the left tower is unfortunate in its profile." Though studiously unacademic in its proportions, the twisted columns in question do not merit the epithet grotesque. This porch with its round arches, deep reveals, lean-to tile roof, curved gable and unsophisticated bit of architectural finery in the shape of a rather ornate column and capital, etc., is meant to be in every feature reminiscent of the naïf spirit seen in the early California Missions. Considering all this, the critic's indication of faulty scale, etc., shows more of pedantry than point. Had he known a little more he would

have said a little less. The capping to the dome alluded to was changed to what appears above long before it was seen by the *Review*. It was originally in the form of a Font, such as one may see at Santa Barbara Mission and though rather "bossy" and solid quite defensible as a symbolic finial surmounting the roof over a Baptistry.

Concerning the Masonic rather than the religious air, which the design seems to possess according to the critic, he relates an anecdote: "It is said that Renan once happened to enter a church with a companion, and his friend

desperately *malapropos*. It reminds one forcibly of another story known to most of us. It tells of the man who had just heard a capital gun story, and being at a dinner was dying to recount it. No decent opportunity occurred in the trend of the conversation until a servant let a door close with a mild slam. Instantly our friend started as though he had been shot. "Dear me!" he exclaimed "what a shocking noise, I surely thought there was an explosion!" By the way, *talking about explosions* reminds me of an awfully good gun story I heard the other day," etc, etc.

The critic of the *Review* had evidently just heard this Renan story and on no other provocation than the sight of a triangular cartouche over the main entrance, must drag it in to give point to his paragraph at the expense of the architect's design and reputation. For, the architect whose design for a Catholic Church really reminds one of a Masonic Temple is surely as much an ass as the critic who can't distinguish one from the other.

The article concludes with a reference to Design No. 2: "Strangely enough the alternate elevation is a much more attractive building somewhat recalling the early Italian Gothic and showing a good deal of careful study and feeling. The fault most noticeable is the entire lack of cornice to the main tower; the spire rising from the square shaft without any break whatsoever."

It is of course very deplorable that a spire should be made to behave in that way—without any break whatsoever. And far more strange than that a building committee of a second rate parish should adopt the less expensive of two designs submitted, it is that a critic in a first-class review has not written a single paragraph on these designs without making any "break" whatsoever.

The man who sees Masonic Emblems in Catholic Symbols, and an *Early Italian* character in work that is distinctly *Late German* can of course trace resemblances anywhere in any thing. Were he suddenly confronted with a vision of his own precious organ of comparison he would as likely as not be instantly reminded of a parallel of latitude, or a purple cow, or any old thing.

In conclusion he is recommended to let criticism alone, and to devote his unique faculty to tracing the baffling connection said to exist between the Goodwin Sands and Tenterden Church steeple.

GISSO WORK.

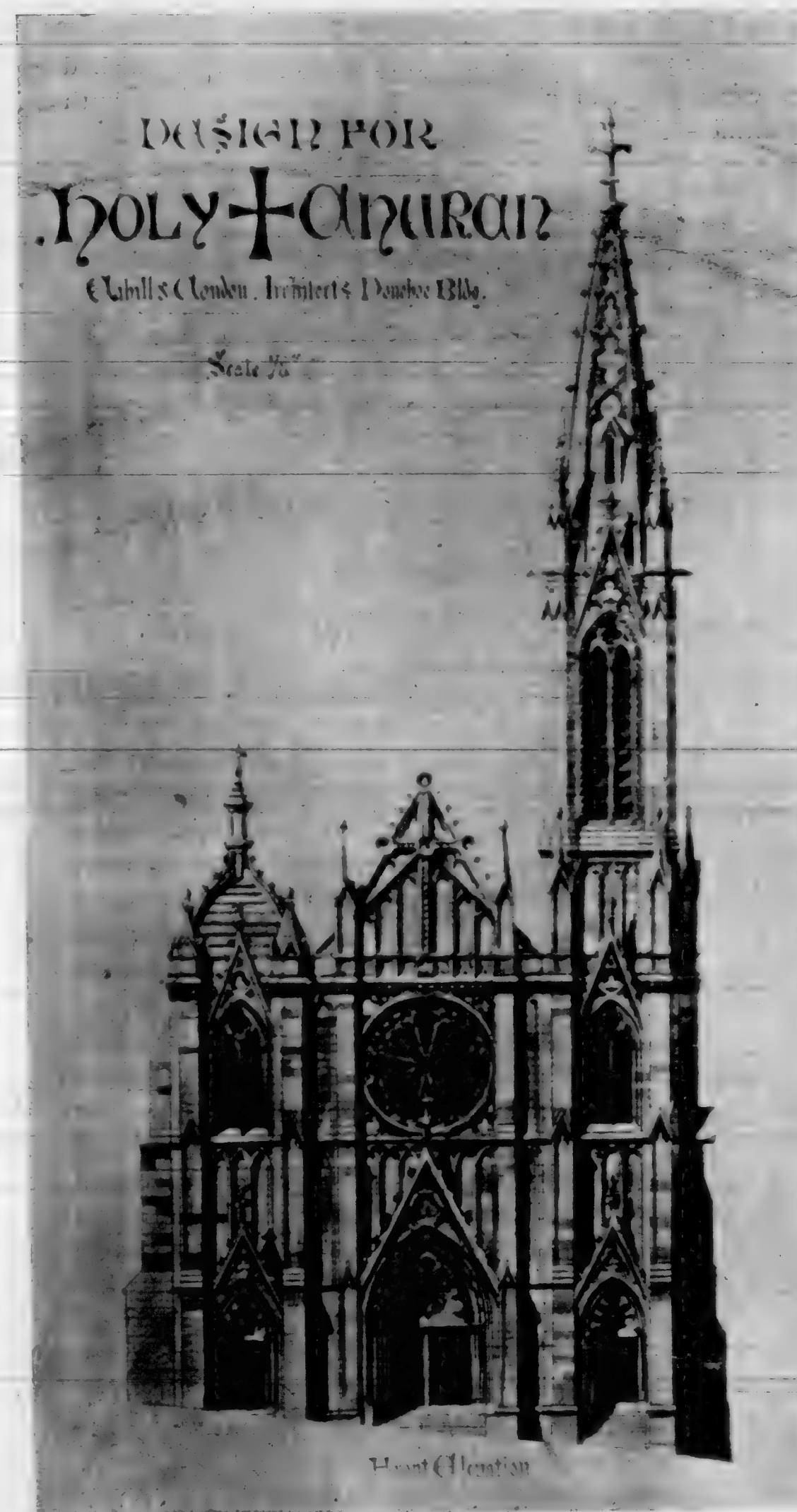


IF ALL the fascinating and interesting work that can be accomplished in the home, gesso work is far away in the lead. Already it is exceedingly fashionable. One sees it wherever one goes, as a mural decoration or as an ornamentation to furniture, and it never fails to add an air

of elegant comfort to the most unpromising surroundings.

It may not be generally known that many of the art schools are introducing this work as a branch of decorative skill, and it may also come as a surprise that many society men and women are deeply interested in this—the most modern of all arts.

Gesso work has certainly many recommendations. In



noticed that he removed his hat. "How is this Renan," he said "I thought that you had nothing to do with Mother Church?" "True" replied Renan, "but we still have a bowing acquaintance." If he had seen the church we have just described, it is a question if even this acquaintance would have been justified." The story itself is good enough but

the first place, next to no tools are required—all that are necessary being a few hog's hair and camel's hair brushes and a palette knife. Then, again, considering the quality of the work that can be turned out, the material is not so costly as to prevent even those whose pockets are slim from taking it up.

Gesso is made of the best glue and the finest plaster of paris. You put the glue in a jar, and melt it in the usual manner, the jar being placed in a saucepan of water, which is kept at nearly boiling point. Then add the plaster, stirring it carefully, and by drawing the saucepan further from the fire keep it below boiling point, so that the gesso may all get thoroughly heated and mixed without boiling.

Another mode of proceeding is to add scraped whiting to the glue, and to use a little resin, especially if very hardened figures in relief are required.

Both these methods are open to the objection that they are difficult to prepare and somewhat tedious, and learners would do well to avail themselves of the specially made composition that can be obtained at any art store. The difficulty in gesso work is the rapid hardening of the materials, but the composition alluded to is specially prepared and dries slowly, so that more care can be given to the modeling, alterations carried out, etc., as it takes quite half an hour to dry.

Beginners will do well to choose a bold design and to be satisfied with a low relief, and as their hands become more skilled they can attempt something more ambitious. The whole secret of success in gesso work lies in going slowly.

Take for a commencement a panel of wood and give it a coat of green metallic color; when dry, size and varnish it. This is called lacquering. On the green groundwork draw your pattern—a simple scroll, or something easy—then with a brush cover the design with the gesso mixture. Let it dry and give it a second coat. Each coat raises the decoration higher, and you can work up and model the design with the brush while the composition is soft. When dry add a few touches of silver and gold to intensify and bring out the design. Japanese papers will be found useful in supplying suitable designs for the early efforts of the gesso worker. They are generally bold and effective, but not complicated. The learner will find that their birds and flowers can be easily copied. The amateur should bear in mind that gesso work lends itself better to large patterns than to small details.

It will take some practice to perfect the worker in the simple form of gesso work described. When he had succeeded thus far he may attempt the more elaborate patterns.

Having made your drawing on paper copy it on the wood, on which you have laid a thin coat of gesso. You now proceed to work the design in relief with the gesso. You will find that you have to use your palette knife pretty freely in rounding your leaves and flowers.

The breast of a bird would look well done in high relief with fibrous gesso. For this you use cotton wool well pulled into little pieces. Each piece is dipped into a composition made of six parts of size to one of linseed oil. You lay the wool on the design and model it into proper shape. It requires a skilful manipulator to do this successfully, and it is perhaps better for the amateur to content himself with the easier method and produce a higher relief by adding one or more coats of the ordinary gesso mixture. You must let the design dry thoroughly and give it a coat of size if you want the colors you use to come out brightly.

For flowers I should use pale shades of red or pink, be-

cause the bird must be gorgeous. His brilliant tail should shine resplendent and this effect is easily attained by using metallic colors. You may on the other hand have a brilliant colored background and make your design in gold and silver. It would be a pity to make a panel all one color, like wood carving, as it would lose so much of the beauty of the spread tail and crest of the bird; but much depends of course on the purpose for which you require it.

There is in fact no end to the variety of changes possible to the successful worker in gesso. He has opportunities for modulation of tone, for happy color blending, for originality of design or for successful reproduction of the works of other decorators. Two prosaic facts should be noted—first, that it is well to pour out on the palette only a little at a time of the metallic paint; and second, that when you have finished your work you can clean your palette and brushes with turpentine.—*New York Herald.*



CHANGING FORM OF STONE BY PRESSURE.

[CONTINUED FROM LAST NUMBER]



THE experiments show that limestone and marble, even when dry and at ordinary temperatures, possess a certain degree of plasticity, and can be made to flow, the movements set up developing many structures characteristic of rocks which have been squeezed or folded in the deeper portions of the earth's crust.

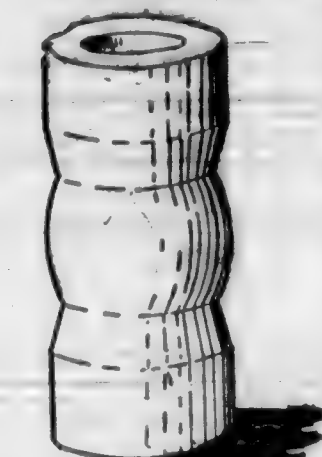
It is now the intention of Professors Adams and Nicholson to reproduce more accurately, if possible, the deformation and cataclastic structures of the interior of the earth. For this purpose they have invented an apparatus capable of generating great heat. With this they propose to surround the iron tube, and, by means of steam and heat, obtain those conditions which surround the plastic marble in the bowels of the earth. It has been shown by geologists that marble and other stone foundations become plastic in proportion to the depth they are found in mother earth. Thus, marble found five hundred feet below the surface of the ground is much less brittle than that found, say, at a depth of one hundred feet. The reason for these different degrees of plasticity consists in the fact that the former is subjected to far greater heat and moisture than the latter. By means of their new contrivance Professors Adams and Nicholson are confident that they can reproduce the conditions that prevail far beneath the surface of the earth, and they are awaiting with confidence the results of their future experiments.

The machinery used in all these experiments was designed



PROF. NICHOLSON

and manufactured at McGill, and its counterpart does not exist elsewhere on this continent. It is largely the work of students, who are thus trained in the principles underlying mechanics and hydraulics. The average pressure employed in moulding the marble is 80,000 pounds to the square inch.



THE CYLINDER AFTER FIRST APPLICATION OF PRESSURE.

This is obtained by a number of hydraulic cylinders, which increases the natural pressure of the water mains—130 pounds to the square inch—to the above astounding proportions.

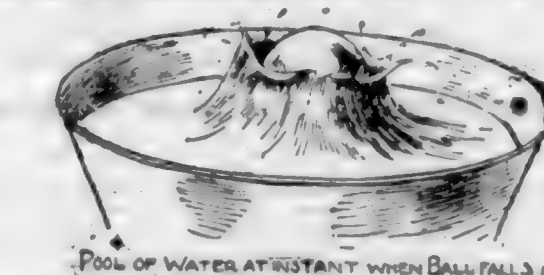
The opinion has been expressed that the experiments suggest a danger from the building of such sky-scrapers as are springing up in our cities. It has been said that if marble, one of the hardest of stones, yields to and becomes plastic under sufficient pressure, then clearly there must be a limit to the height to which one building stone can be heaped upon another in the erection of walls, without incurring the danger of such yielding of the stones of the bottom of the wall or building as will endanger the integrity of a building. For, short of the point at which the stone crumbles, there is apparently a point at which it may slowly change its shape under stress of heavy and long continued pressure.

In reference to the surmise Prof. Nicholson says: "The height of a uniformly thick brick wall required to crush brick work is about one thousand feet, and that of a stone wall to crush either sandstone or limestone about five thousand feet. Long before these heights could be reached the building would have failed from lack of lateral stability under wind pressure, unless the width of base was of similar proportion to the height. Chimneys from five hundred to six hundred feet in height have, it is true, been built, and are still standing, but they have, of course, a regular batter all the way up, reducing the load very much. The crushing pressures assumed by me in my computations on this subject are 800 pounds per square inch for brick work and 4,400 pounds per square inch for sandstone. There is not, therefore, nor can there be any sky-scraper a near approach to the moulding pressures, such as 70,000 to 80,000 pounds per square inch, employed in our experiments at McGill."

Another interesting question on which new light is thrown by this experiment is the perplexing one of the motion of the glaciers. As everybody knows a glacier is in effect a great river of solid ice. It is equally well known that the ice stream flows along its channel, slowly, to be sure, but just as surely as a stream of water. The early students of glaciers doubted this, but numberless careful observations, culminating with the famous ones of Professor Tyndall, have demonstrated the point beyond all controversy. Of course the bed of the ice stream is usually steep, and hence at first sight it seems nothing remarkable that the ice should slide along it. So the famous explorer of the Alps, de Saussure, who was among the first to recognize the motion of glaciers, explained this motion as a mere sliding of the ice. Very soon, however, other observers saw that this simple explanation by no means sufficed, for the most casual observation showed that the channel through

which the glacier moves—its banks or borders—is not usually of uniform width from beginning to end, but, on the contrary, widens and narrows as does the channels of a river. And, like the river of water, this river of ice at all times completely fills its channel, spreading out into lagoons of ice where the channel widens and narrowing into a slender stream as the walls contract. Clearly, then, the ice stream changes its shape just as the stream of water does; yet how is this possible, since ice is a solid, and a very brittle solid at that?

Numberless explanations have been put forward in elucidation of this puzzle, but the one that has seemed to have greatest plausibility and hence has gained greatest currency assumes that the ice in the depths of the glacier is being constantly melted by the pressure of the mass above it, and is constantly recondensed, being molded into new forms during the moment of transition. The justification for this hypothesis is found in the fact which was demonstrated by Professor James Thomson, the brother of Lord Kelvin, that



POOL OF WATER AT INSTANT WHEN BALL FALLS INTO IT.

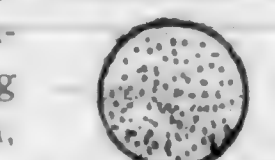
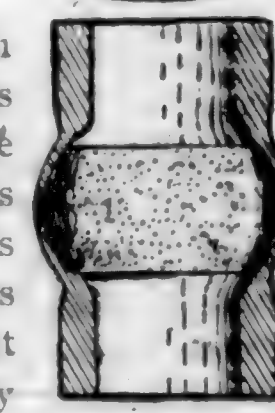
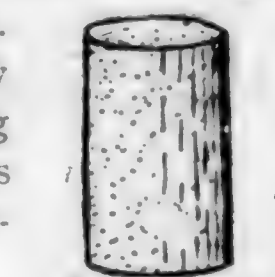


ARMOR PLATE PENETRATED BY CANNON BALL.

pressure, if sufficient, greatly lowers the melting point of ice; if cut into and broken into fragments will recondense into one mass if the parts are kept in contact. It was pointed out by the Scotch geologist and mathematician, Dr. Croll, that the sun's rays, beating upon the surface of the glacier, might penetrate into its transparent depths, and, being retarded at the bottom, might heat the ice at a depth to a temperature above that at the surface and this cause would manifestly act in conjunction with the increased pressure at the bottom of the glacier, to effect the melting of the ice there. At no time, however, would there be any great surplus of heat there and the portions of ice thus melted would be certain to recondense almost instantly, because of the large quantity of heat which is abstracted and rendered latent whenever ice changes into water. But during the instant of transition from ice to water and back to ice again, the particles of the mass might slightly change their form, under influence of pressure and of gravitation; and thus by an endless series of infinitesimal jerks, as it were, the glacier would creep on as it is observed to do.

Now, however, the experiments regarding the mobility of marble put quite a new complexion upon the question of glacial movement. For if it be proved that marble, a substance far harder than ice, and quite as brittle, can be molded by pressure alone into new shape, it seems perfectly plausible that a much less degree of pressure might mold ice into new forms by causing its molecules to slide over one another without the intervention of melting. In this view ice and marble, and, of course, all other solids, are to be regarded as merely very stiff or viscid liquids. Gravitation alone does not suffice to make them flow, as it does more limpid liquids, but when additional force is applied their mobility becomes apparent.

This view, indeed, as applied to such solids as iron and other malleable metals is not new, for the mobility of such solids under pressure, as when hammered, is widely known. A curious experiment recently made by Professor Sinclair



COLUMN BEFORE PRESSURE—CYLINDER IN WHICH COLUMN HAS BEEN REDUCED BY PRESSURE AND HAS BURST IRON SHEET-ING.