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CONSTRUCTION

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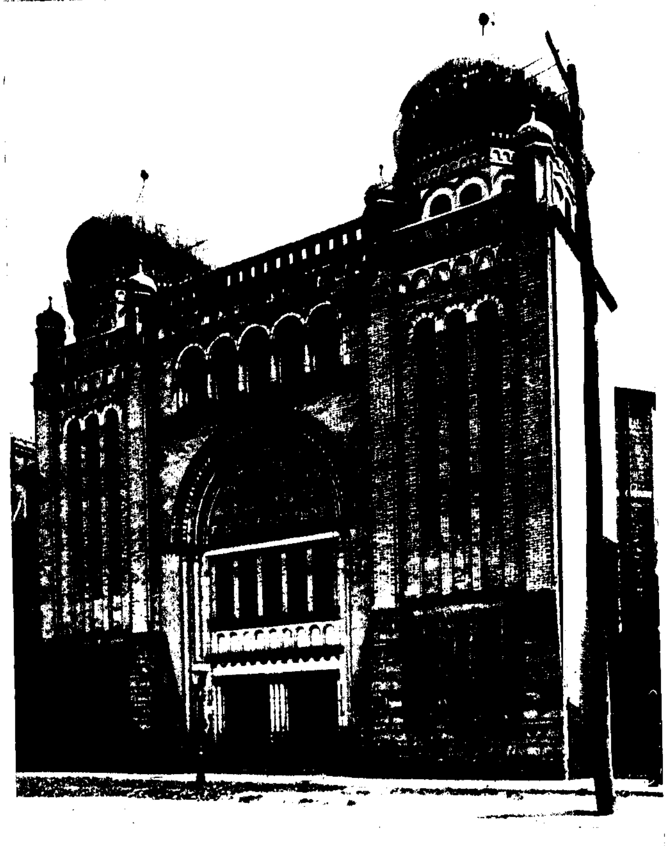

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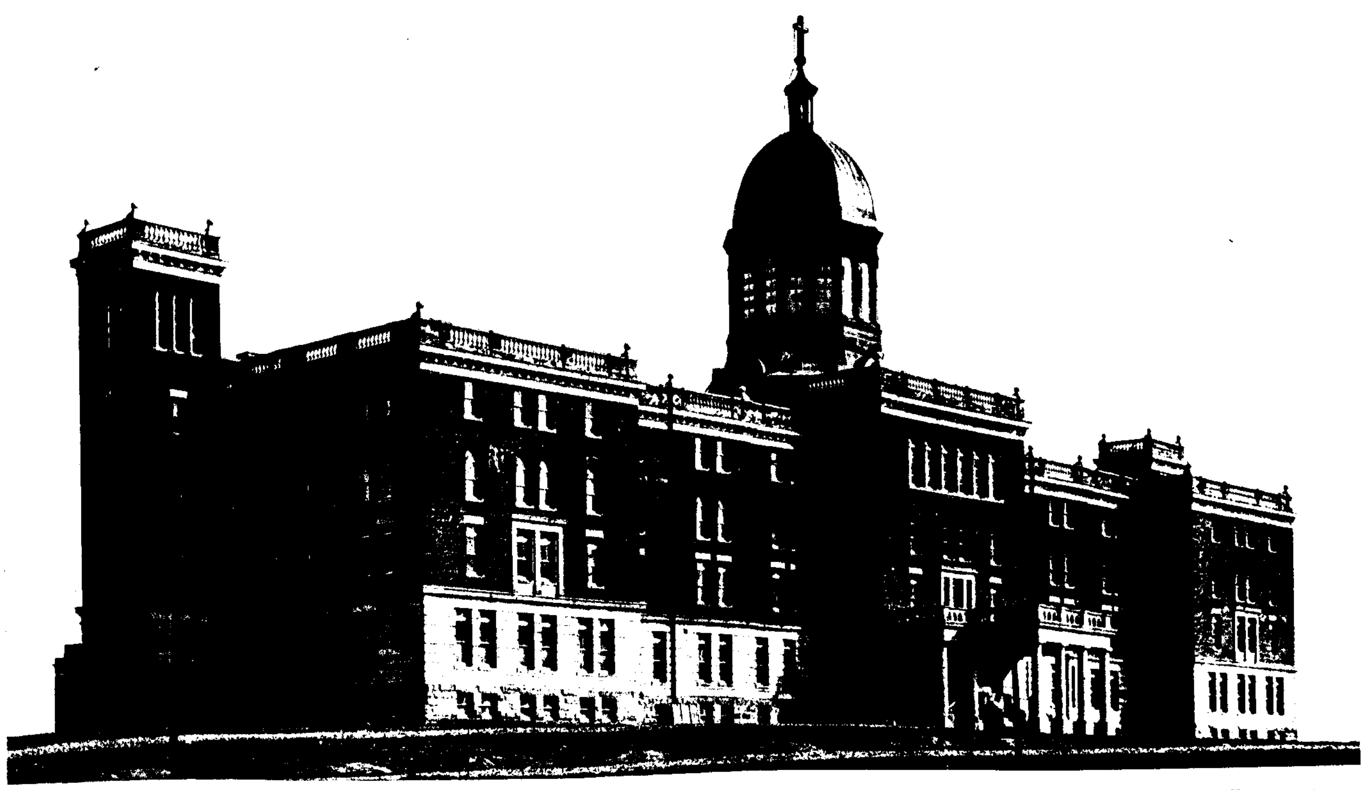

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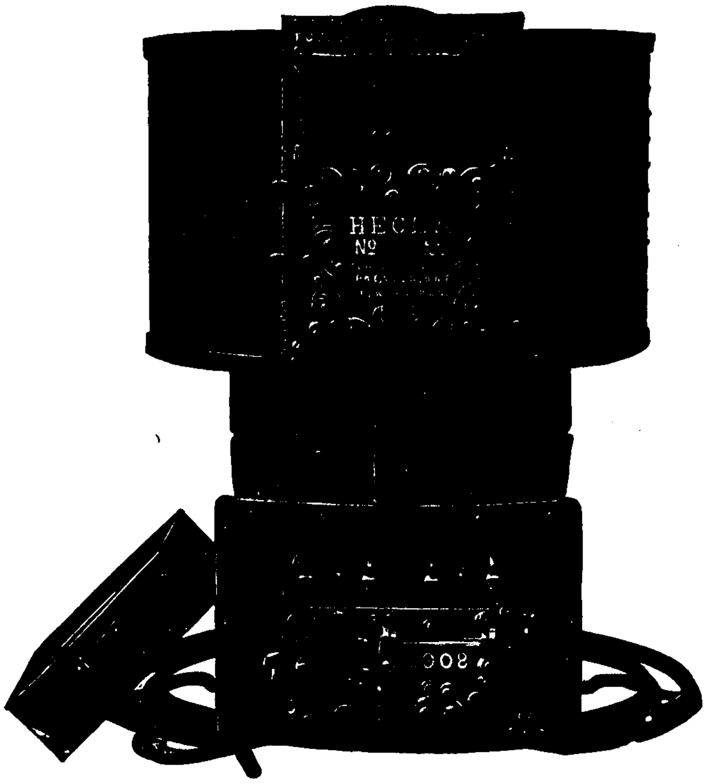

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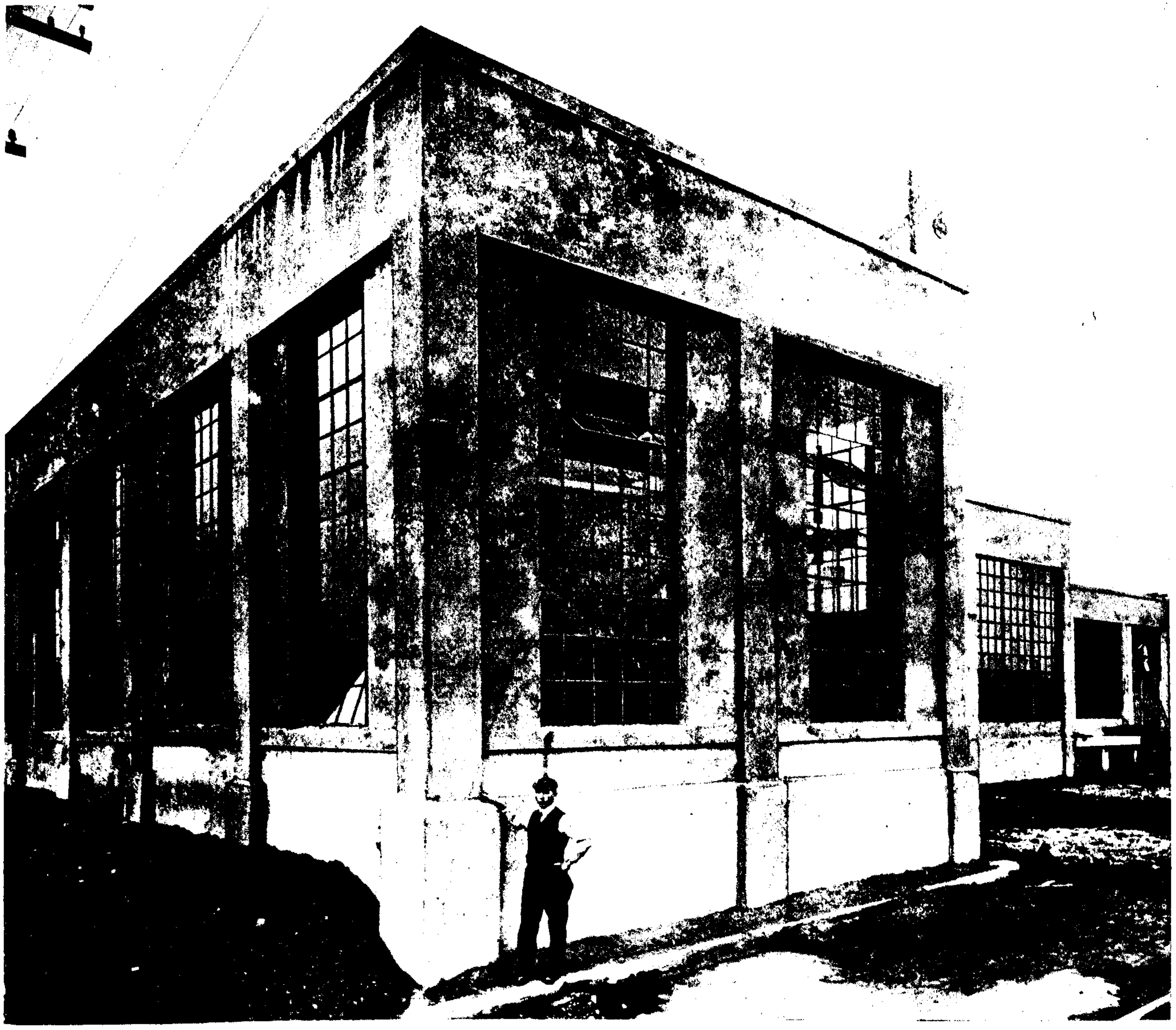

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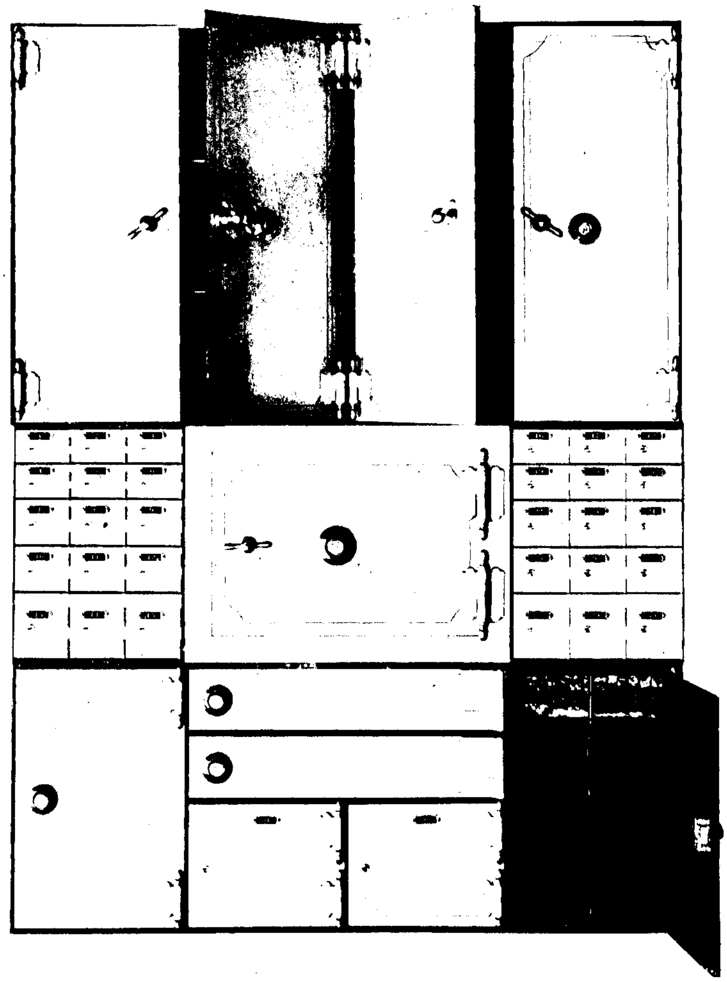

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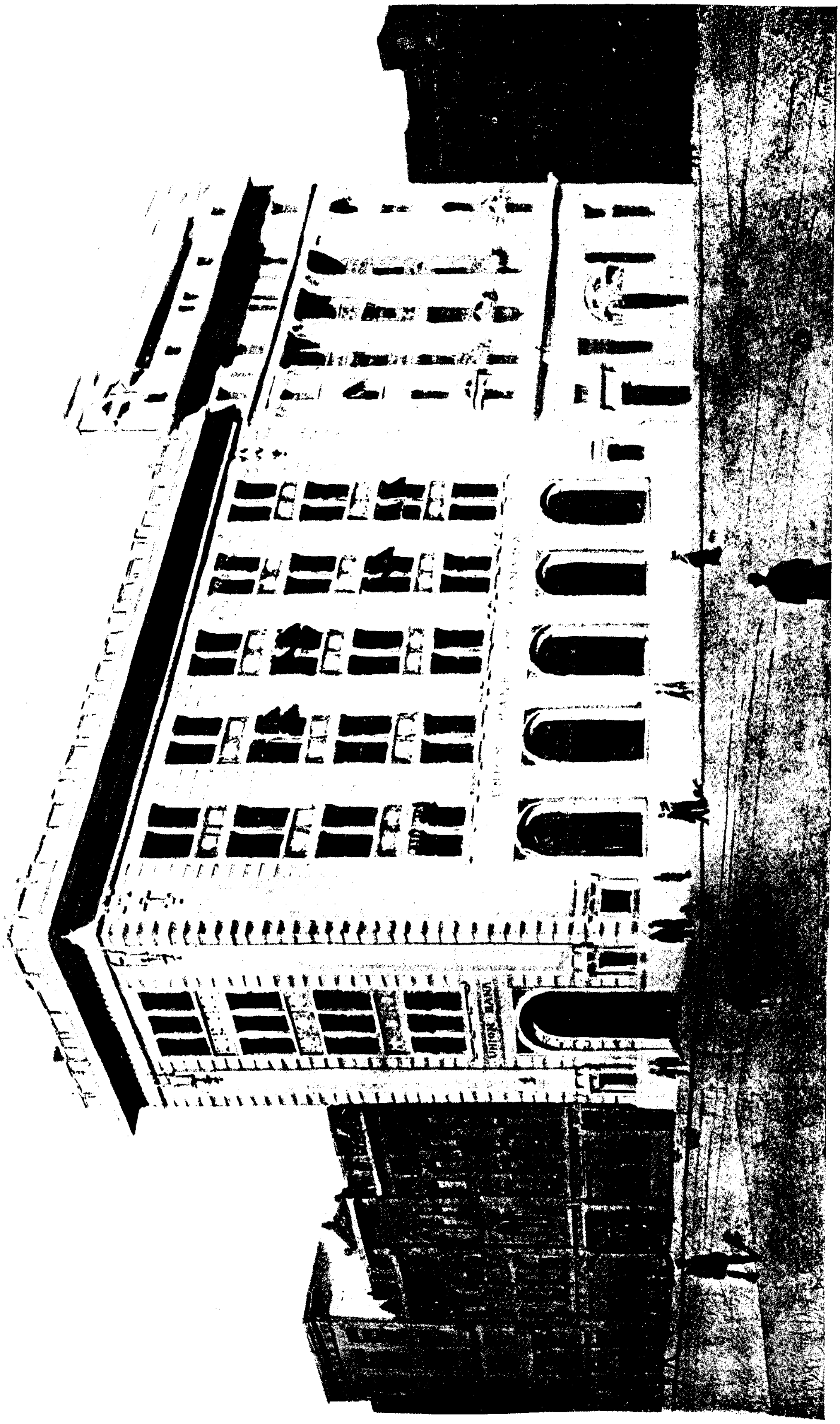

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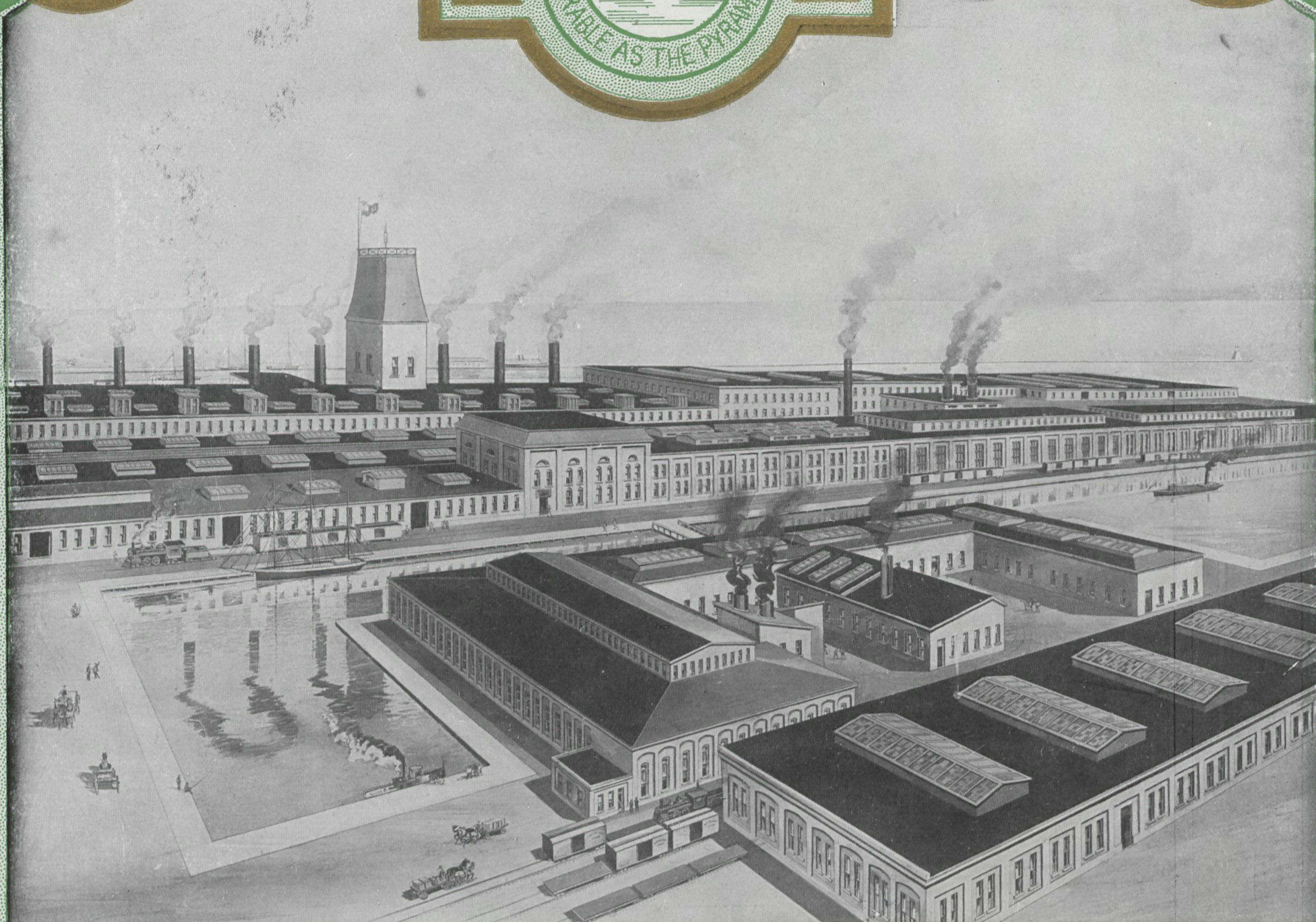

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ALEXANDRA WARE

CONSTRUCTION

VOL. VI NO. 2

CONTENTS FOR FEBRUARY, 1913

Full Page Illustrations

H. GAGNIER, Limited, Publishers

GRAPHIC ARTS BUILDING, TORONTO, CANADA

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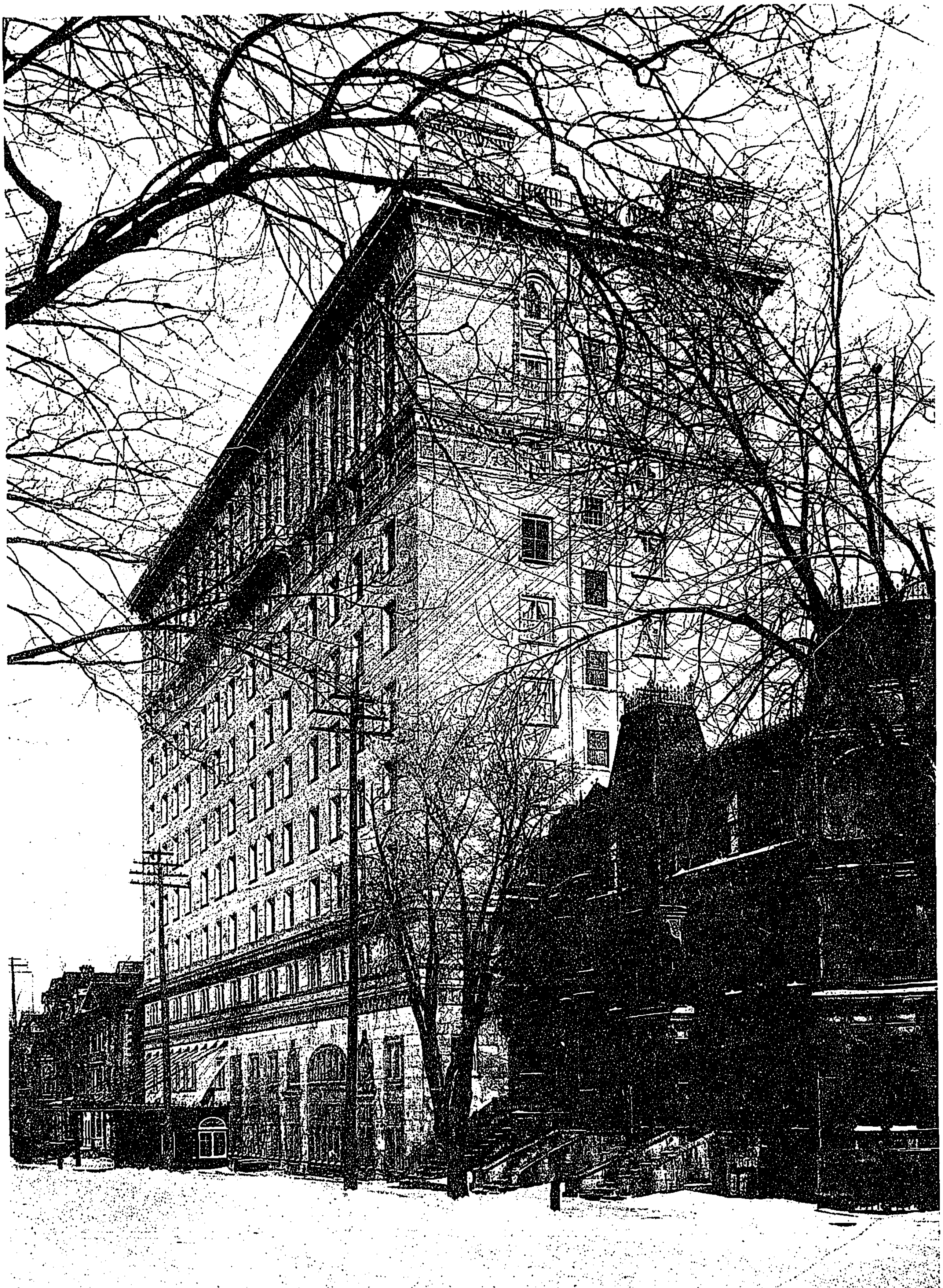
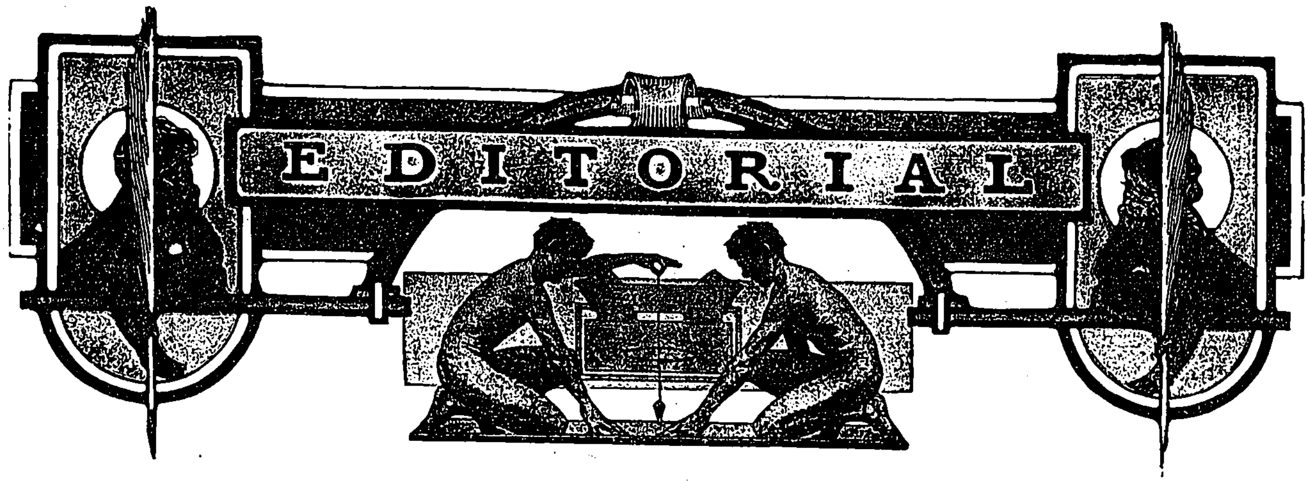


RITZ-CARLTON HOTEL, MONTREAL, CAN.



¶ *The Balkan war—Its sympathetic side—The disastrous results to the political situation as well as in the field of art.*

THE HEARTFELT SYMPATHIES of all thinking people must be with the Balkan nations in the present struggle of the Cross against the Crescent. It is a contest waged in the interest of right, of freedom from massacre and oppression. For many centuries the cruelty of the Turks has been the shame of all European countries. And what could be more of a reprimand to these powerful Christian nations than the clean cut victories of Bulgaria, Servia and Greece? Their efforts should instill into these supposedly enlightened nations traits of justice and honor instead of their present jealous and covetous natures. Aside from the cause of right and ultimate beneficial results there is great danger ahead. It is in the realm of art where this fear lies. The Turks have religiously guarded their sacred architecture. In one instance they destroyed many holy relics for fear of Christian contamination, at another time through superstitious sentiment they filled in their finest example of gateways, leaving only traces of its former grandeur. In the event of the Turks' religious zeal running rampant through the encroachment of Christian nations, we may look for nothing less than a wholesale destruction of art. Little else could be expected than a complete demolition of mosques, palaces, etc. The finest example of Christian architecture to-day is judged to be St. Sophia, and reports have it that this wonderful structure is undermined. How much truth is attached to this we do not know, but it is an established fact that the Turks will never allow a foreign creed to defile the inner sanctum of their religious edifices. What a loss to the world if this centre of Byzantine art should become a memory of the past—if its ancient ruins of Constantine the Great; its relics of the glorious reign of Justinian; its vast creations under Mohammed II.; its splendor of Suleiman the Great; all should perish with the elimination of the Turkish power in Europe? No more will their faith in Mohammed enable them to regain their former glory—with all their sacred temples destroyed, their spirit cowed by the European display of strength, they will die, as they lived, inseparable from the glories of their religious beliefs.

¶ *The Balkan war—What interest it has to the architect—The tremendous cost to commercialism and to the fine arts.*

DOES THE BALKAN WAR and the ultimate result interest the Canadian architect? Most emphatically, yes. Aside from the loss of art, the world's progress in civilization and commercialism will be interrupted for centuries, should the present conflict terminate in a general European war. The Turks will undoubtedly be conquered, but will each Balkan nation be allowed to enjoy the fruits of their victory? What if Servia insists upon having a seaport and Austria refuses to entertain such a proposition? It would mean a conflict between them in which England, Russia and France would uphold Servia, while Germany and Italy would back up Austria's objections. Then what? A general financial demoralization throughout the world which would paralyzé the growth of all nations. M. Jules Roche, after a thorough and analytical study of the expenses during the French war of 1870, estimates the maintainance of the armies representing the six nations for one month to approximate $5,400,000,000. Such an expense would mean the death of all commercial, industrial and financial interests. Shortly all means of subsistence would fail; the mills and factories would stop either from a dearth of laborers or a marketing field; food stuffs would soon be exhausted, with little hope of being able to import same. It is utterly impossible to calculate the tremendous effects such a war would have; but we are awake to this one fact —Architecture and Building would be dealt a terrific blow, from which not one of us would witness the recovery again to its present prosperous outlook. All building transactions would be interrupted, the many and large contracts awarded would be recalled and the unprecedented plans contemplated for the year 1913 would become our Castles in Spain. Picture for one moment all Europe and possibly Canada involved in such a warfare—think of the human lives sacrificed, the devastating inroads into the trade centres of the world, and the irreparable destruction to Fine Arts. The resulting panic would surpass all former ones and bring nothing but regret and hardship in its wake.

Canadian architecture ably presented to the English members of this profession in London Critics universally praise our high class work.

IT IS ENCOURAGING to read the editorial comments of the English press in their praise of the Canadian achievements in architecture. This wholesome criticism has been inspired through the efforts of F. S. Baker, F.R.I.B.A., who presented this subject recently before the Royal Institute of British Architects in London. The paper dilated on the better class of work being done from Halifax to Vancouver and was illustrated by lantern slides and photographs. Mr. Baker commented on the superiority of the work being done by local architects and showed conclusively the folly of having Canadian institutions designed and executed by foreign concerns. It is a high tribute to the architectural profession that the ex-president of the R.A.I.C., and one so eminently fitted for such a task, should lay aside his ever increasing business activities to present this phase of commercial life before the members of the R.I.B.A. It is a sacrifice deserving of sincere commendation and can only result in a better knowledge of the tremendous strides the Dominion of Canada is making in the world of art, as well as a more wholesome attitude towards our consistent efforts in creating an architectural style worthy of emulation.

City planning—The need of studied schemes for the improvement of national features—Work that is being done throughout Canada.

NO OTHER MOVEMENT is progressing so rapidly as the beautifying of our cities and towns. It is demonstrated by the vast expense incurred in replanning and changing the existing conditions in our large cities; it is shown in the Town Planning Act passed by the Legislatures of the various provinces; it is revealed in the actions taken by our architectural associations; and it is being exemplified by our small villages which are earnestly considering their public growth and possibilities.

In Ottawa, Edward White, the British expert engaged by Rt. Hon. R. L. Borden, reports that for the best economic advantage of the Capital there should be a double line of buildings running east and west separated by a broad boulevard. At the centre should be a wide open square with the Supreme Court and Railway Commission occupying a prominent position encircled by an elaborate terrace.

In New Brunswick the Legislature passed an Act that all future developments in towns and cities are to be carried out under Government supervision. This regulation is a little too drastic, but may result in a sanitary and artistic treatment of many places which would otherwise adopt an unwholesome scheme.

At a recent meeting of the Alberta Association of Architects the members went on record as approving the work of the Provincial Town Planning Commission, which has for its object the betterment of conditions in the matter of housing, sanitation, traffic and the beautification of towns and cities.

Many other instances could be cited to show the general awakening of the people towards schemes of individuality and character. Plans are being prepared in the new cities of the West which show wide boulevards, parks, recreation grounds, monumental buildings and civic centres. It is an encouraging sign and full of great promise. Let the enthusiasm grow until every part of this great Dominion is released from the clutches of selfish commercialism and the people are privileged to enjoy the blessings of freedom and beauty.

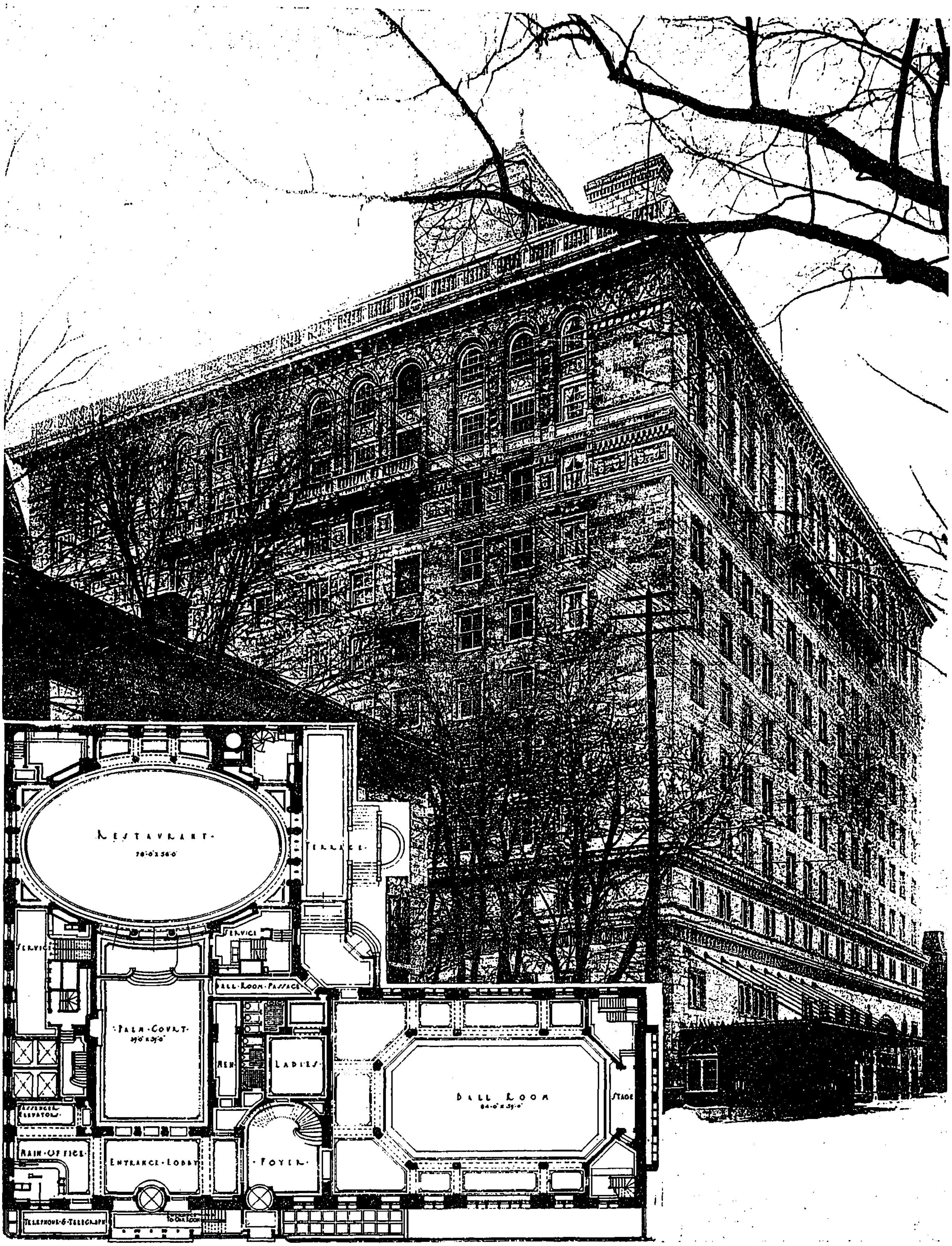
Building statistics—The remarkable activity during the year nineteen hundred and twelve —Prospects for the present year phenomenal.

IT IS EXTREMELY GRATIFYING to see the remarkable record made in building permits for the year 1912. But our greatest pleasure comes from the character of the work, both in an artisitc sense and in the improved methods of construction.

The future outlook is exceedingly bright. Our population is having a surprising growth, which means, in itself, a continuation of the large building industries. We must house, we must school, we must provide for sickness, we must govern, we must live —all of which necessitates new structures. Unless some unforeseen calamity comes to us it is safe to predict that the combined total of building for the present year will be 50 per cent. increase over that of 1912.

The following table will be of general interest in reviewing the relative merits of the various cities as to their standing and actual increase in building lines:

		Amount of building.	Increase. Percent.
1	Toronto	$27,401,761	12
2	Winnipeg	20,475,350	15
3	Calgary	20,394,220	58
4	Montreal	19,641,955	34
5	Vancouver	19,428,432	10
6	Edmonton	14,446,819	293
7	Victoria	8,208,155	103
8	Regina	8,047,309	57
9	Saskatoon	7,640,530	54
10	Hamilton	5,491,800	29
11	Moose Jaw	5,275,797	119
12	Fort William	4,211,285	37
13	Ottawa	3,261,850	20
14	Point Grey	3,004,815	—
15	Medicine Hat	2,836,239	281
16	Maisonneuve	2,685,828	124
17	South Vancouver	2,550,000	—
18	Port Arthur	2,494,179	318
19	Prince Albert	2,006,925	117
20	Westmount	1,824,369	27
21	New Westminster	1,634,518	45
22	Outremont	1,582,000	20
23	Lethbridge	1,358,240	31
24	St. Boniface	1,251,012	10
25	Brantford	1,167,105	90
26	Brandon	1,166,214	13
27	London	1,136,108	9
28	Windsor	1,098,063	48



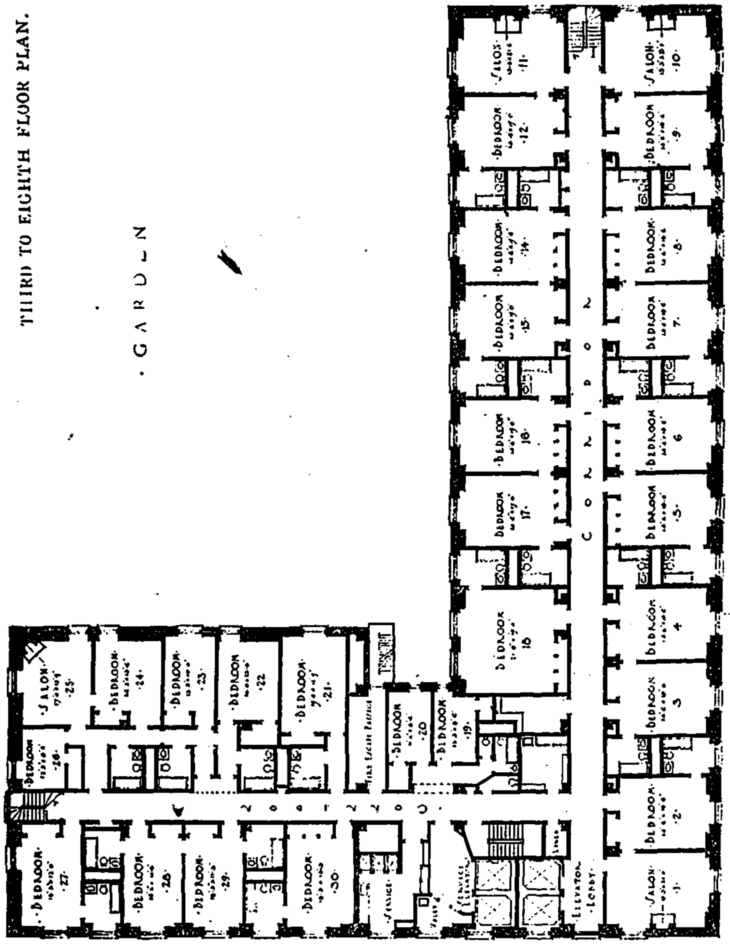
GROUND FLOOR PLAN.

VIEW FROM SHERBROOKE STREET.

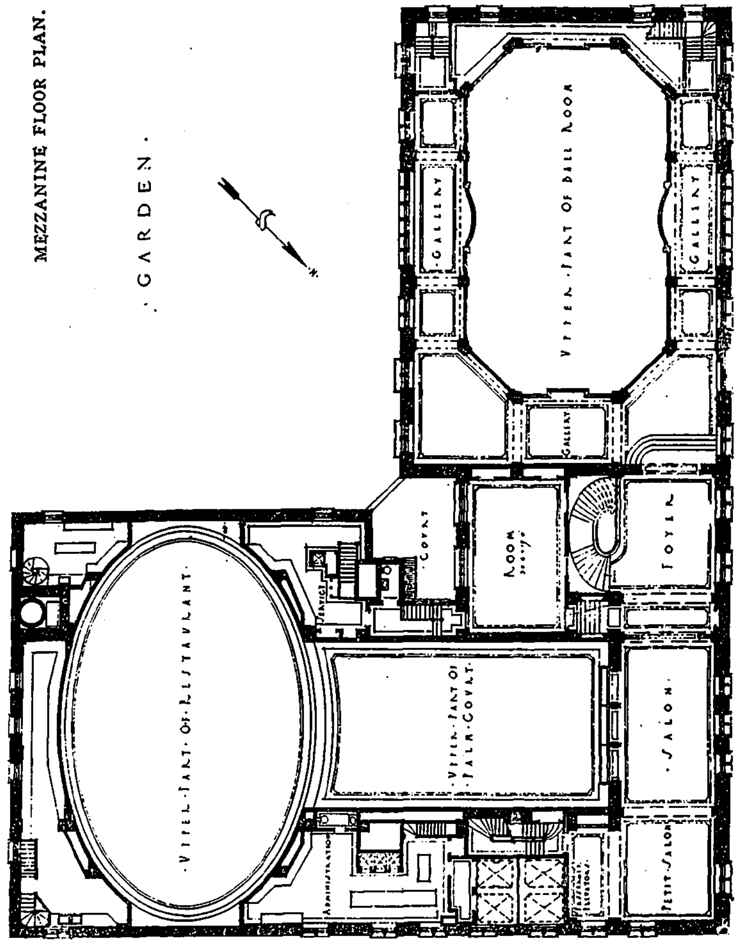
RITZ-CARLTON HOTEL,

MONTREAL, QUE.

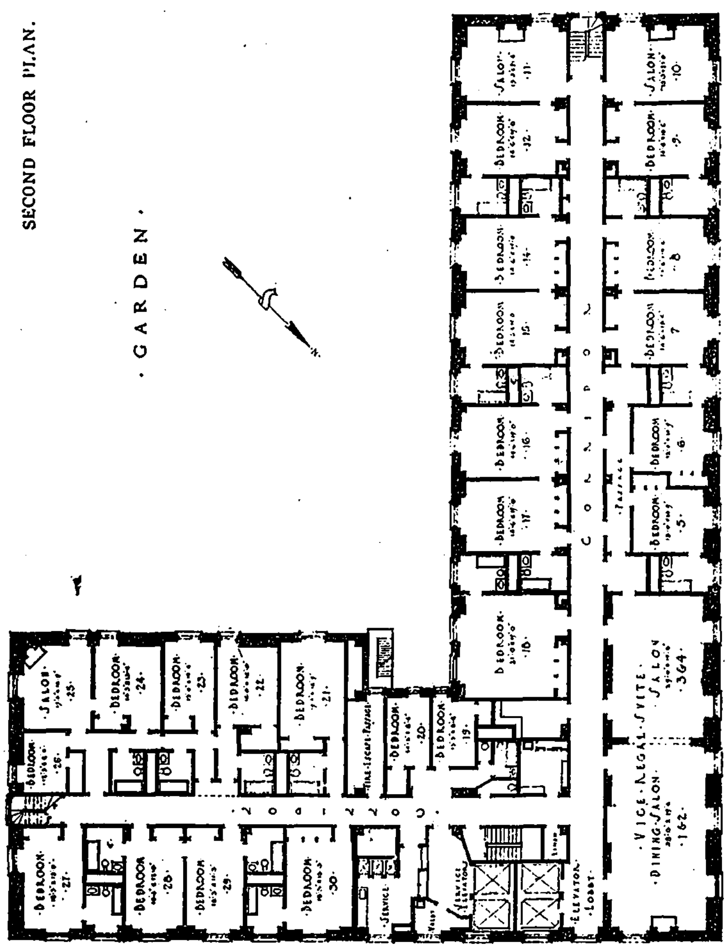
THIRD TO EIGHTH FLOOR PLAN.



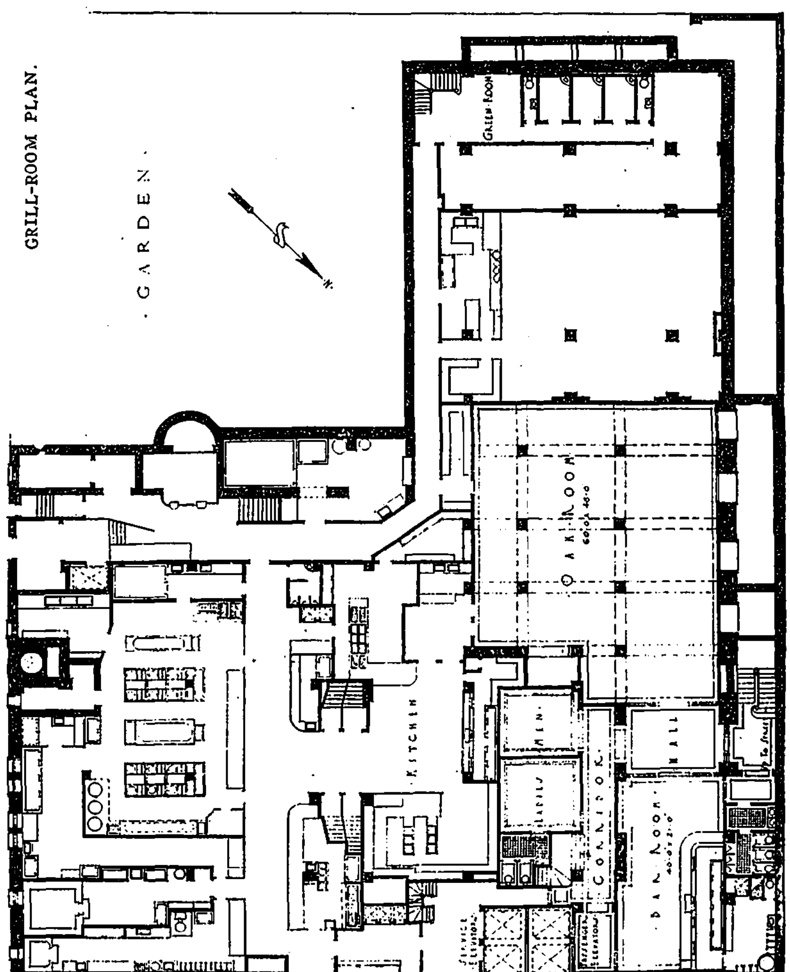
MEZZANINE FLOOR PLAN.



SECOND FLOOR PLAN.



GRILL-ROOM PLAN.



PLANS OF THE RITZ-CARLTON HOTEL, MONTREAL.

BALCONY IN PALM COURT. OPENING FROM SALON.

The Ritz-Carlton Hotel, Montreal, Can.

THE RITZ-CARLTON HOTEL at Montreal is one more link in the marvelous growth of a creation started through the ingenuity of a Swiss farmer. M. Cæsar Ritz has demonstrated the advisability of a unity of purpose developed in a practical and artistic manner. From the common life of a peasant he has risen to the summit of success and will live as an example most worthy of emulation.

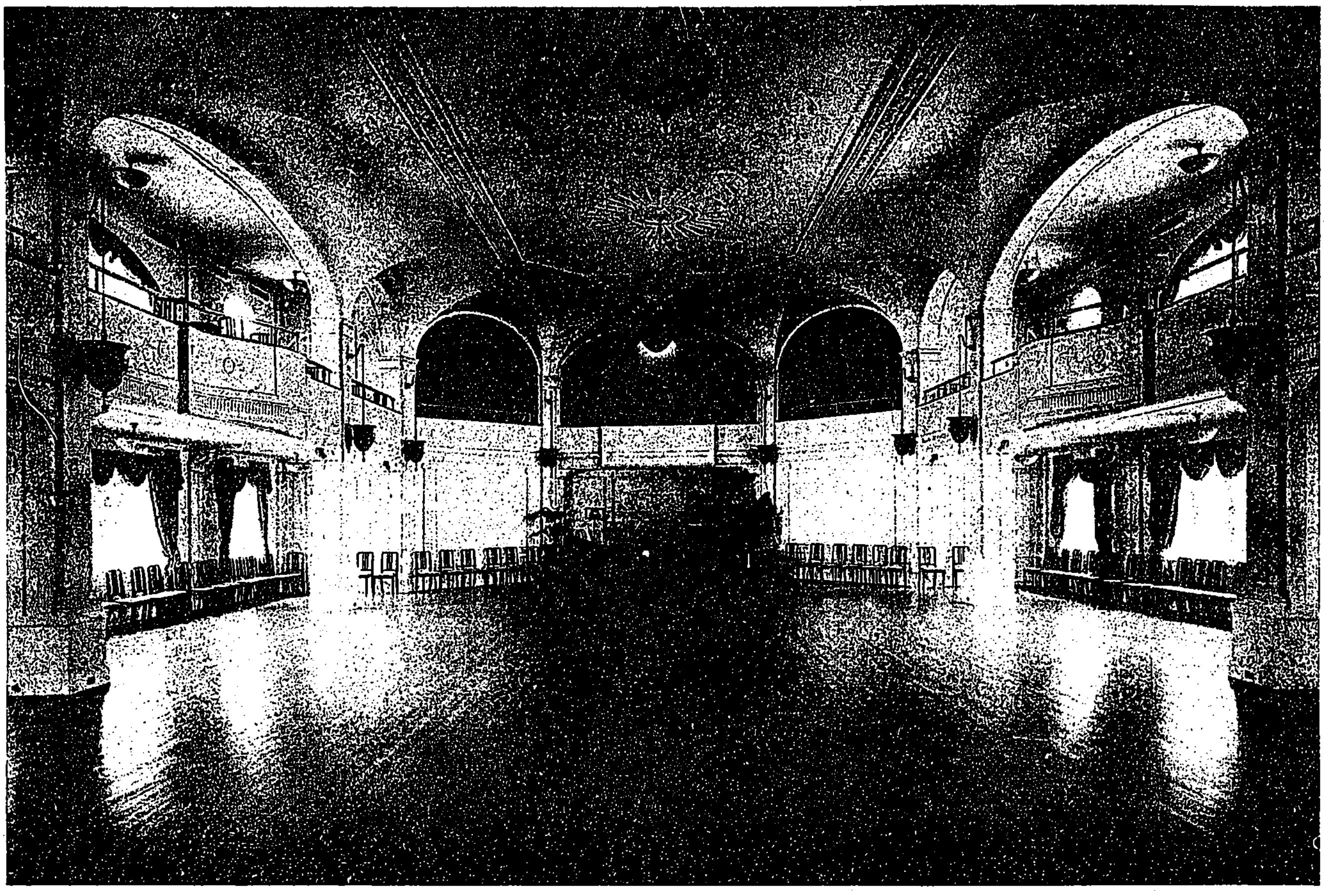
It might be well to consider for a moment the traits which forced such recognition from the whole civilized world. He had a clear insight into the centralizing of interests; he was imbued with a desire to make his finished product one harmonious whole; he grasped the advisability of eliminating the mercenary impressions; he sensed in a remarkable degree the purity of color, form and taste. In fact each succeeding hotel is only a broader development of the ideas he incorporated in his first large enterprise—the Ritz Hotel at Paris, 1897. From that time on the growth has been truly marvelous, and to-day there are eighteen hostelries built and several in course of construction.

The finality of an undertaking is what makes the original thought worthy of consideration. Unquestionably the fundamental principles were all that the critic could expect—what, then, are the practical applications which give each hotel the stamp of general approval. A careful study of one will furnish you with the reason for the high standing of all.

In the first place the planning is carefully studied with a view of best suiting the needs of the community in which the hotel is to be erected. Then the architectural treatment both upon the exterior and upon the interior is considered. In every instance the possibilities of the site, the general surroundings, the vistas, the character of buildings near by, etc.—all weigh in the style adopted and the materials used. The impressions obtained from the exterior necessarily must be maintained upon the interior. After the decorative features are arranged attention is given to the furnishings. In addition to perfect harmony in color and design, they must invariably have the quality of comfort. When all is complete in the way of equipment then the features essential to the preservation of its highly established reputation, viz., cooking and service, are standardized.

The citizens of Montreal may, and in fact do, feel that in their new hotel they have the finest and most artistic building of its character in the Dominion of Canada. They realize that the standard already established has been raised a trifle higher in this resultant of genius, through a broad experience with all phases of the work and a studied handling of the æsthetic capabilities. And it is safe to assume that they will be able to claim such a distinction as long as the hotel is under the advisement of M. Rudolph Bischoff, the present manager. With his careful attention to the minutest details of all departments, his strict disciplinary tactics prevalent throughout the complete working corps, and his keen and hospitable interest in every guest—these qualities will foster the existing atmosphere of charm and comfort. In this way the harmonious blending of the æsthetic and the practical will continue to live, while time will only strengthen and enhance in every respect the praiseworthy features of the present edifice.

The hotel is situated at the corner of Sherbrooke and Drummond streets in the centre of a rich residential district—a guarantee in itself that the environs will maintain its setting of wealth and dignity for many years to come. The site commands a superb view in every direction. To the north rises the stately and far-famed Mount Royal; to the east the many attractive features of the city with the Belle Isle Mountains forming a suitable background many miles away, and to the south the valley of the St. Lawrence, the Victoria Bridge, the Green and Adirondack Mountains. Surrounded by a forest of trees and a stretch of wealthy homes in all directions, it is still within a few hundred yards of the business section. Removed from the constant noise of endless



GRAND BALL ROOM.

traffic, it furnishes quiet and comfort, exceptional qualities to be found in the most modern and up-to-date hotels of our cities.

Externally the general appearance is a masterpiece of refinement and dignity. The terra cotta trimmings at the window openings and elsewhere are in perfect harmony with the limestone which gives the structure a feeling of solidity and strength. Rising majestically for eleven stories, the internal treatment is expressed by means of the horizontal courses. The base consisting of the ground and mezzanine floor plans, the narrow frieze between the two cornices denoting the first or servants' dormitory floor, and the shaft and cornice indicating the living quarters for guests. The three top stories and cornice are rich in ornamentation and demonstrate the artistic and practical use of terra cotta. It is well to notice the natural blending of the terra cotta with the stone and how much the former material expresses the latter. The balustrade at the top rests upon an extremely high base which permits of its architectural merits being enjoyed from the street below. The balconies give the desired break in the two central divisions and lend an additional value to the decorative treatment. The marquise acts as a vestibule, having the part adjoining the building encased in metal, painted white, one end of which is used for the telephone booth, while the other permits of a direct entrance from the street to the grill or oak room below.

Upon entering the office lobby the first impression is that of quiet dignity. Instead of gazing into an obtrusive and mercenary office desk and the accompanying lobby of bustle and smoke, one catches a glimpse through an artistic glass treatment of doors into the palm court and old rose dining hall beyond. The lobby has a marble floor the coldness of which is relieved by heavy oriental rugs; the walls are covered with imitation Caen stone above a warm Hauteville marble wainscot which is also used for the office counter and openings. In addition to the vista towards the main dining room there is one equally charming looking through the foyer to the ball room. Here is demonstrated one of the traits already mentioned as being characteristic of the Ritz hotels. All mercenary suggestions are removed by placing the office in the corner, readily accessible to the main entrance, elevators, etc., and at the same time in an inconspicuous location. Careful attention has been paid to the individual features; the partitions separating the palm room from the lobby, also the foyer, are made of clear glass panels furnishing an unobstructed view; the elevators are screened by mirror doors; the office enclosed in an ornamental screen; and the heating and ventilating hidden at the windows by a marble enclosure flush with the walls. Little touches of comfort are added by easy chairs, palm boxes, and small ornate tables.

Directly opposite the main entrance to the lobby is the light and cheerful opening into the palm court. This room inspires one with a feeling of restfulness and deep content, making the entry into the dining

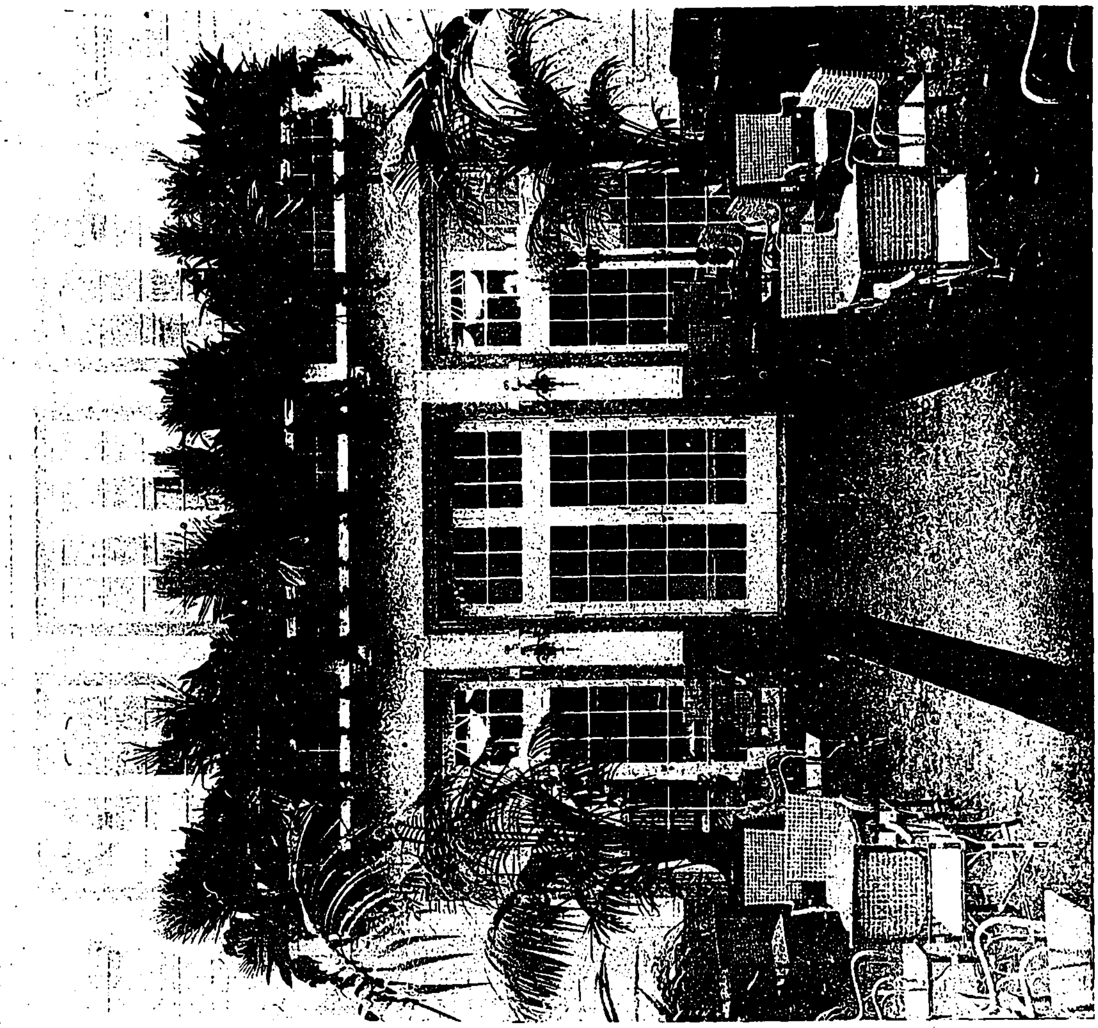
PETIT SALON.

room beyond a matter of ease and grace, a feature often objectionable on account of opening directly from the lobby. The court is made quite inviting by means of a number of small Antoinette tables where tea is served. The decorative scheme is very happy. The heavy soft Wilton carpet, the tables and wicker furniture and the clusters of palms form the rich green coloring in striking contrast to the French Hauteville marble wainscot and deep cream walls above. The six gold candelabra and sixteen wall brackets containing one hundred and fifty candle lights together with the concealed lighting in the cornice, flood the place with a powerful glow of subdued radiance. At the far end broad steps lead to the landing on the same level as the floor of the dining room, which raised portion is admirably suited to the needs of the orchestra. An iron balustrade in black and old gold similar to that of the main stairway encloses the platform. A large open fireplace adds still more cheer to the attractiveness, while the delicately molded ornament of the walls and cornice reveal the cleverness of the designer in uniting the architecture with the furnishings in making a harmonious treatment of the many and varied parts.

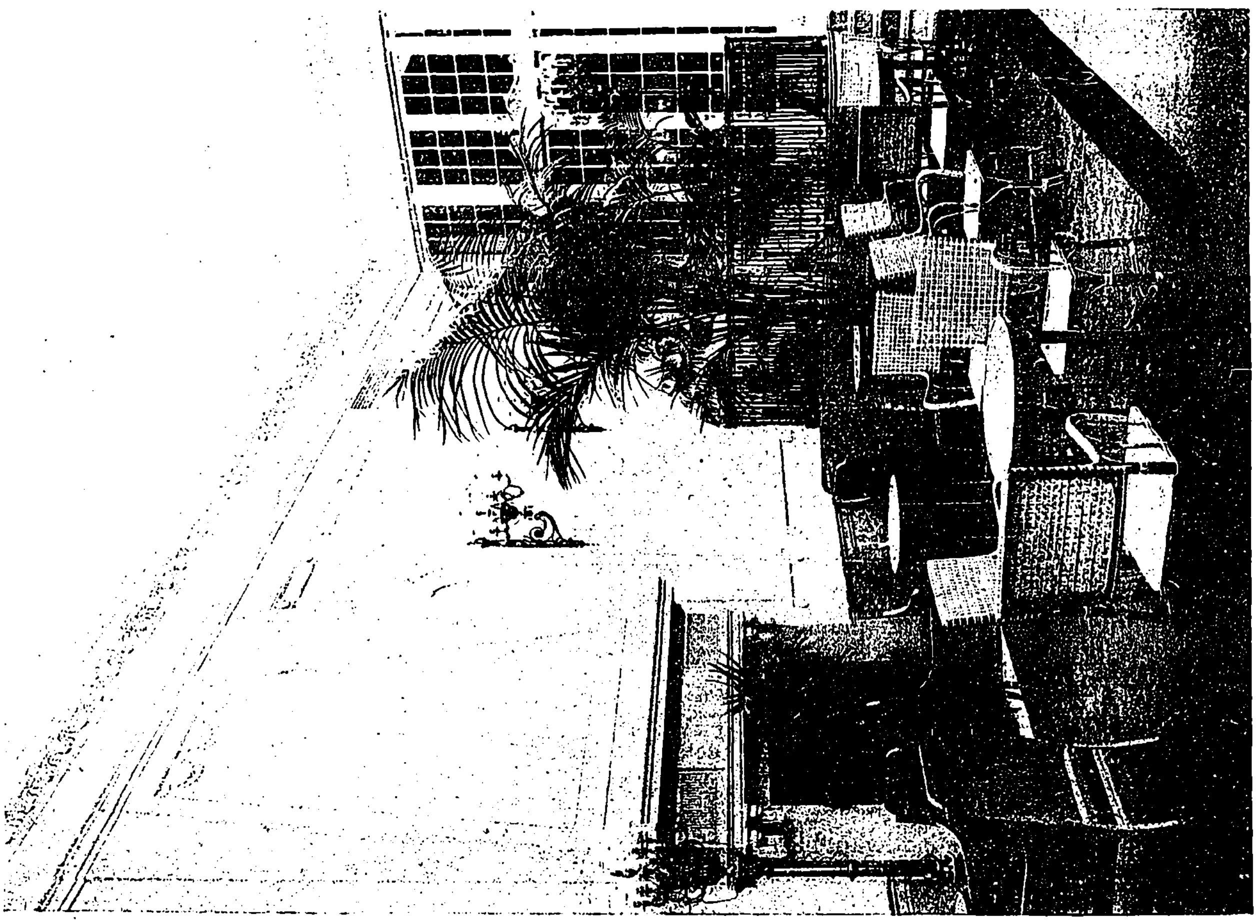
Opening from the palm court is the oval dining room or restaurant with three large window treatments. The room is seventy-eight by fifty-six feet and capable of accommodating two hundred and fifty guests. It is decorated in the Adams style and contains a slightly domed ceiling with elaborately moulded details in very low classic reliefs. The lighting comes effectively from a myriad of lights hidden behind the ornate cornice and reflected from the curved surface above. The eye is led from the white duresco ceiling to the floor by the entrance design and window openings, which are also finished in a very light tone. Between these prominent features are delicate cream panels admirably adapted as a setting for the graceful wall lights in dull gold.

While the upper part of the dining hall is kept in a light tone which has the tendency of making the room seem much larger, the lower part is more cozy through the use of old rose effects. The heavy super Wilton carpet is in two shades of old rose, the lighter harmonizing with the silk tapestry upholstering of the chairs. The curtains are of heavy rose silk hung by shaped pelmets with applique of the hotel crest in the centre. At one end the windows extend to the floor and open upon the ball room terrace which overlooks the Dutch garden. This garden will be used for summer parties and is accessible from the terrace by means of steps and balustrade, recalling to mind the old approaches of famous chateaux.

From the entrance lobby one passes through the foyer into the grand ball room, ninety by forty feet and capable of accommodating four hundred. Here are held receptions, concerts, banquets, and all other social functions. The character of the design is in perfect harmony with the other parts already described and is finished with duresco plaster and wood work in white relieved by the gilded metal work and curtains. The ornament is of extremely

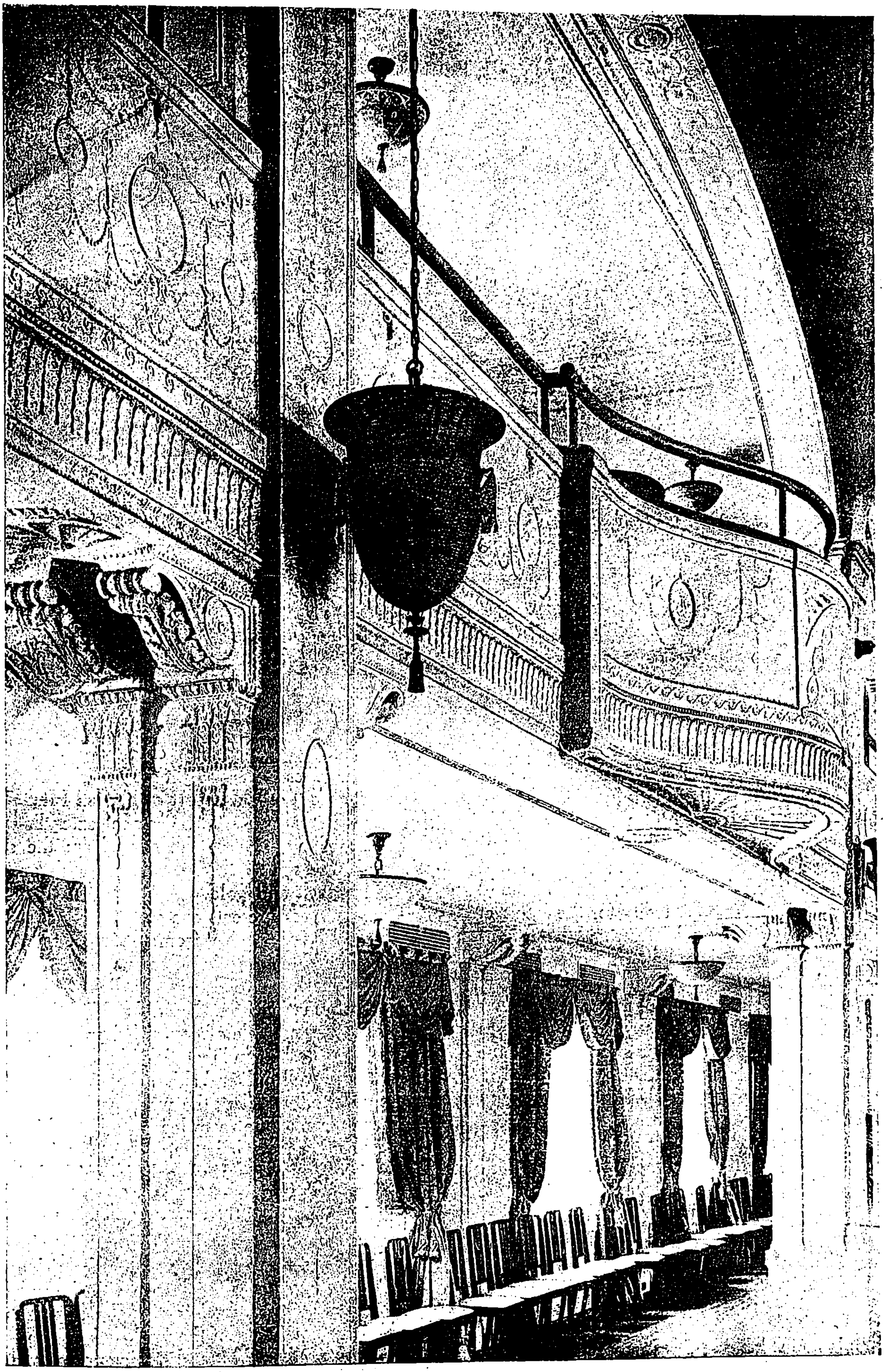


PALM COURT.



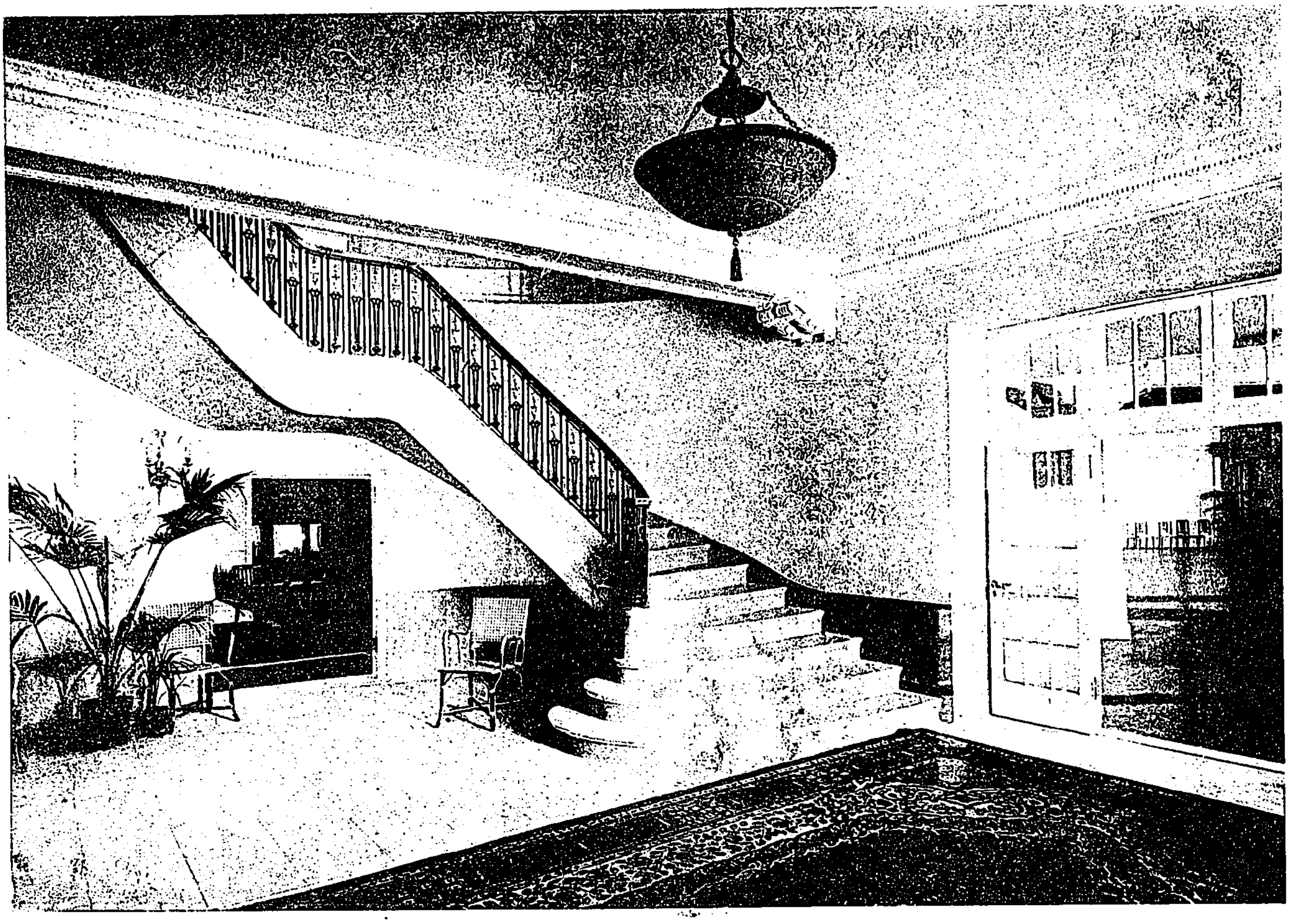
PALM COURT.

RITZ-CARLTON HOTEL, MONTREAL, CAN.



DETAIL OF BALL ROOM.

RITZ-CARLTON HOTEL, MONTREAL, CAN.

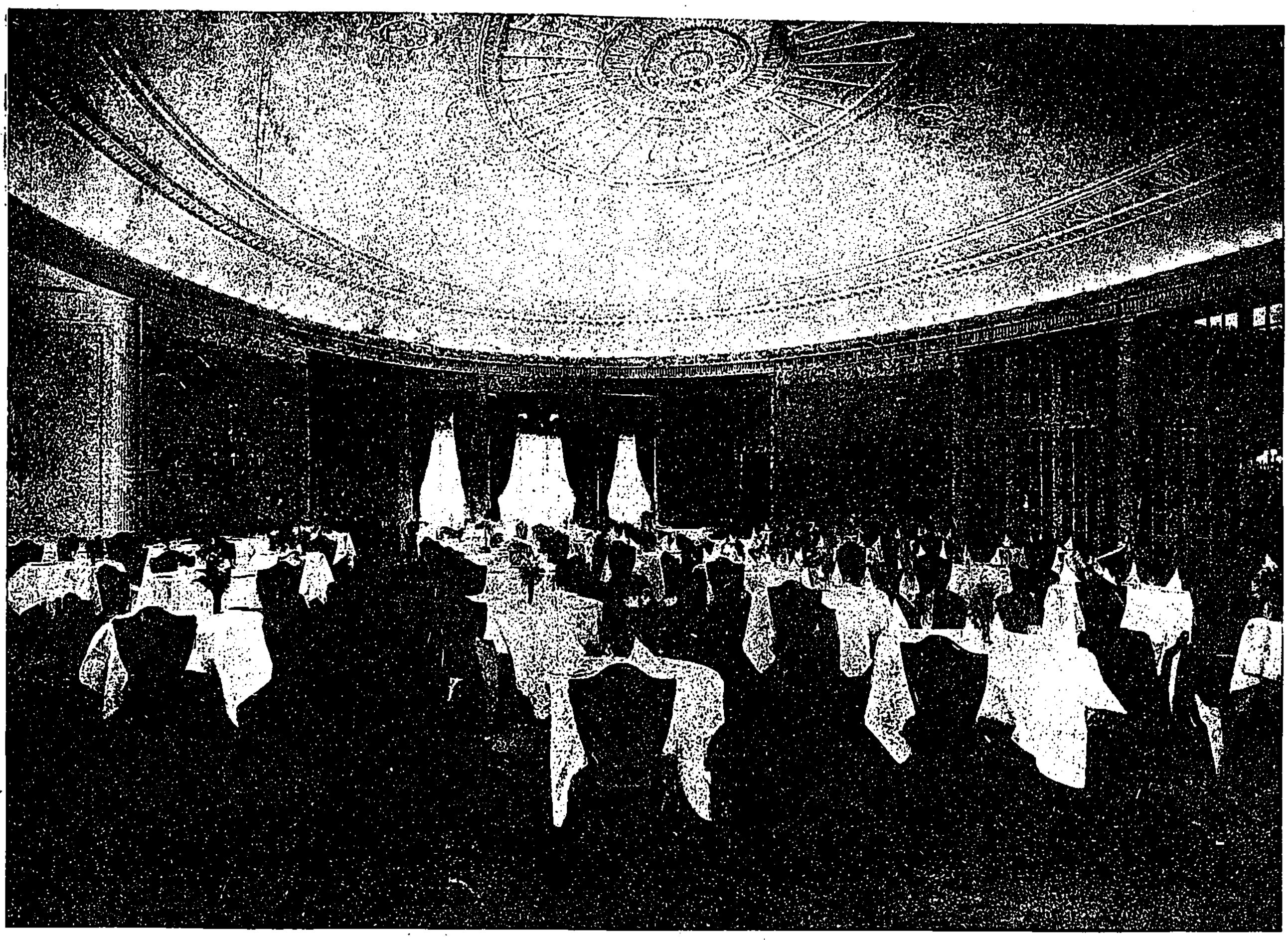


ENTRANCE FOYER.

rich low relief work in striking contrast and at the same time maintaining a unison with the plain vaulting above, which is interrupted by a delicately moulded course forming a centre panel. Within are two elaborate patterns which form the setting of electric crystal ceiling fixtures of cut glass and metal finished in dull gilt. The balcony extends around the room and affords an opportunity for the architect to make his work of unusual interest. The various widths of the bays necessitated different curves which break the monotonous effect so often obtained in equal divisions. This feature, together with the low relief of the design and the upward tendency, gives the room an unusually large appearance. From the piers of the balcony hang electric lights encased in etched alabaster glass globes and finished in dull gilt; the hanging brackets have the same metal work with crystal beaded bowls. The curtains are of French gray moire silk, extremely heavy, and of same material as the upholstering work and the covering of the balcony rail. A spring floor has been laid of quartered oak; all furniture is of mahogany. An independent entrance from Sherbrooke street gives access to the ball room from the foyer without having to pass through the entrance lobby.

The foyer is the connecting link between the ball room, and main lobby. The main stairs lead to the foyer above, which opens into the salon, smoking room, and balcony of ball room. At a landing half way up the stairs is the entrance to the manager's office, directly over the ladies' dressing parlor. The floor of the foyer is laid in light gray marble squares; the walls consist of a wainscot of French Hauteville marble with imitation Caen stone extending up through to the ceiling on the next floor; the steps are of marble similar to the wainscot with an iron railing in black and gold.

The oak room presents one of the most attractive features. Upon entering from the corridor, which is accessible from the main office and from the vestibule, a remarkable effect of daylight is present. This transformation from the subdued lighting to the more glorious spectacle of covered day is caused bv a superb method of indirect lighting. The myriad of lights are well hidden behind the upper members of the cornice, encircling the walls and surrounding the seven piers. The room lends itself to this treatment by having a simple but very ornate design. The wainscot of quarter-sawed oak is finished in its natural tone, extending within two feet of the ceiling and highly panelled. The furnishings consist of fiftv tables accommodating one hundred and sixty hungry mortals: chairs upholstered to match the rich green effect of the heavy Wilton carpet with the wood in perfect harmony to the wainscot. The only features breaking the continuitv of the wall surface consist of entrances from the lobby and serving room, opening for cashier's quarters and four small sterilizing rooms which are finished in white enameled tile. The wall brackets are of antique silver. Directly across the



RESTAURANT OR MAIN DINING ROOM.

entrance hall is the bar, designed similarly to the oak room, excepting a nine-inch square tile floor with wide tinted jointing and wicker furniture.

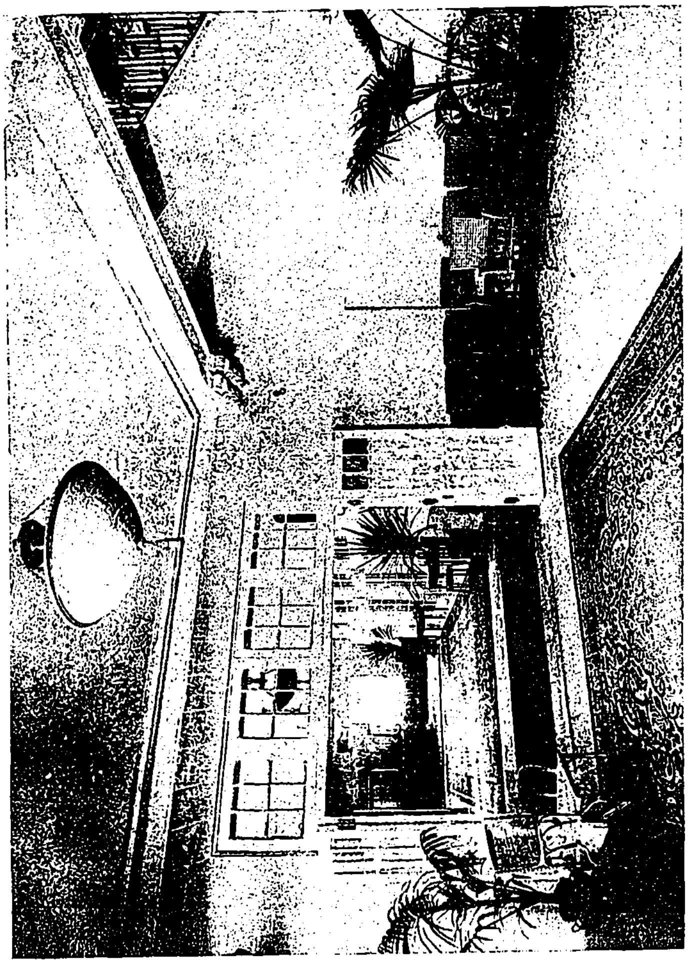
Located over the manager's office on the mezzanine floor is the smoking room, the walls of which are in buff plaster with panel mouldings and cornice in natural oak. The carpet and upholstery are a myrtle green, producing a pleasing appearance. Passing from here through the foyer, we come to the salon and petit salon, known as the blue room. Here is found a radical departure from the general tone of the whole decorative scheme. The floor is covered with a rich deep blue super-Wilton carpet; portiers, table covers and upholstering of dark blue repp, and walls of bluish gray tone. There is no jarring note to the whole scheme, the elevator opening having mirror doors and the wood work of a light gray matching the tint on the walls. The electric standards, brackets and hanging fixtures are of antique silver and alabaster. From the balcony of this room is obtained a most interesting view among the bevy of ferns, along the delicately creamed ornamented walls, over the small shaded candle lights, and through the elaborate partition of slender columnettes with some three hundred and fifty opaque glass, into the charming old rose dining hall.

The first floor is practically the servants' dormitory, and provides for the help's bed rooms, sewing rooms, dining rooms, dressing rooms, supply rooms and lounge. Arrangements are also made for the guests' barber shop and hair-dressing parlors with gray and white mosaic floor, marble wainscot, stands and bowls, and mahogany woodwork.

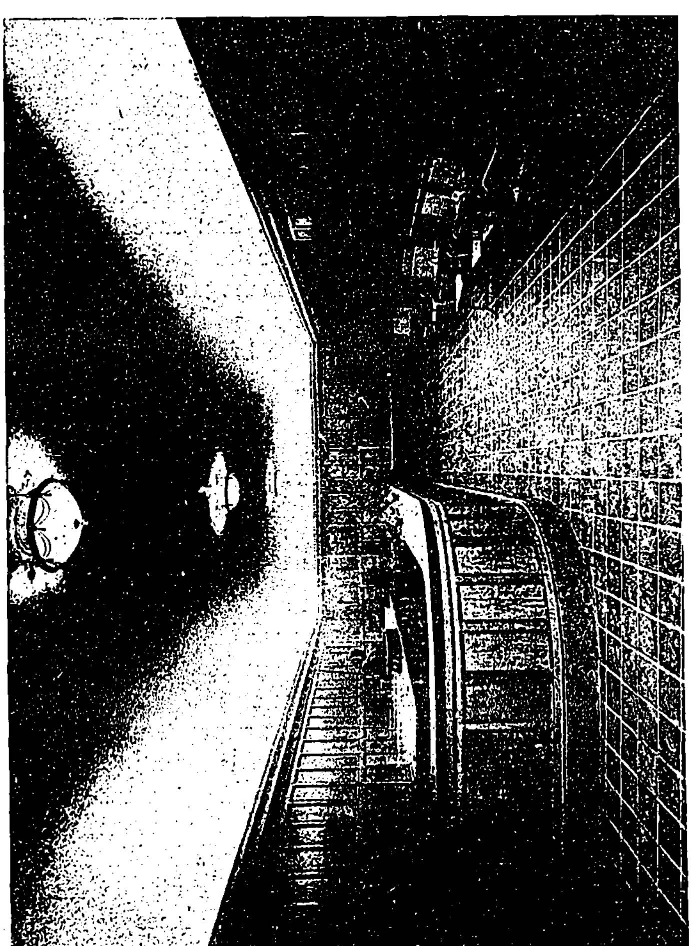
All above the first floor are bed rooms for the use of guests, with the vice-regal suite on the second. There are twenty-seven suites, one hundred and sixty-four double bed rooms and seventeen single rooms. The salons of the suites have silk armure curtains, Chesterfield sofas, mahogany tables, writing desks, chairs, commode, etc., and washable plaster walls. In the bedrooms are brass beds, mahogany furniture, chintz portiers and plaster walls with very delicate panel mouldings. It is safe to say that this is one more feature emanating from the first principles laid down by M. Ritz. Every room is exceptionally large with a built-in wardrobe, portable electric light standards and trunk stand.

Adhering strictly to the attractive and cleanly policy maintained throughout all departments, the kitchen walls and partitions are built of white glazed tile and floors of nine-inch square tile. Connecting the kitchen with all floors are electrical dumb waiters equipped with special heating apparatus underneath, for the purpose of keeping meals served to the various floors warm. Corresponding lifts without the heaters administer to the cold storage needs. All liquors, etc., are served from a special bar attached to this department. Considerable marble is used, especially in the oyster bar and places demanding unusual cleanliness.

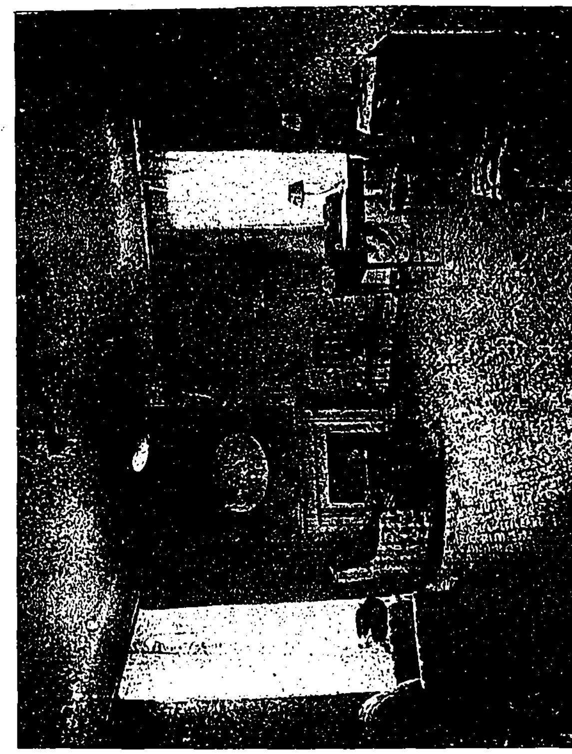
RITZ-CARLTON HOTEL, MONTREAL, CAN.



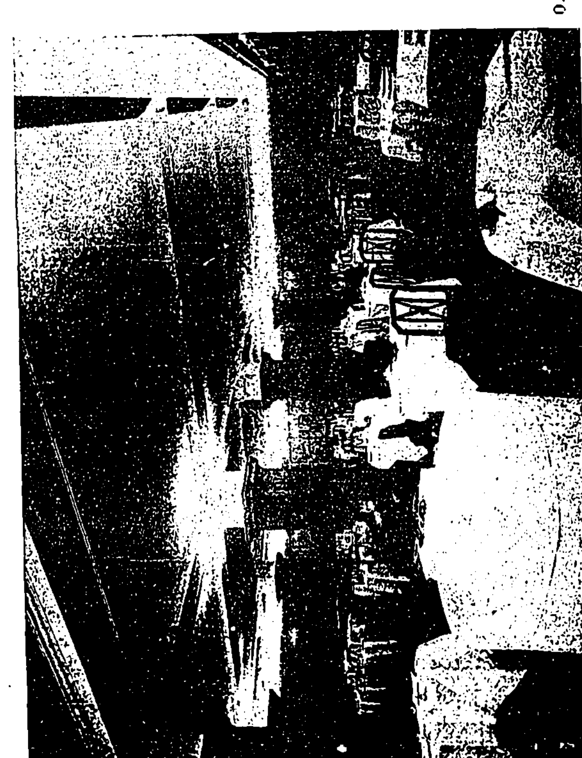
FOYER



BAR



SUITE SALON



OAK ROOM.

The cellar floor provides for a service dining room, refrigerating plant, trunk rooms, wine room, elevator motor room, filter space, lockers, help's barber and tailor shops, blower room and switch board room. In the refrigerating plant are two twenty-five ton ice machines, one of which is held in reserve, the other being operated from exhaust steam at a very low pressure. There are also fifty cold storage boxes cooled with brine. One high pressure system operates the cold storage boxes located on each floor, another of low pressure takes care of the basement, kitchen and butcher shop. All ice is made from filtered water. Four filters of two hundred gallons capacity, with coagulating tank for feeding the alum solution, purify all cold water used throughout the building. The filters consist of an eight-inch layer of screened gravel over specially equipped strainers, all of which is directly beneath three feet of filtering sand.

Three floors underneath level of main entrance is located boiler room containing three boilers of seven hundred and fifty horsepower, coal bunkers, elevator space, vacuum cleaners and tanks, thermostatic pumps, twenty thousand gallon suction tank operated by two air compressors, pit for oil buffers and hot water tanks. All toilet and bath rooms are supplied with hot water by means of the thermostatic system. Two heaters operated from exhaust steam at about four pounds pressure supply three thousand gallons of hot water per hour from 50 to 160° F., one supplying every need below the ground floor, the other everything above. All lower sewerage is taken care of by means of automatic compressed air cast-iron ejecters with a capacity of two hundred and fifty gallons each at a pressure of thirty pounds.

In the sub-basement are found four fresh air fans of the multi-vane type. One supplies all the basement and service quarters, another the ball room, oak room, bar and smoking room; the third is a general supply fan providing for rest of building, including the palm court, lobby, main dining room, etc.; the last or rotating fan with fresh air connections to the wine cellar and grill room, the latter having an exhaust into the service dining room. Fresh air intakes are supplied with air filters consisting of steel frames and galvanized wire netting covered with cheese cloth. A fresh air supply fan with independent exhaust fan at roof is arranged for the kitchen and boiler room with adjustable iron swivel ducts. Bath and toilet rooms have a fifteen horsepower exhaust; ball room has two forty-two inch exhaust fans; all other rooms to the first floor have a sixty horsepower motor capable of discharging ninety thousand cubic feet of air per minute.

The radiator system consists of seven hundred vertical sectional patterns with thermograde valves and auto valves which prevent all escape of steam.

The corridors throughout are finished with cement floors having marble borders and base, duresco ceilings and walls, heavy Wilton carpets of tan shade with dark borders. Elevator doors into each corridor are made of the double process chipped wire glass excepting at basement, ground and mezzanine floors, where are installed mirror doors.

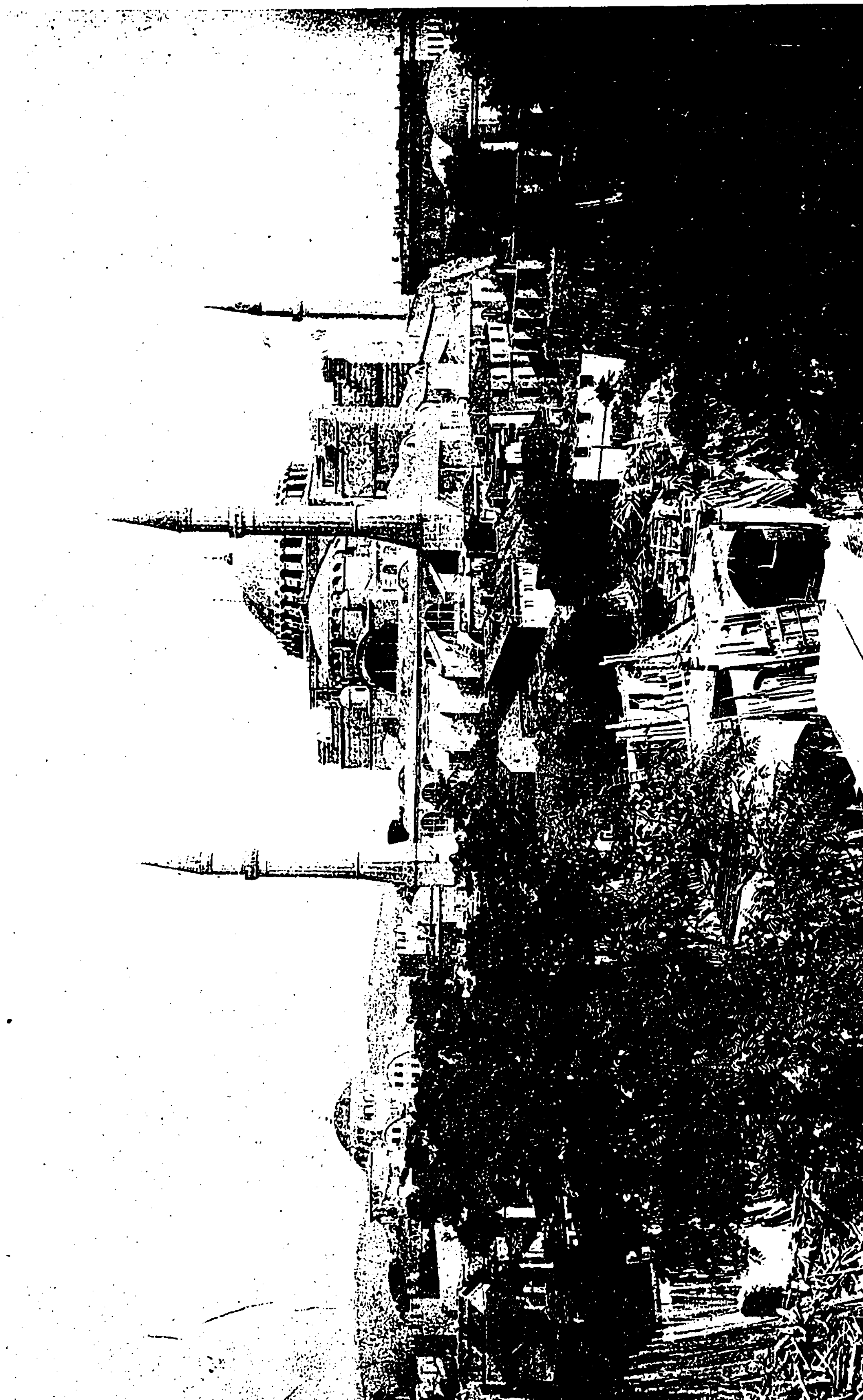
BED ROOM.

The building is fireproof throughout, with all floors laid in cement and all partitions of gypsum blocking and metal furring. The approximate cost of entire building is $2,000,000.

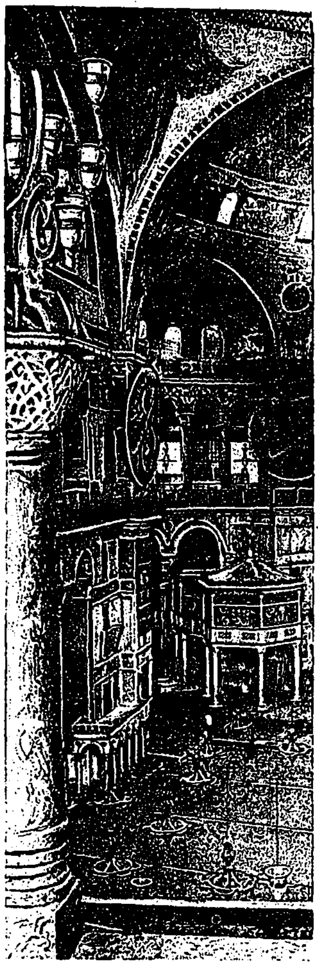
Among the contractors who materially assisted in the equipment and finish of the hotel are R. De Vigan & Co., of Montreal, makers of artificial Caen stone cement; the Lautz Company of Toronto, dealers in foreign and domestic marble; Otis-Fensom Elevator Co. of Hamilton, Ont., makers of elevators; William Rutherford & Sons Co. of Montreal, wholesale and retail dealers in all branches of millwork; and J. & J. Taylor, Ltd., of Toronto, manufacturers of safes. Architects, Warren & Wetmore.

The other hotels erected by the Ritz-Carlton Hotel Co. are located in London, Paris, Madrid, Lucerne, Naples, Rome and Evian-les-Bains, in Europe; New York, Philadelphia, and Montreal, in North America; Sao Paulo, Rio de Janeiro, Guaruja, and Buenos Aires, in South America. Restaurants of this company are established on the S.S. "Amerika," S.S. "Kaiserin Auguste Victoria" and S.S. "Imperator" of the Hamburg-American liners.

BED ROOM.



MOSQUE OF SANTA SOPHIA, CONSTANTINOPLE.



European Turkey—I.

Constantinople

F. R. MAJOR

Awake! for Morning in the Bowl
 of Night
Has flung the Stone that puts the
 Stars to Flight:
And lo! the Hunter of the
 East has caught
The Sultan's Turret in a Noose
 of Light.

—*The Rubaiyat of Omar Khayyam.*

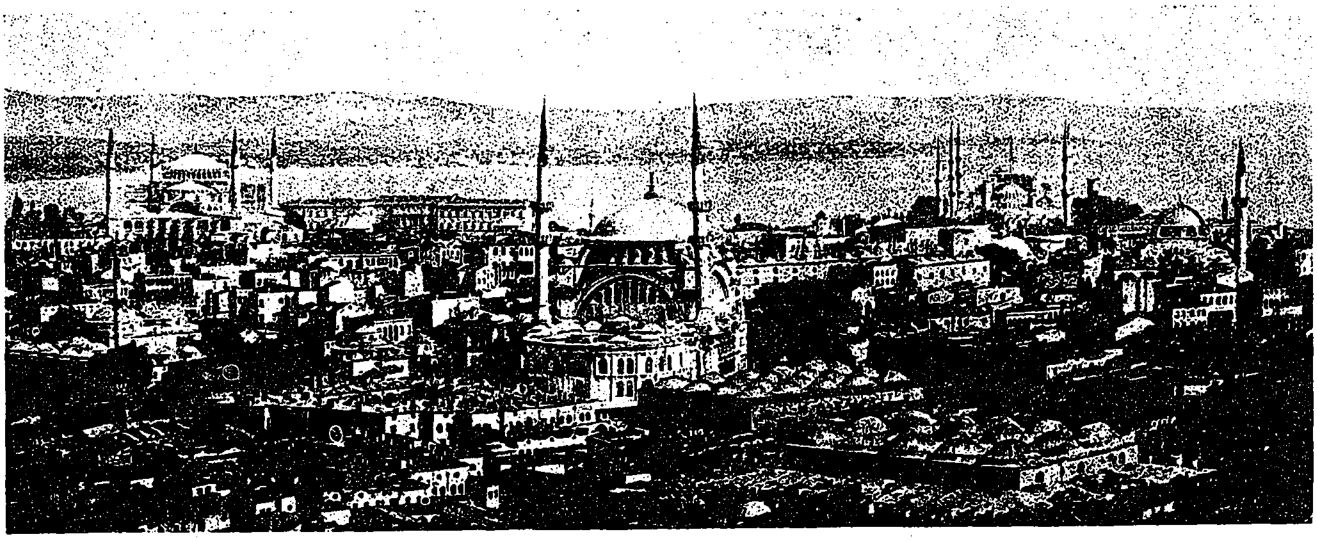
The Crescent, taken by the Mohammedans from the Christian Byzantine Empire, had already been taken by Christianity from Paganism. Constantinople first assumed the Crescent in 339 B.C. The attack of Philip, of Macedon, which was made on a dreary winter's night, was revealed by the howling of the dogs and shortly after by a meteor which lit up the Macedonian army. Saved by this miracle, the citizens erected a statute to Hecate the Torch-bearer and struck coins bearing her emblem, the crescent moon.

MILITARY FEUDALISM of European Turkey is at an end. The revolution of the Bulgarians, Serbs, and Greeks has protested emphatically against the many centuries of oppression and suffering. As the Balkan races fell in the fourteenth century through a divided interest, so have they failed to escape the cruelty of the Moslems for these hundreds of years. But at last driven to the extreme limit of endurance, they have formed a solid front and practically expelled the Turk from European shores. Will it be permanent? Or is it only momentary—for how often have they been driven to their very thresholds only to emerge again and again mightier than before.

The Turk possesses a remarkable amount of inactivity. We can scarcely attribute this to laziness even though one obtains this impression to a remarkable degree. Fine looking and well proportioned, they have a marked capacity for military discipline, hardships and privations in spite of their indolent disposition. Some one has said that this static condition of inactivity of the race is due to the fact that the Turk is too proud to be a laborer; too stupid to engage in any calling requiring unusual ingenuity and inventiveness, and that his religion inculcates a fatalism which is hostile to effort. His whole teaching has been to enjoy the rights of oppressing Christians, for in doing so he is carrying out the will of God. In religious matters, therefore, he is cruel, intolerant and vindictive, while his sympathies for music, drama and art are highly cultured.

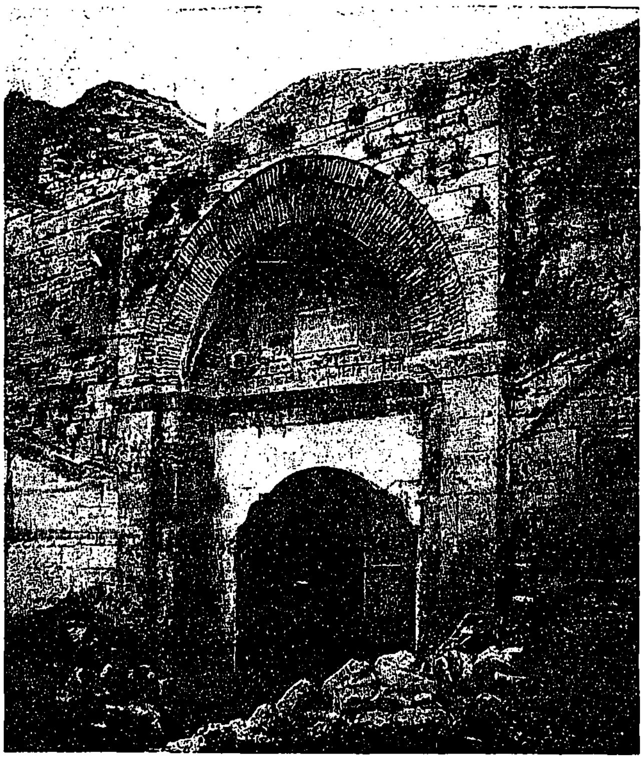
To-day Constantinople has practically a million and a half people, a third of whom are Turks, a fifth Greeks, and a like number of Armenians. The remaining consist of Jews, Bulgarians, Persians, Kurds, Gypsies, etc. The city itself is extremely dirty and alive with the repulsive diseases like scrofula and leprosy. The picturesqueness of its background and the charm of its architecture and customs hide so much of the objectionable. The streets are narrow, extremely crooked, and badly paved, but in spite of all this they are extremely attractive with the various types of nationalities and their variegated costumes. Imagine a congested scene of peddlers hawking their wares, slaves carrying all sorts of merchandise from baskets of fruit to pianos, women mysteriously veiled, pilgrims, donkeys, dogs, etc., etc.

In order to imagine ourselves in the midst of this, let's have Mark Twain tell us of a Constantinople street scene: "It was an eternal circus. People were thicker than bees in those narrow streets, and the men were dressed in all the outrageous, outlandish, idolatrous, extravagant, thunder-and-lightning costumes that ever a tailor with the delirium and seven devils could conceive of. There was no freak in dress too crazy to be indulged in; no absurdity too absurd to be tolerated; no frenzy in ragged diabolism too fantastic to be attempted. No two men were dressed alike. It was a wild masquerade of all the imaginable costumes—every struggling throng in every street was a dissolving view of



CONSTANTINOPLE, SHOWING MOSQUES OF ST. SOPHIA AND AHMED.

stunning contrasts. Some patriarchs wore awful turbans, but the grand mass of the infidel horde wore the fiery red skull-cap they call a fez. All the remainder of the raiment they indulged in was utterly indescribable. The shops are mere hen-coops, mere boxes, bath-rooms, closets—anything you please to call them—on the first floor. The Turks sit cross-legged in them and work, and smoke long pipes, and smell like—like Turks. That covers the ground. Crowding the narrow streets in front of them are beggars who beg forever, yet never collect anything; vagabonds driving laden asses; porters carrying dry goods boxes as large as cottages on their backs; peddlers of grapes, hot corn, pumpkin seeds, and a hundred other things, yelling like fiends; and sleeping happily, comfortably, serenely, among the hurrying feet, are the famed dogs of Constantinople."

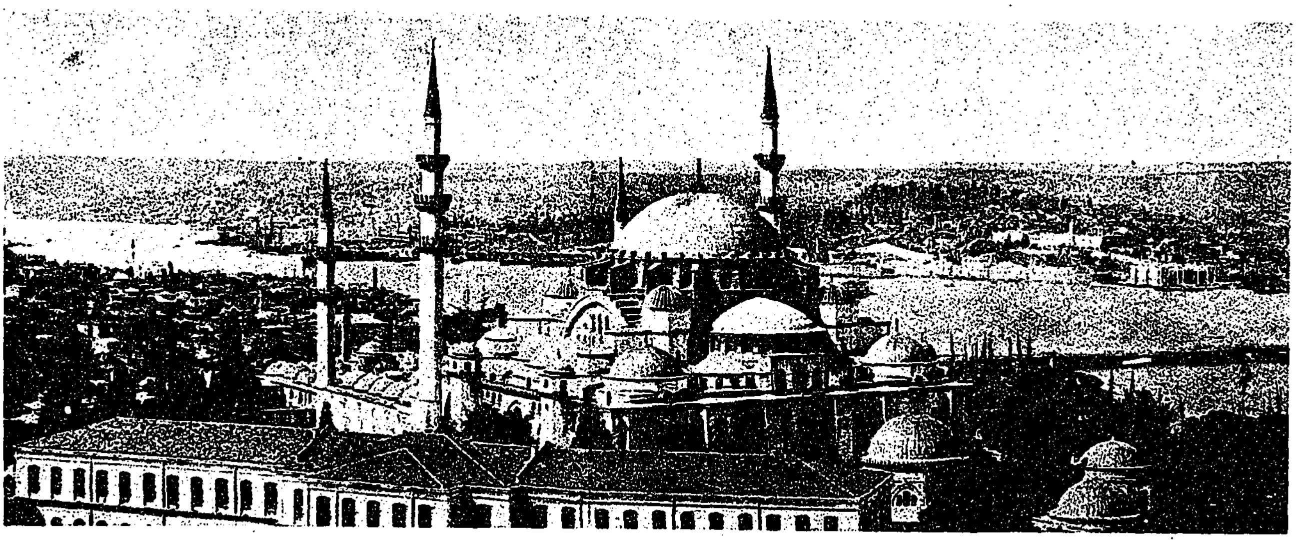


FIFTH MILITARY GATE.

It is difficult to picture such a remarkable change from the splendor of this city during the reigns of Constantine the Great, Justinian I., Mohammed II., and Suleiman the Great. Conquered, pillaged and burnt for centuries, she was rebuilt by these various rulers, who endeavored to make it the most magnificent metropolis in the world. And each one succeeded in his one supreme effort, bringing materials from all parts of the world which would adorn and beautify. No labor or expense was considered too great in restoring the old edifices and in erecting new ones. As a result of their enthusiasm and self glorification there are to-day three hundred and seventy-nine mosques, palaces costing as high as thirty million dollars, and fountains that vie in ornamentation and richness to the most elaborate in existence.

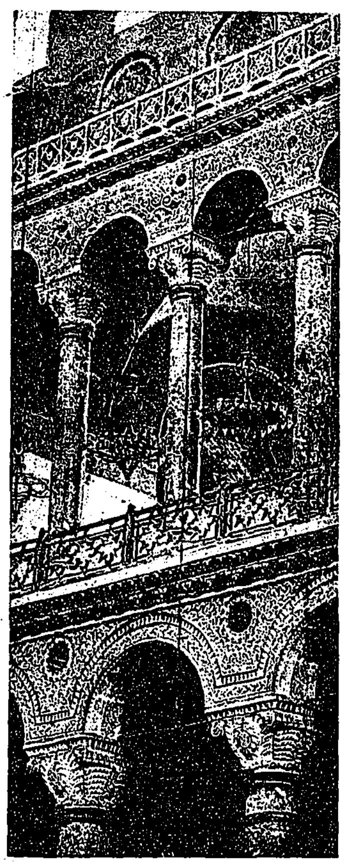
COLUMN OF CONSTANTINE.

In reviewing the growth of these remarkable structures, together with their architectural properties, we must constantly keep in mind the conditions under which they developed. Strange as it may seem, the Delphic oracle told the Greeks in the



CONSTANTINOPLE, SULEIMAN MOSQUE IN FOREGROUND.

eighth century B.C. to "Build ye opposite to the City of the Blind." Faithful to the command the galleys of the Hellenic race swept past the site of their blind forerunners and landed on the peninsula destined to become one of the most illustrious places in history. The "City of the Blind" was undoubtedly Chalcedon on the Asiatic shore opposite, which was founded six hundred and fifty-seven years before the Christian era. Byzantium, so called, arose on the seven hills commanding a beautiful view of the Bosphorus. And from her first settlement down to the present era this illustrious haven of political and commercial advantages has gone through a continuation of sieges and warfare unequalled in the history of the world and which exemplify the remarkable recuperating powers of her people.



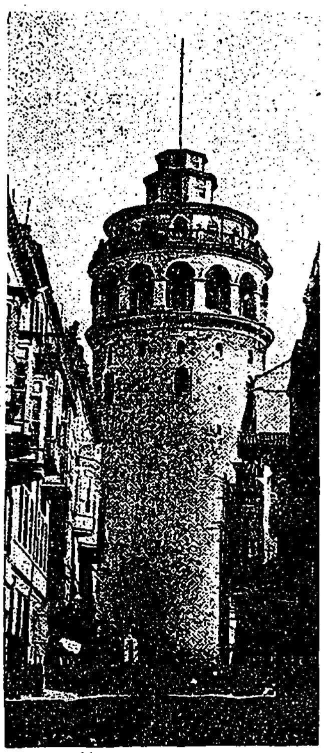
GALLERIES OF ST. SOPHIA.

One hundred years after the foundation of Constantinople there were two hundred and fifty large public buildings. The city had few rivals and readily became the terminus of the chief routes of the empire, with an annual revenue of $20,000,000. She boasted of the strongest fortress, the best equipped naval station, the greatest arsenal, in addition to being the centre of education and the Mecca for religion. Situated "at the meeting of two seas and two continents, like a diamond between sapphires and emeralds," it developed into a commercial focus. All this in spite of wars, the ravages of ferocious hordes, and internal strife. In 148 B.C. Byzantium became a Roman ally and was exceptionally rich in works of art. Through all her vicissitudes she religiously guarded the monumental structures as well as her other artistic treasures. The decision to take sides with the Syrian general in 170 A.D. led the Romans to sack the city and foolishly destroy her splendid fortifications. The alternate cruelties of the Romans and barbarians continued; captured by Darius; burned by the Persians; besieged by Philip of Macedon; destroyed by Septimus Severus —it managed to exist until Constantine the Great, ruler of the Roman empire, changed the name of

THE GOLDEN GATE.

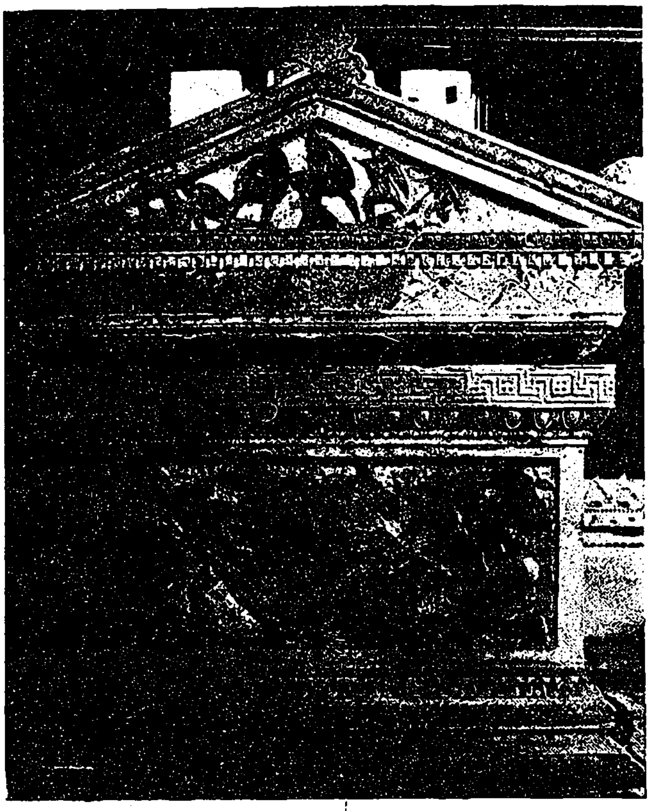
an indestructible monument to the living character of the great emperor who had inscribed on the base, "O Christ, Ruler and Lord of the world, to Thee I consecrate this obedient city and the sceptre and power of Rome! Guard Thy city! Guard it from every harm!"

The palace of Belisarius near the Adrianople gate is among the few ancient edifices remaining.


THE TOWER OF GALATA.

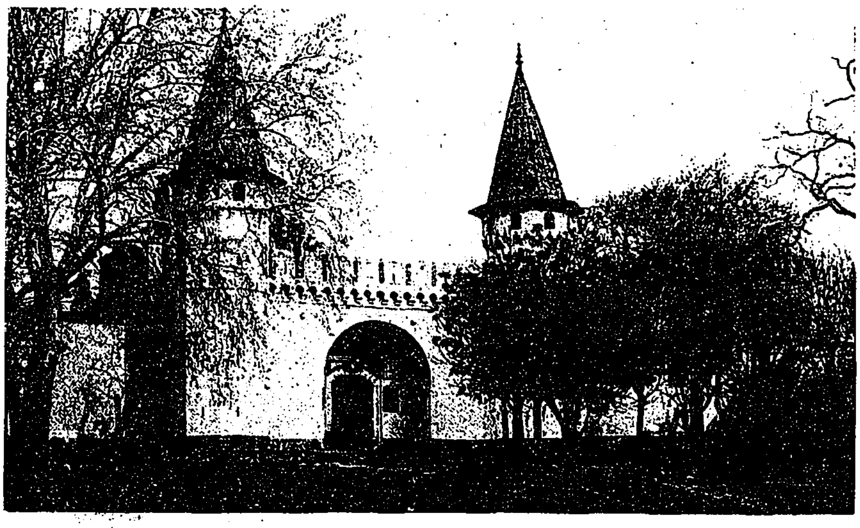
Stripped of its outer coverings, it is still most impressive and contains several examples of delicate carvings most exquisite in design. There is much to admire and study in this one massive example of Byzantine architecture which still exists. The underground palace and the cistern of Binbirdirek are attributed to the skill of Constantine. The former rests on three hundred and thirty-six white pillars with Corinthian capitals. The latter, called the "Thousand and one Pillars," is arranged so that the pillars form aisles beneath the overhead arches. Monograms of Constantine the Great are to be seen upon the bricks built into the arches as well as into the shafts of the columns.

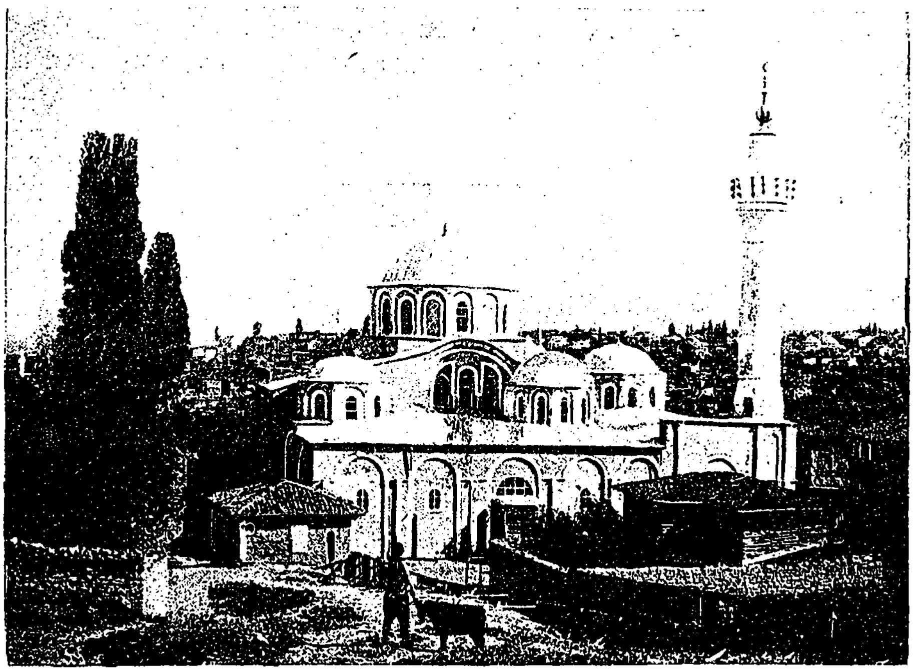
The rulers succeeding Constantine down to Justinian I. did little to advance the realm of architecture. Valens is noted for the aqueduct, parts of which are still in use, although it presents little else than a picturesque ruin with its Gothic arches covered with vines. Theodosius I. celebrated his victories with a memorial hall graced with delicately carved columns. Arcadius lives through the splendor of his court. Theodosius II., 408-451, designed the Golden Gate after the Triumphal Gate of Rome. It was an entry for all conquerors who were to be honored for victories both at home and abroad. The Turks living under a tradition that by means of this gateway some Christian monarch would conquer Turkey, had it walled up. A few columns of a greenish tint and massive towers are still in evidence. Anastasius built the great wall extending from the Sea of Marmora to


SARCOPHAGUS OF ALEXANDER THE GREAT.

the Black Sea and which became a vital factor in the safety of the city afterwards.

Under the reign of Justinian I., A.D. 527-565, his government extended over Italy, Illyricum, Africa, islands of the Mediterranean and part of Spain; the legal reforms were far-reaching in their scope; churches, basilicas, monasteries, fortresses, hospitals arose everywhere. The greatest monument was the Church of the Divine Wisdom, which is considered the most perfect specimen of a Christian Temple. In Anthemius of Tralles he had one of the world's greatest architects. Two hundred fortresses and military towers were built in the Balkan provinces alone. The long wall of Anastasius was repaired, the summer palace of Heraeum erected


ENTRANCE OF THE OLD SERAGLIO.



ANCIENT GREEK CHURCH OF KHARIA.

Byzantium to Constantinople and made her the capital of the civilized world, 330 A.D.

According to St. Augustine: "Throned in the Hippodrome, ever to be the centre of Byzantine life, Constantine gave thanks to God for the birth of this fair city, the daughter, as it were, of Rome herself." The new emperor aimed to make his capital the grandest city ever known and succeeded to no small degree in carrying out his chief desire. Magnificent edifices, theatres, baths, palaces, and churches arose as if by magic. Adorned as they were by the treasures from Rome, Syracuse, Athens, Delphi and Antioch, they represented the artistic creations of all nations. Private houses sprung up all over the city, while fountains, aqueducts and porticos showed the prosperous state of affairs existing at that time.

But how little remains of the Hippodrome in the great forum of Constantine which held one hundred and twenty thousand people. Here were proclaimed the emperors, awards bestowed upon the victorious leaders, criminals and heretics punished, and sportive festivals inaugurated to feed the brutal desires of the populace. Now one finds only the Serpent Column, the Egyptian obelisk and the burnt pillar. The Serpent Column belonged to Greece over twenty-three hundred years ago and commemorated the final defeat of Xerxes. It is the greatest metal relic of ancient history, wound around by three serpents on whose coils are inscribed the cities which participated in the battle of victory. The heads were destroyed by a subsequent conqueror.

The syenite obelisk, sixty feet high, was brought from Heliopolis by Theodosius, and contains bas-reliefs depicting scenes in the Hippodrome during the fourth century. The Latin inscription tells of the difficulty in raising the column with its marble and granite base:

"To raise this four square pillar
to its height,
And fix it steady on its solid
base,
Great Theodosius tried, but
tried in vain.
In two and thirty days, by Proclus' skill,
The toilsome work, with great applause, was done."

The column of Constantine the Great was raised by him on the spot where his tent stood during the siege of Byzantium. It originally consisted of ten drums of porphyry, each one of which were ten feet high and eleven feet in diameter. The joints were concealed by bronze laurel wreaths. A white marble pedestal held the column topped by a statue of Constantine himself by Phidias. Injured by an earthquake in 1012, numerous fires and a collapse during the reign of Comneus, it now presents a wrecked appearance. This "burnt column" is the source of legends and superstitious beliefs and exists

EGYPTIAN OBELISK AND SERPENT COLUMN OF HIPPODROME.

with magnificent gardens and the old Byzantine palace restored. The old Byzantine church founded by Justinian possesses a spirit and action in the decorations unusual in works of that period. It contains some remarkable mosaics and frescoes of the fourteenth century.

Although San Sophia was founded by Constantine the Great and rebuilt by Theodosius, considerable credit must be given Justinian I. for this magnificent temple, so much of which still remains. It is hard to realize the historical and religious importance of this edifice which caused Justinian to exclaim, "God be praised, who has esteemed me worthy to complete this work! O Solomon, I have even surpassed thee!" Four white minarets added by Mohammed II., 1453, rise above the white and rose-colored walls. Upon the interior one hundred and seven gigantic and beautiful pillars of green marble and red porphyry support the four arches which in turn uphold the illustrious dome with its forty windows. These marble columns were imported from Phrygia, Egypt, Rome, Athens, the Cyclades and elsewhere. In its entirety it is a temple of marble, metals, ivory, pearls and cedar gathered from the entire world and stands a living monument to the skill and artistic nature of its creators. The previous conflagrations persuaded Justinian to use little wood. He enriched the walls with mosaics; made the doors of silver gilt, ivory, amber and cedar; laid the pavement in marble so veined as to present the appearance of water flowing through. Enormous green disks with pious inscriptions in gold are hung to the upper gallery, while the cartouches lower down are of porphyry bearing the names of Allah, the Prophet and his Caliphs. Ferguson says: "The eye wanders upwards from the large arcades of the ground floor to the smaller arches of the galleries, and thence to the smaller semi-domes. These lead the eye to the larger, and the whole culminates in the great central roof. Nothing, probably, so artistic has been done on the same scale before or since. So far as the interior is concerned, no Gothic architect ever rose to the conception of a hall one hundred feet wide, two hundred and fifty feet in length and one hundred and eighty feet high, and none ever disposed each part more artistically to obtain the effect he desired to produce. In fact, compare it as we may with any other buildings of its class, the verdict, internally at least, is that San Sophia is the most perfect and most beautiful church which has yet been erected by any Christian people."

MARBLE TOWER BY THE PROPONTIS.

The tower of Galata is a hollow cylinder with walls twelve feet in thickness and stairway leading to the top. This white fortification was built by a Christian emperor and originally had a large cross at the summit which was destroyed by Mohammed II., who in turn crowned the apex with a tapering cone.

Among the many interesting treasures found in the Imperial Museum of Antiquities is the sarcophagus of Alexander. This is one of the finest examples in the museum and considered to be the best relic of ancient art. Among other works found here are the tomb of Tabnith, various inscriptions, a head of Minerva, Byzantine and Persian pottery and glass.

The triple wall will be discussed in next article.

BYZANTINE TRIPLE WALL.

In connection with the foregoing article it might be well to mention certain books bearing on the life, customs and characters of the Turks, dealing particularly with life in Constantinople. Some of these from an architectural standpoint are very valuable, and any or all of them would make excellent works of reference in connection with Turkish life.

The first, "The Thousand and One Churches," by Sir W. M. Ramsay and Miss Gertrude M. Bell, contains hundreds of illustrations dealing with ancient churches and buildings throughout the Turkish peninsula. In some instances ground plans and details are also given. When the author visited the thousand and one churches, along with the late Sir Charles Wilson, in 1882, he hoped that some attention might be given to these ruins, which are perhaps the most interesting in Asia Minor for church antiquities. He had not the knowledge of architecture, however, needed for the task, and therefore did not re-visit the spot. Some years later Sir William Ramsay sent a letter to the Athenæum in reference to a proposed trip which attracted the attention of a Miss Bell, who, being very much interested in the architectural features, arranged to join Sir William Ramsay and his wife in making the tour. The result is very gratifying, particularly from an architectural standpoint, and the book will prove of extreme value to every lover of art. The work contains 580 pages, and, as has been before mentioned, is profusely illustrated. The price is $3.00, postpaid.

The next book to be mentioned is "The Sultan and His Subjects," by Richard Davey. This work embodies the results of an earnest attempt to set forth the chief characteristics of those heterogeneous nationalities which, in process of time, and by virtue of conquest, have fallen under the dominion of Islam. The work deals with the Ottoman and Christian subjects of the Sultan generally, but chiefly with the Turks of Constantinople. The book gives an intimate knowledge of the life and manners of the Turks, and of the Eastern Christians, and of their religious and political views.

To show the interest of the volume a few of the chapter headings may be quoted: "A Saunter by the Walls of Constantinople," "Round and About Stambul," "In the By-ways of Modern Stambul," "In the Hareem," "The Sultan's Court and Hareem," "Brief History of Reform in Turkey," "Sancta Sophia," the last named chapter being an important one from an architectural standpoint. The price of this book is $1.50, postpaid. The volume contains over 500 pages.

A third book to be reviewed is "The Revolution in Constantinople and Turkey," a diary, by Sir W. M. Ramsay, with episodes and photographs by Lady Ramsay. Sir William Ramsay, when taking the train for Constantinople, resolved to take a record of what he saw and heard in events that seemed likely to be historical, and day by day, in train or steamer, cab or club, the diary was written. It was reproduced in this volume, improved in expression, but unchanged in meaning. This work was written in 1909, and of course primarily referred to the revolution which was taking place at that time in Constantinople. On account of the present condition in Turkey this volume has a great historical significance. The revolution was a phase of the long conflict which has been waged throughout historical memory between Asia and Europe. It resulted in introducing European science and order into Turkey, and was essentially patriotic. Sir William Ramsay at the time of writing had a very strong belief in the true patriotism and noble purpose of the many leading young Turks, and of the movement generally. Now that the young Turk party is particularly in the ascendancy in Constantinople this volume is of very particular interest.

A very interesting feature of Sir William's experiences in Turkey was that in connection with the transaction of business. He states that there is no country where business is done with so little loss of time, although, as he says, there is infinite delay if you try to obtain from the Turks what they do not wish to give. If you go direct to the Turkish official, he says, and deal straight with him, and make him feel sure you have no hidden motive, things often arrange themselves in a few minutes, but our Western red-tape and unreal forms are an abomination to him, and he loves to foil official requests, which he believes to be all deceptive, a belief in which he is too often justified. This work contains some 34 very interesting illustrations of life in Turkey, and is published at $3.00 net postpaid.

A very interesting volume is that entitled "Turkey and the Balkan States, Described by Great Writers," by E. Singleton. In this volume has been gathered together what has been said by the great writers, in connection with Turkey and the Balkan States. It makes a most interesting collection for general reading.

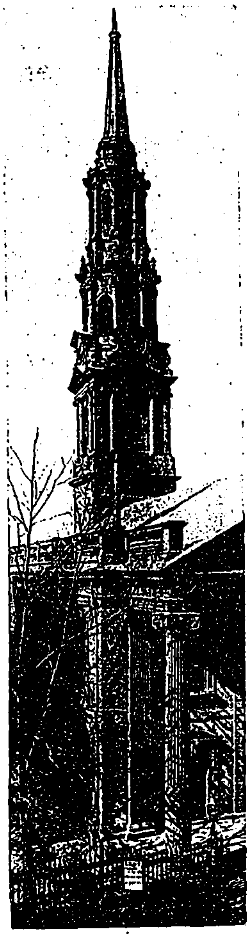
A beautifully illustrated work is that by F. G. Aflalo, entitled "Rebuilding the Crescent." This contains 24 illustrations taken from photographs and a map. The price is $3.00.

A book rather intimate with court life in Turkey is entitled "In the Palaces of the Sultan," by Ira Seamour Dodd. The price is $4.00.

A book which gives a good idea of domestic life in Turkey, is one written by L. M. J. Garnet, and is titled "Home Life in Turkey." The price is $1.75. "Behind Turkish Lattices," by H. D. Jenkins, is a volume which gives intimate descriptions of Turkish home life also.

Sir W. M. Ramsay, in his "Impressions of Turkey During Twelve Years Wandering," gives his reminiscences of life as he has seen it in various parts of the Turkish empire during his many and varied journeys. The price of this book is $1.75.

Any or all of the above mentioned books can be ordered from William Briggs, publisher, 29-37 Richmond street west, Toronto.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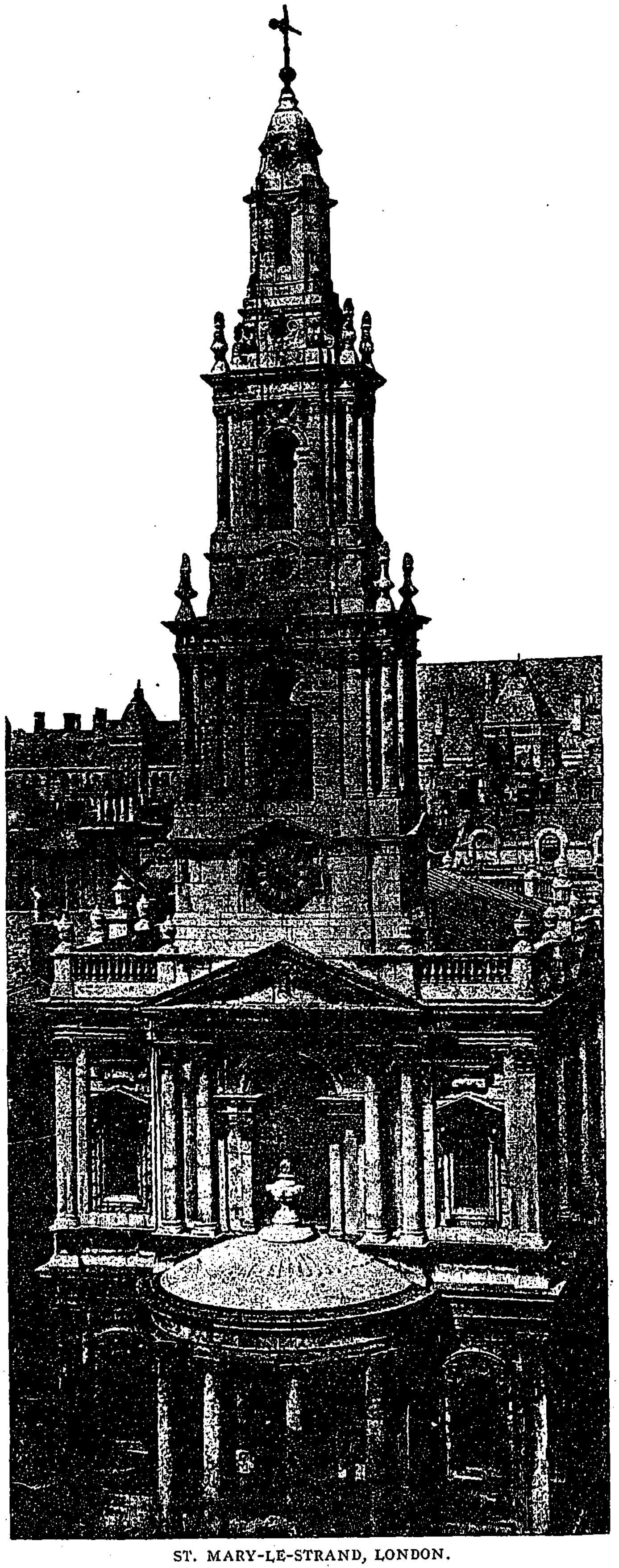

ST. MARY-LE-STRAND, LONDON.


ST. JOHN'S, NEW YORK.


ST. PETER'S CHURCH, PHILADELPHIA.

DETAILS OF
SPIRES ON COLONIAL CHURCHES.


ST. MICHAEL'S CHURCH, CHARLESTON, S.C.

Colonial Architecture—III.

THOMAS W. LUDLOW, M.A.

THE first places of public worship to be built in the colonies were plain and severe in the extreme. In the natural reaction which always follows such a course, buildings which were unmistakably churches began to be erected, copying closely the type established by Wren. These are oblong in plan with four or six round-headed windows on each side, a pediment with a bulls-eye window at either end, a tower with a graceful tapering spire more slender, perhaps, than its London prototype rising through the roof, and in New England two front doors recalling the quaint social custom of seating the men and women on opposite sides. Their details are rather free in their classic treatment. In the smaller towns and villages these structures are usually of wood, clapboarded or shingled, while in the cities they are more substantially built of brick or stone.

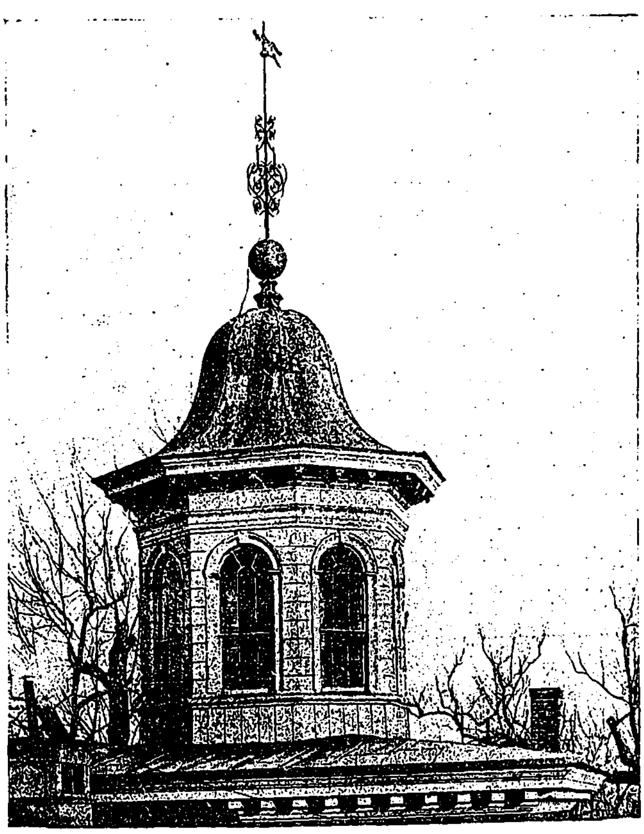
The towers are their most prominent features and, like Wren's, the scheme is simple; a square base above which are several contracting, usually octagonal stories terminating in a steep spire. The lower stories are treated with orders, cornices, pediments, balustrades and large scrolls used with much variety, though often rather awkwardly.

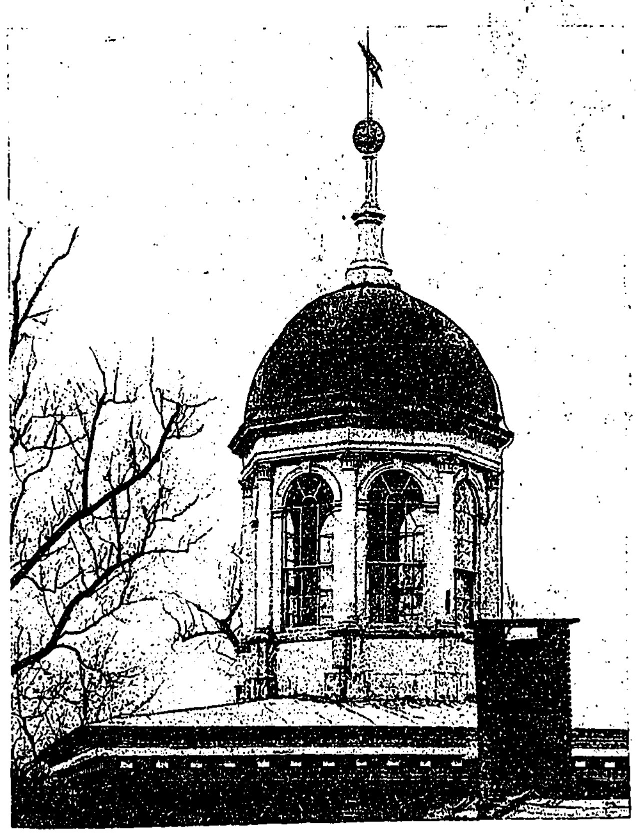
The interiors also closely follow English models and show the system adopted by Wren and his successors of the column carrying an ugly and irrelevant fragment of entablature, which serves as the impost of the arch. On the whole the interior details are more correct than those on the exterior, because the amateur architect, who always designed these structures, was assisted in the execution by the mechanics. "Indeed it is noticeable throughout the whole colonial period, at least the politically colonial period, that the carpenters were much better trained than the stonecutters, and the woodwork habitually betrays the result of this superior training, being at once more correct in design and very much more accurate in detail than the stonework, in the comparatively few instances in which classic detail was attempted in stone."*

Christ Church, at Philadelphia, was built between 1727-31, with the tower completed in 1754 from a design drawn by Dr. John Kearsbey, a physician. It is a plain, pleasing brick structure with a not ungraceful wooden spire without orders; the chancel has a square end in which there is a very effective Palladian window. At the end of erection it was by far the finest building in the colonies.

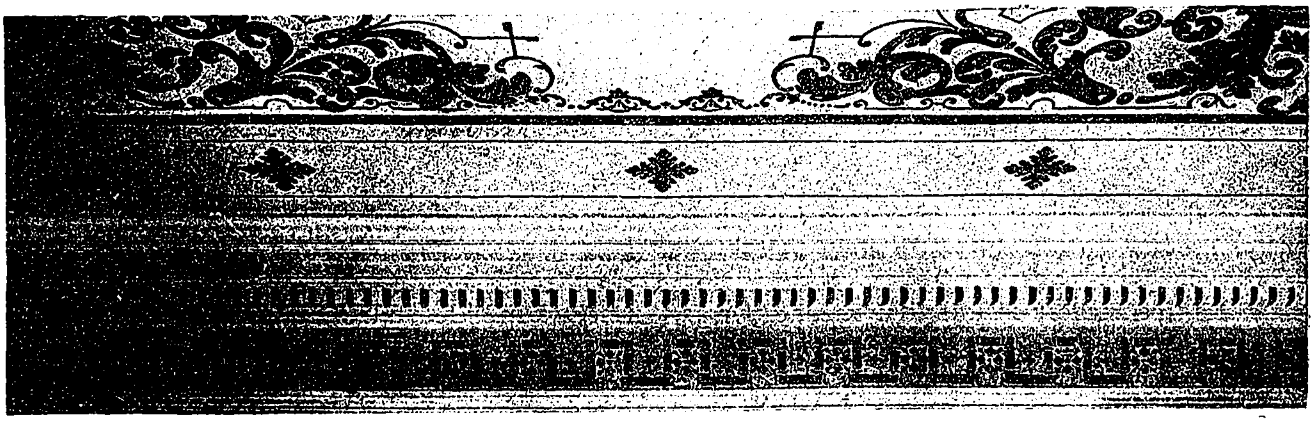
The life of the Southern planter was more devoted to luxury and ease than to any especial religious zeal; consequently he built but few churches of any note. The best two examples are both in Charleston, St. Michael's and St. Philip's. St. Michael's,

*Montgomery Schuyler: "A History of Colonial Architecture."



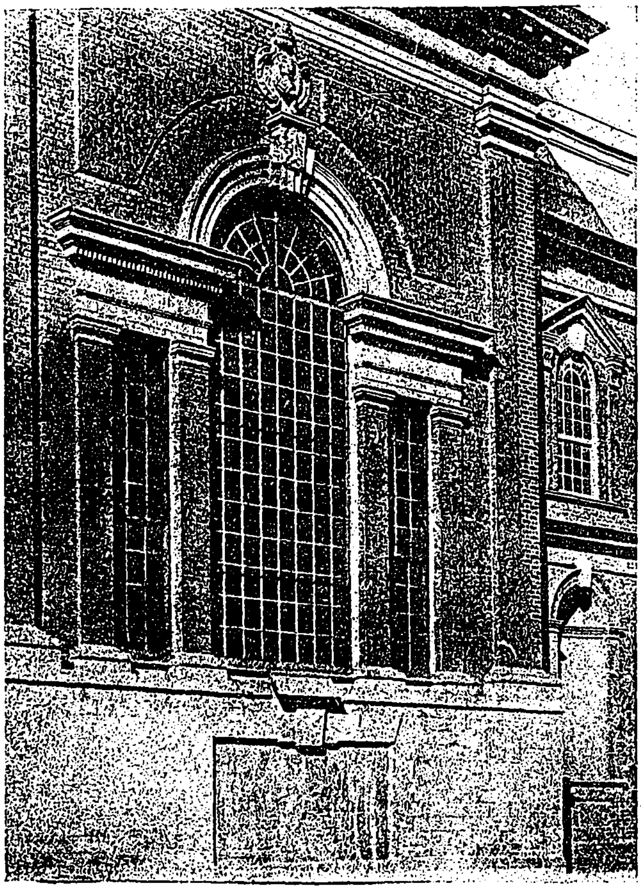


1755 CUPOLAS, PENNSYLVANIA HOSPITAL, PHILADELPHIA. 1796.



CORNICE DETAIL, VESTIBULE, CITY HALL, NEW YORK CITY.

the larger and more pretentious of the two, was commenced in 1752 from a set of plans drawn presumably by James Gibbs and brought over for the purpose. The South Carolina "Gazette" of February 22, 1752, says in describing the proposed edifice: "It was to be erected from designs drawn by Mr. Gibson, an Englishman." The addition of the "son" on the end of the name can readily be accounted for by an editorial error, as no eighteenth century architect by the name of Gibson has been handed down to posterity. The church is 130 feet long by 60 feet wide, having a square tower and steeple 168 feet high rising from separate foundations. A beautiful portico with four colossal Doric columns, supporting a pediment, projects from beyond the tower. Although older than St. Michael's, having been



DETAIL OF CHRIST CHURCH, PHILADELPHIA.

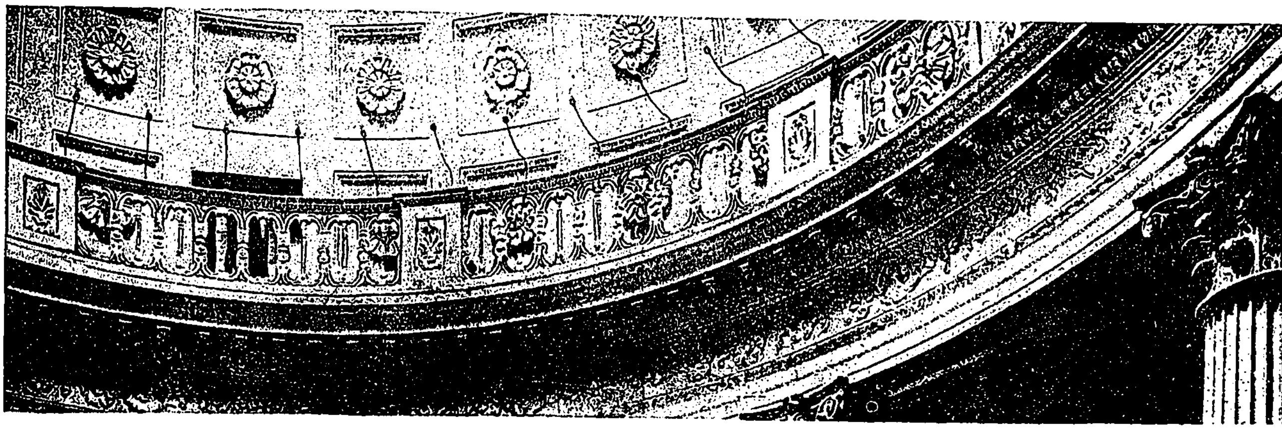
built in 1733, St. Philip's is very similar, although the tower is not quite so high or so slender and the details are coarser, points naturally expected on earlier buildings.

New York can still boast of two ecclesiastical structures of colonial times, the chapels of St. Paul's and of St. John's, Varrick street, belonging to Trinity parish. Both of the Trinity chapels are of the Wren type. The older one, St. Paul's, was built from 1764-66 by McBean, a Scotchman, supposed to have been a pupil or assistant of Gibbs from the strong resemblance between the interior of this chapel and St. Martin's-in-the-Fields. The other, St. John's, by John McComb, was built from 1803-7. The chancel and choir are very effective, the architecture of each being distinctly marked. The towers of these chapels are quite similar, being slender and graceful compositions. That of St. Paul's is the most pleasing, as it is the more slender and tapering. The porches of these churches differ greatly, the little two-columned entrance to St. Paul's is just as insignificant as the high Corinthian portico of St. John's is colossal and overpowering.

The public buildings prior to the Revolution are, with few exceptions, of little interest, owing, no doubt, to the poverty of the colonies, to the difficulty of obtaining sufficient grants from the Crown, and to the speed with which they necessarily had to be built to fulfil their especial requirements.

In the post-revolutionary structures the classical spirit predominates, and a reflection of the more refined qualities of the Louis XVI. are to be seen. This is perhaps illustrated in the New York City Hall as well as in any other structure.

John McComb, mentioned above in connection with St. John's Chapel, and the architect credited with the design of the City Hall—1803-12—was an ardent admirer of Sir William Chambers and the Adams, the influence of whom is to be seen in this great work: the former in its monumental design and the mechanical perfection of the work, and the latter in the delicacy of its ornament and the lack of depth and breadth of the reveal. In plan the building consists of a central pavilion, two wings, and a pavilion at each end. It is two stories high, raised



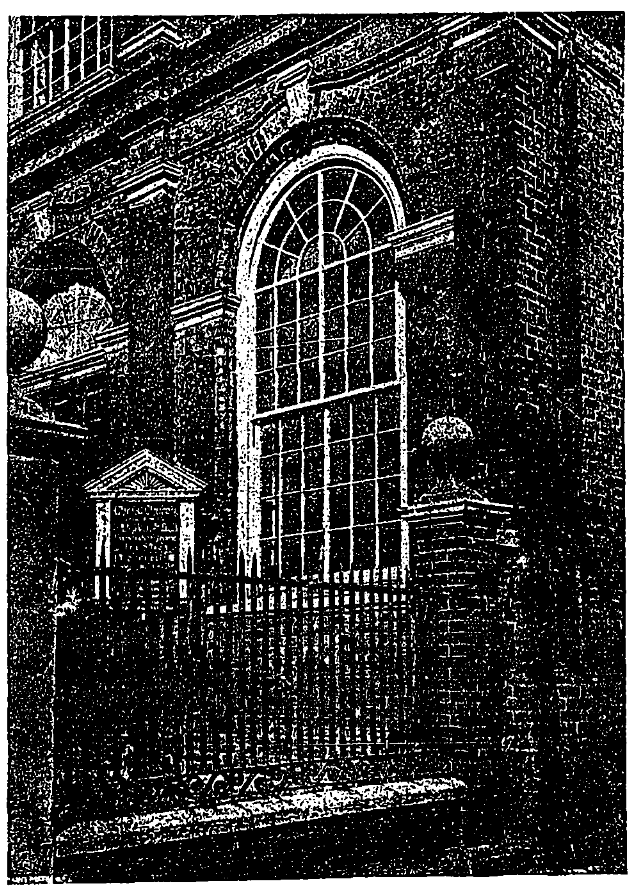
BALCONY IN ROTUNDA, CITY HALL, NEW YORK CITY.

on a rusticated basement and is marble on three sides. It was building from 1803-12.

The first educated American to devote himself to the profession of architecture was Charles Bulfinch, born in Boston in 1763. After his graduation from Harvard in 1781 he spent three years studying in Europe, and on his return entered seriously upon his career. In 1795 he was appointed architect to the new Massachusetts State House, which, with the exception of the Federal Capital at Washington, was the most monumental building then projected in the States. In general composition it is very successful and consists of two stories above a rusticated basement. The flatness of the wings, the slight reveal in the openings and the treatment of the details are purely colonial, while the arrangement of the centre, where a colonnade is superimposed above an arcade for the first time in America, is distinctly French and recalls some of Mansard's work at Versailles. Another innovation is the placing of the pediment on the sub-structure of the dome instead of over the colonnade. by this means an awkward juncture between the base of the dome and its supporting mass is skilfully overcome. The general excellence of this structure is remarkable considering the date of its erection, and it remains to-day a dignified and creditable public building. It is still worthy of the position it holds as the inspiration for classical domed state capitals many of which have since been built.

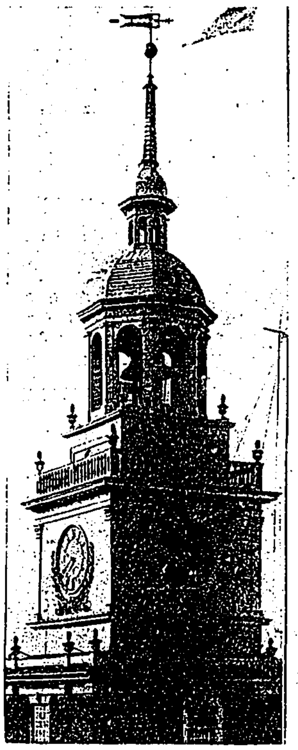
In this new country, where everything was at first struggling for existence, the influence of Jacobean architecture was barely felt, but later as the people gained in strength and numbers the Renaissance was becoming stronger in England. Inigo Jones returned from his studies in Italy full of enthusiasm for Palladio's work and at once found favor for his classical designs. This movement, now fairly begun in the mother country, was carried to its height and continued throughout the eighteenth century by a brilliant group of men like Wren, Vanbrugh, Hawksmore, Gibbs. Campbell, Taylor, the Adams, Chambers and others. The influence of these men was felt over a large sphere and the work of the contemporary amateur and carpenter architects in the colonies reflected their ideas, while striving to live up to and improve upon their standard. Therefore the richest and most interesting period of colonial architecture is included between the lives of Wren and Chambers.

Many of the architectural folios then published found their way across the Atlantic, and it is to them that the graceful, well studied work of the period is largely due. Classical details were used by every carpenter with beautiful results without a too superstitious reverence for the rules in the Italian textbook. As far as it is possible to ascertain, the names of the books in common use, together with the author's name, during the colonial period were as follows: Robert and James Adam: "Works in Architecture," three parts, 125 plates, London, 1773-1822. A. and R. Banjamin: "The American Builders' Companion," 44 plates, Boston, Mass.,



DETAIL OF CHRIST CHURCH, PHILADELPHIA.

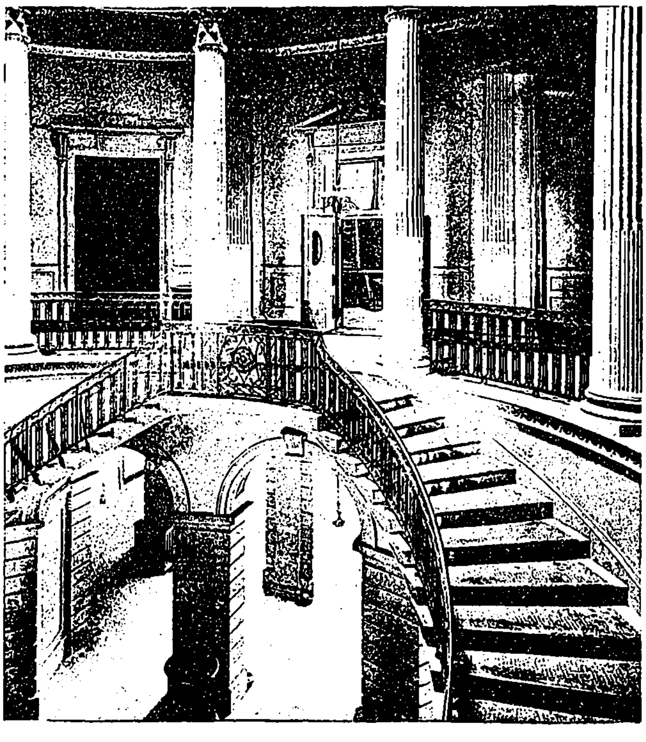
1806. Asher Benjamin: "The Rudiments of Architecture," Boston, Mass., 1814; "A Handbook of Architecture," Boston, Mass., 1834; "The Country Builder's Assistant," Greenfield, Mass., 1796. C. Campbell: "Vitruvius Britanicus," London, 1715-25; "The Builder's Dictionary, or Gentlemen's and Architects' Companion," 33 plates, London, 1734. James Gibbs: "Rules for Drawing the Several Parts of Architecture," London, 1753. Inigo Jones: "Designs Consisting of Plans and Elevations for Public and Private Buildings," London, 1770, published by Wm. Kent. Inigo Jones and others: Designs published by Isaac Ware, London, 1756. Batty Langley: "The City and County Builder's and Workman's Treasury of Designs," 200 plates, London, 1756. B. and T. Langley: "Builders' Jewel," London, 1763. Thomas Langley: "Builders' Jewel." James Norman: "The Town and Country Builders' Assistant," etc., 59 plates, Boston, England, 1786. William Paine: "The Practical Builder or Workman's General Assistant," 83 plates, Boston, England, 1792. Sir John Sloane: "Sketches in Architecture," 52 plates, London, 1793. A. Swan: "The British Architect or Builders' Treasury of Staircases," etc., 60 plates, London, 1745. Isaac Ware: "A Complete Body of Architecture," London, 1756.


INDEPENDENCE HALL, PHILADELPHIA.

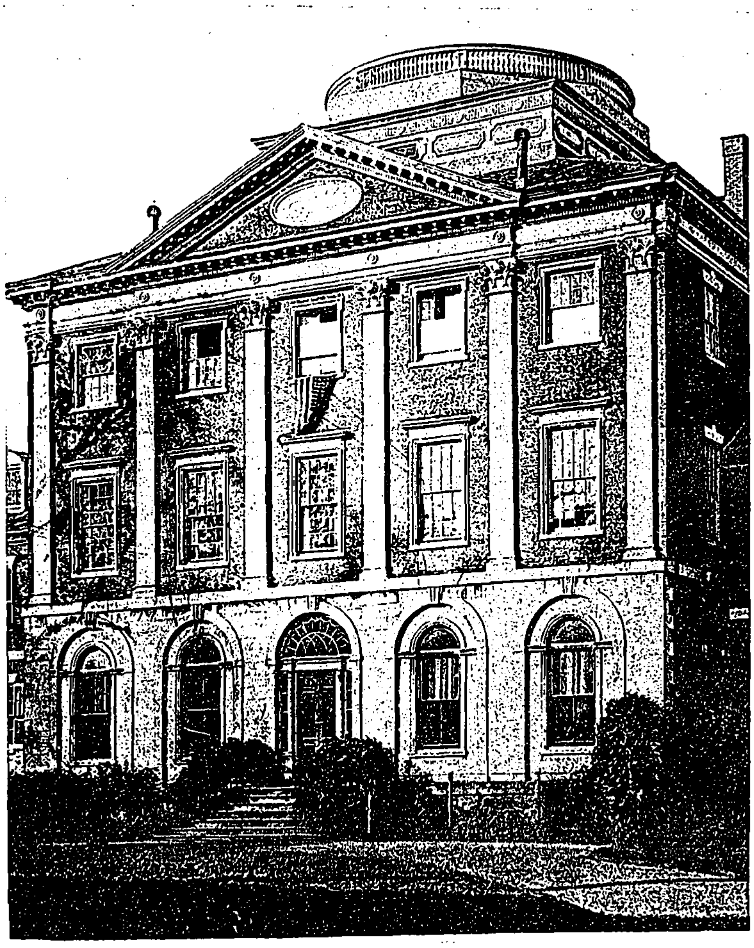
On account of the triple association with architect, contractor and carpenter, which every builder had with each house, there are but few instances where names have been preserved, either by tradition or in old records. The few names that do remain, given in the following list, are either those of amateurs or men of late date, when architecture was beginning to be recognized as a profession: John Allys (1666-1700), churches at West Springfield, Hatfield and Hadley, Mass.; John Ames (1814), churches at Ashfield and Northboro, Mass.; Asher Benjamin (1790), Carew and Alexander houses at Springfield, Hollister house at Greenfield, West Church at Boston, Colton house at Agawam—all in Massachusetts; Peter Banner (1810), Park Street Church at Boston, Mass.; Joseph Brown (1775), First Baptist Church and Providence Bank, Providence, R.I.; Chas. Bulfinch (1790-1835), State houses at Boston, Mass., and Augusta, Me, court houses at Worcester and Cambridge, Mass., State prison at


ENTRANCE TO VESTIBULE, CITY HALL, NEW YORK CITY.

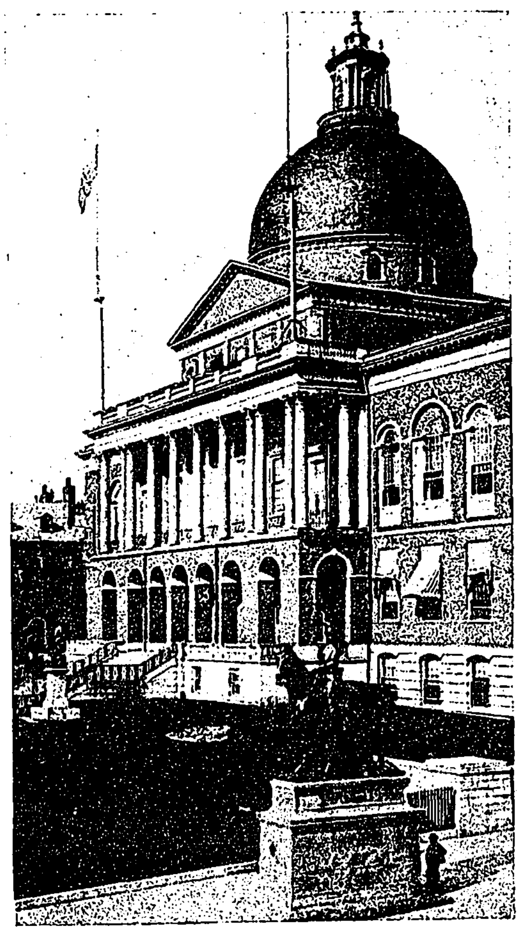
Charleston, Mass., Massachusetts General Hospital at Boston, Mass., University Hall at Cambridge, Mass., New North Church at Boston, Mass., meeting-houses at Pittsfield, Weymouth, Trenton and Lancaster, Mass., at Peterboro', N.H., and many other buildings not now standing, associated with the National Capitol from 1817; Joseph Clarke (1772-1785), State house, Annapolis, Md.; Isaac Damson (1804), First Church at Northampton, First Church at Springfield, church in Pittsfield, court houses in Pittsfield and Lennox, North Church in Ware—all in Massachusetts, bridges across the


ROTUNDA, CITY HALL, NEW YORK CITY.

Connecticut River at Charlestown, N.H., Springfield and Chicope, Mass., and the Penobscot, Hudson and Ohio Rivers; Duff (1744), McDowell Hall, Annapolis, Md.; John Elderkin (1660), First Church and parsonage, New London, Conn.; James Gibbs (1714-1754), St. Michael's Church, Charleston, S.C.; John Greene (1814), First Congregational, Episcopal and First Universalist Churches, Providence, R.I.; Geo. Hadfield (1795), Federal Capitol, Washington, D.C.; Stephen Hallet (1793), Federal Capitol, Washington, D.C.; Andrew Hamilton (1735), Independence Hall, Philadelphia, Pa.; Peter Harrison (1760), Christ Church at Cambridge, Mass., town market, Redwood library and Jewish synagogue at Newport, R.I.; Davis Hadley (1812), North Church, New Haven, Conn.; James Hoban (1794-1831), Federal Capitol and White House at Washington, D.C., State Capitol at Columbia, S.C.; Philip Hooker (1813), Boys Academy, Albany, N.Y.; James Hyde (1835-1840), rebuilding St. Philip's Church, Charleston, S.C.; A. Insti (1750), decorative iron work in Charleston, S.C.; Thomas Jefferson (1817), University of Virginia, Moticello and Farmington, near Charlotteville, Va.; Ebenezer Johnson (1815), United Church, New Haven, Conn.; Dr. John Kearsbey (1727), St. Bartholomew's and Christ Church, Philadelphia, Pa.; B. H. Latrobe (1803), Federal Capitol, and east portico, St. Paul's Chapel, at New York city; Richard Mundy (1783), town hall, Newport, R.I.; McBean (1764), St. Paul's Chapel, New York, N.Y.; John McComb (1803-1815), St. Paul's Chapel and City Hall, New York, N.Y.; Samuel McIntyre (1806-1820), South Church and several houses, Salem, Mass.; Edward Pell (1721), North Church, Hanover street, Boston, Mass.; Samuel Rhodes (1770), Pennsylvania Hospital, Philadelphia, Pa.; John Smibert (1742), Faneuil Hall, Boston, Mass.; Robert Smith, Carpenter Hall, Philadelphia, Pa.; William Spratz (1776-1778), Deming house, Litchfield, Conn., and Cowles house, Farmington, Conn.; Dr. Wm. Thornton (1793-1800), the Federal Capitol and the Tayloe house, Washington, D.C.; "Woodlawn," near Mount Vernon, Westmoreland county, Va., and the Philadelphia Library, Philadelphia, Pa.; Robert Twelves (1730), South Church, Boston, Mass.; George Washington (1793), additions, wings and outbuildings at "Mount Vernon," Westmoreland county, Va.; Diedrick Werner (1750), decorative ironwork in and out of Charleston, S.C.; Judah Woodruff (1769-90), Gay house, Congregational church, Cowles house, Hooker house, Whiteman house, Norton house—all in Farmington, Conn.; Sir Christopher Wren (1665-1728), court house and first buildings of William and Mary College, Williamsburgh, Va.



PENNSYLVANIA HOSPITAL, PENNSYLVANIA.



STATE HOUSE, BOSTON.

CONSTRUCTION

A · JOURNAL · FOR · THE · ARCHITECTURAL ENGINEERING · AND · CONTRACTING INTERESTS · OF · CANADA

FREDERICK REED, Editor

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CONTRIBUTIONS—The Editor will be glad to consider contributions dealing with matters of general interest to the readers of this Journal. When payment is desired, this fact should be stated. We are always glad to receive the loan of photographs and plans of interesting Canadian work. The originals will be carefully preserved and duly returned.

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CURRENT TOPICS

PLANS for a $3,500,000 penitentiary at Joliet, Ill., have been prepared by W. C. Zimmerman. The main features of this structure will be: Sunshine in every cell; constant supervision of prisoners from one central point; circular cellhouses connecting with a general dining hall; outside cells for each prisoner with separate heating and ventilation arrangements, assuring the maximum effect for the health of the inmates; connection of all buildings within the walls by corridors.

* * *

GERMANY has found concrete a worthy material for steam and hot-water radiators. The hygienic quality is the one commanding marked attention among architects and builders. Of a porous nature, they furnish moisture as well as heat to the air, at the same time heating more quickly and cooling more slowly than radiators of other substances. Special gypsum moulds or iron castings receive the necessary mixture of cement and sand, making a wall thickness of approximately ⅜ inch thick. The radiators can be made in all possible forms and shapes.

C. L. MORGAN, R.I.B.A., of London, will open offices for the practice of architecture in the Davis Chambers, 615 Hastings street west, Vancouver.

* * *

A MONUMENT to General Wolfe will be erected by the Battlefield Commission to replace the one which now stands on the Plains of Abraham at Quebec.

* * *

D. W. F. NICHOLS and J. Pender West have formed a co-partnership for the practice of architecture under the firm name of Nichols & Pender West. Their new offices are at 911 Somerset building, Winnipeg.

* * *

BERTRAND & CHAMBERLAIN, architects, have opened an office in the Walter Scott building, Moose Jaw. Their present work consists of the Moose Jaw Engineering Works, Ltd., the Metal Securities and the proposed Citizens Hotel.

* * *

THE CITY HALL Committee of the London, Ont., council have decided to purchase immediately the property selected for the new Federal Square scheme. An expenditure of $250,000 will be necessary for a large part of the block bounded by Dundas, Waterloo, King and Wellington streets. The work is progressing rapidly and augurs well for the civic improvement of this city.

* * *

GEORGE A. ROSS, A.R.I.B.A., of the architectural firm of Ross & MacFarlane, recently dissolved, and Robert H. Macdonald have formed a co-partnership under the firm name of Ross & Macdonald. Their new address will be Beaver Hall Hill, Montreal. A considerable amount of the more important work of the firm now dissolved will be carried to completion by Ross & Macdonald.

* * *

AT THE ANNUAL meeting of the Quebec Association of Architects, held recently, the following officers were elected for the ensuing year: President, J. E. P. Dussault; first vice-president, W. F. Maxwell; second vice-president, Jos. Perrault; secretary, J. E. Vanier, and treasurer, Hugh Vallance. An interesting survey of the year's work was given by Mr. Dussault, president of the Quebec City Section.

* * *

IN THE INAUGURAL address of Mayor Euler, Berlin, Ont., a progressive policy was urged in regard to civic improvements. The new mayor cited the necessity of planning for a city of fifty thousand people; recommended a city planning organization; the completion of the tuberculosis sanitarium, a new city hall, public comfort conveniences and permanent road improvements along the leading streets.

Wind Pressure on Buildings

ALBERT SMITH, M.W.S.E.*

IT IS, OBVIOUSLY, of the first importance to base practical assumptions upon experiments performed in the open air,—that is, in an air channel of infinite cross section,—and upon such a number of models as to show the influence of the shape of the building upon the distribution of the pressure.

In the fall of 1911 the writer laid out the plans for the model building shown in Plate III. and the pressure-reading apparatus shown in Plate I. It will be noted that the model building has three different roof slopes, auxiliary base sections which give three height variations, and is built in two length sections, giving three different lengths of model. In all, then, there were twenty-seven different models used. While the range of three variations is not a large one, it was expected that the variations of distribution due to shape would be fairly regular, and that three would suffice.

It was regarded as certain that the maximum wind effects would be found at the middle of the longitudinal dimension of each model, and it was accordingly determined to test three points in each wall and each roof-slope at this section. Some of the models with 5 ft. and 6 ft. height of wall were tested at four and five points in the wall.

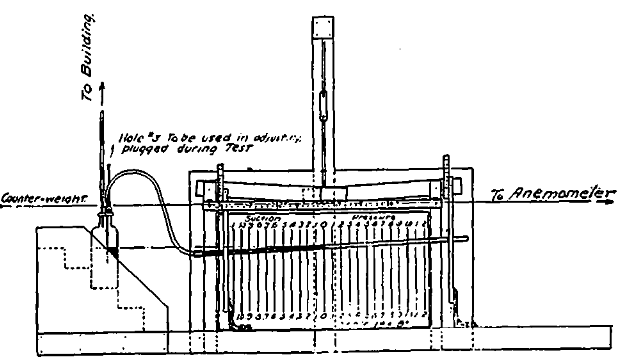


PLATE I.

Pressure reading apparatus. Battery of seventeen tubes and bottles, ½ in. center to center.

Small holes were bored in the wall and roof, and a brass nozzle was screwed into each hole, flush with the outside surface. On the inside end of each of these nozzles was attached a piece of ⅜ in. rubber tubing. These rubber tubes led, by means of a glass tube, through a rubber stopper into the air contained above the surface of the liquid in the bottles. (See Plate I.) By means of a rubber tube syphon, the liquid in the bottle was connected with the liquid in the glass tube shown in front of the scale. When the air pressure inside the bottles was the same as the air pressure in the end of the long glass tube, that is, the air pressure inside the building, the level of liquid was the same in the bottle as in the tube. If, however, during a wind, either pressure or suction was produced at the end of the brass nozzle in the wall, that pressure would be communicated to the surface of the liquid in the bottle. The level of the liquid in the long tube would then either rise or fall, and the amount of this rise or fall would be proportional to the amount of the pressure or suction exerted.

Seventeen such bottles and tubes were provided for originally, but only sixteen were installed. The tubes were placed in a vertical rack and were spaced accurately on ½ in. centers. The bottles were seated on sixteen small steps whose height varied by ½ in. Four were placed in one row, so that the end steps, shown in Plate I., have a 2 in. difference in height.

The heights of the ends of the tube rack were controlled by two horizontal levers whose positions were adjusted by means of the turnbuckle shown above the center of the rack. It is needless to say that great care was used to make the respective arms of these levers exactly equal. The liquid was then introduced into the bottles and syphons until the upper edges of the meniscuses of the liquid in the tubes were all brought exactly on the vertical line marked zero. (See Plate I.) The line of the meniscuses in the tubes should then remain vertical for any slope of the tubes produced by the turnbuckle. In practice it was found that this was the case, except for slopes very near the horizontal. All the readings were taken with a slope of 0.024 in 1, but the turnbuckle adjustment was used in order to be able to take readings in a 40 or 50 mile wind, if one should occur. The line of meniscuses was very nearly vertical for a slope as small as 0.01 in 1, but no attempt was made to utilize a wind requiring such delicacy.

While the apparatus was being set up, and during the first tests, there was some danger from frost, so that the tube rack had to be very carefully adjusted for level. This also made it necessary to use a liquid with a low freezing point. The liquid used was the water from the West Lafayette water works system, mixed with alcohol in the proportions of two to one.

The intensity of the pressure indicated by any given reading was determined as follows: Calling the fall of the liquid in the bottle H_1, and the rise in the tube H_2, and the scale length for 1 lb. pressure L. difference of level for 1 lb. per sq. ft. $= 12/62.5 \times 0.95 = 0.202$ in. where 0.95 is the specific gravity of the alcohol and water mixture.

$$\frac{L \times 0.21^2 \times \pi}{4} = \frac{H_1 \times 2.1^2 \times \pi}{4} \text{ or } H_1 = 0.01\ L$$

where 0.21 is the diameter of the tube, and 2.1 is the diameter of the bottle. $0.202 = L \times \tan \text{slope} + 0.01\ L$. $\tan \text{slope} = (0.202/L) - 0.01$. The

*Paper read before the Western Society of Engineers by Albert Smith, Professor Structural Engineering at Purdue University. Similar tests have also been made by Prof. Nipher of Washington University, St. Louis.

probable useful slope was estimated to be such that 1 lb.=8 in., giving tan slope=0.202/8—0.01 =0.015. With the tubes inclined at this slope, pressures could be read directly on a scale laid out to 8 in.=1 lb. per sq. ft.

When the first readings were being taken, it was demonstrated that with a slope of 0.015 the readings for some points of the model would not lie within the visible part of the tube during a wind exceeding 20 miles per hour. The tubes were accordingly adjusted to a slope of 0.024, but no second scale having been provided, the readings were taken with the 8 in. scale.

The original plan was for an apparatus without errors, which should show the true pressures at each point in the model by reading on the pasteboard scale behind the tubes. It was found, however, that the instrument, when put together as well as seemed possible at the time, contained tubes and bottles of varying diameter, and that some of the tubes were curved in the vertical plane. Since a correction was necessary for each reading before the results were diagrammed, it was thought just as well to let the observations taken with the 8 in. scale stand without repetition, and to take the rest of the observations with the same scale. The correction factors are discussed under the heading "Correction of Data."

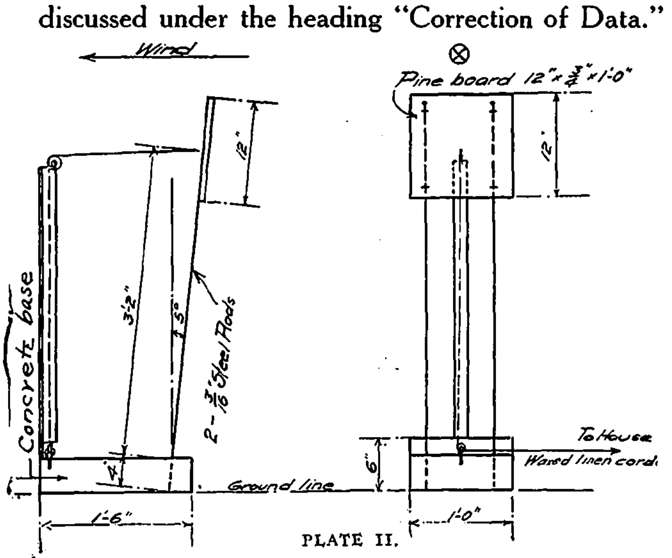


PLATE II.

Anemometer for indicating actual wind pressure.

The Pressure Indicator.

On the sample records will be noticed a narrow horizontal scale, above the tube scale, and in front of this scale will be seen a small triangular pointer. This scale gives pressure in pounds per square foot on a thin plate exposed at the end of the building. The pointer is carried on a thread running over pulleys at either end of the tube rack. At the left end the thread, after passing over the pulley, carries a small counterweight. At the right end the thread is carried around pulleys, out of the house, to the pressure indicator. The pressure indicator itself is shown on Plate II. Two 3/16 in. steel rods were imbedded in a heavy concrete base. A pine board whose area was 144 sq. in. for moderate winds (72 sq. in. for high winds), was attached to the upper ends of these rods. This target was so placed as to be at about the average height of the exposed surface of the models. From the target a thread led over a pulley down a covered channel and into the house. On a very still day the indicator was calibrated by hanging weights varying from 0.1 lb. to 1 lb., on a thread running from the target over a special pulley set up for the purpose. This latter pulley was about 3 in. in diameter to reduce the friction to a small quantity. A great many trials were made, going up and coming down the scale, to determine the scale length for 1 lb. pressure, and the resulting determination is believed to be without any appreciable error. This contrivance undoubtedly has some inertia, and will read too low at the beginning of its motion, a fault which it shares with the tube indicators, but it will also read too high at the end of its motion, which the other will not do.

The pressure indicator was designed to furnish a comparison of thin plate wind force with the forces on the building surfaces at the same instant. There are three conditions which tend to vitiate its showings: (a) The velocity of the wind which hits the target is greater than the velocity which is producing forces on the model. A large object produces such an increase of wind velocity around its edges that a small target exposed quite near to the large one will have a much greater unit force. (b) Since the size of the model varies very greatly the ratio of these velocities cannot be constant. (c) A very slight deviation of the angle of incidence of the wind from the normal to the side of the building produces a very large change in the amount, velocity, and direction of the air flowing around the ends of the building, and hence on the target unit-force. It was not possible to be sure that the wind during a test was not as much as 10° away from the normal, though with care we could be fairly sure that it was not more. From the results of Stanton's and Duchemin's tests on inclined plates, we are justified in inferring that the pressures on the buildings are not appreciably affected by a small variation in the direction of the wind, but increased or diminished amounts of air striking the target will evidently greatly affect the pressure-indicator readings.

The obvious remedy for these defects would be to remove the target to such a distance that the eddy around the end of the building would not affect it. It is not certain, however, how far out from the building the pressures during a gust may be regarded as uniform.

In future tests it will be necessary to get thin plate pressures some distance in front of the building by means of an observer stationed in a pit. The observations on thin plate pressure taken during these tests are, perhaps, interesting, but quite valueless for comparison with the building forces.

Records.

The original records consist of photographs taken of the instrument within the building while the wind was blowing. To make this possible the liquid was colored with a small quantity of safranin. After some trials, the least quantity which would make a clear photograph was determined, and it was found that this mixture did not stain the tubes badly during the tests. The rise of the liquid in the tubes was observed to lag somewhat behind the variations of the wind intensity, due to the damping effect of the water column. Care was taken in selecting the instant for exploding the flash light after the rapid increase of velocity of the gust had ceased, and before the correspondingly rapid decrease had begun. The pressure indicator, whose reading appears in the horizontal scale above the tube rack in all the records, which was quite sensitive to changes of velocity in the wind, furnished an excellent guide as to the proper time to set off the flash. This condition existed when both the pressure indicator and the meniscuses of the liquid columns were as nearly as possible at rest. In all cases two photographs were taken of each model shape. This was done to guard against a failure of the camera, and to furnish a check record of each shape with a wind of different intensity. Altogether, for ten of the twenty-seven model shapes there is only one good photographic observation. The intention of repeating these observations afterward was given up, because on comparing the duplicates in the other seventeen cases, it was found that the relative lengths of the tube readings remained almost exactly the same, even where the difference in wind velocity was large. After this comparison, if two photographs were of equal clearness the one taken with the greater wind velocity was used, and no use was made of the other, although it was preserved in the records of the tests.

Exposure of the Models.

The models were placed near the north edge of a large level field of the farm of the Purdue School of Agriculture. The nearest fence to the south or west was about 500 yards away. A quarter of a mile to the south is a railroad cut about 40 ft. deep and about 200 yards wide. At a distance of a quarter of a mile there were a few bushes, and the nearest trees were half a mile away. The country stretches off to the southwest and to the west in a level plane, broken only by the railway cut and a few small swales, until the nearest hill, about 50 yards high, is reached at a distance of about two miles. All the tests were taken with south and southwest winds, and for these winds the exposure seems as nearly perfect as it is possible to get in this part of the country. In a level plane of very great extent, it is probable that the diameter of the whorls of the wind would be much greater than here, and its structure, for limited areas, much more nearly uniform.

Construction of the Models.

Five members of the class of 1912 in the School of Civil Engineering of Purdue University, O. L. Canfield, D. C. Hayne, D. H. Miles, G. D. Miller, and C. W. Neu, selected the taking of these observations and reporting upon the same as a thesis assignment for the B.S. degree. These men constructed the model shown on Plate III. The covering material was of plaster board, except for the additional base sections, which were made of 1½ in. planks to secure stiffness. The plaster board was used in order to make the models light and easy to turn in a direction normal to the wind, and to make the changes from one to another shape of model easy. The lack of stiffness of the plaster board made it difficult to handle, and in spite of very thorough painting, inside and out, its lack of durability added greatly to the difficulty of the last tests, so that some other material will certainly be used for further tests. The problem in the framing of the models was to construct them so as to facilitate the change from one shape to another, while a high wind was blowing. Two boxes were first made, 6 ft. x 10 ft. and 6 ft. x 5 ft., both 4 ft. high, and open top and bottom. Four gables were made for each different slope, and one peak strut for the 10 ft. and one for the 5 ft. house. The gables fitted into seats at each end of each box, and were latched in place. The ridges were socketed into the gables, and were also latched. Both the 5 ft. and the 10 ft. roofs were made in four pieces each. Two pieces, 30 in. wide. came down on either side from the ridge, and below them, on either side, were the pieces which varied with the different roof slopes. In the 10 ft. house an intermediate truss was found necessary to prevent the covering from bulging. To exclude the rain and to secure reasonable air tightness at that point, the peak was covered with thin sheet lead, which was readily shaped to fit in place, and whose weight prevented the lifting of the roof at the peak, during any wind which was tested. One small door was made at the end of each house. The 15 ft. house, for which tests are shown, was secured by putting the 5 ft. and the 10 ft. house together. When this was done an open gable was put in instead of the two closed gables which would come together, thus securing uniformity of pressure conditions throughout the inside. When the first trial readings were taken, the amount of the suction on the lee wall was so much smaller than the pressure on the windward wall, that we began to search for an error. We finally decided that the building not being air tight, having indeed some very considerable cracks, the escape of the air at the ends of the building was causing the inside pressure to be unduly low, thus diminishing the suction observed on the lee wall. If the ends and roof were absolutely air tight, and the openings in the windward and leeward sides were equal, the inside pressure should be a mean between the pressure and suction on the walls. The ends of a building whose side is normal to the wind receive suction over their entire area, so the suction area of any building is very much greater than its pressure area. This fact tends, obviously, to make the inside pressure less than the mean between wall pressures and suctions. While no attempt was made to make the models absolutely air tight, the large cracks were stuffed up, and openings between the bottom of the building and the ground, due to slight inequalities of the ground, were filled with earth. The effect of this was to markedly increase the amount of the suctions. Openings were then made in both windward and leeward walls whose total area was 27 sq. in. The effect of these was to still further increase the suctions in comparison with the pressures. (See

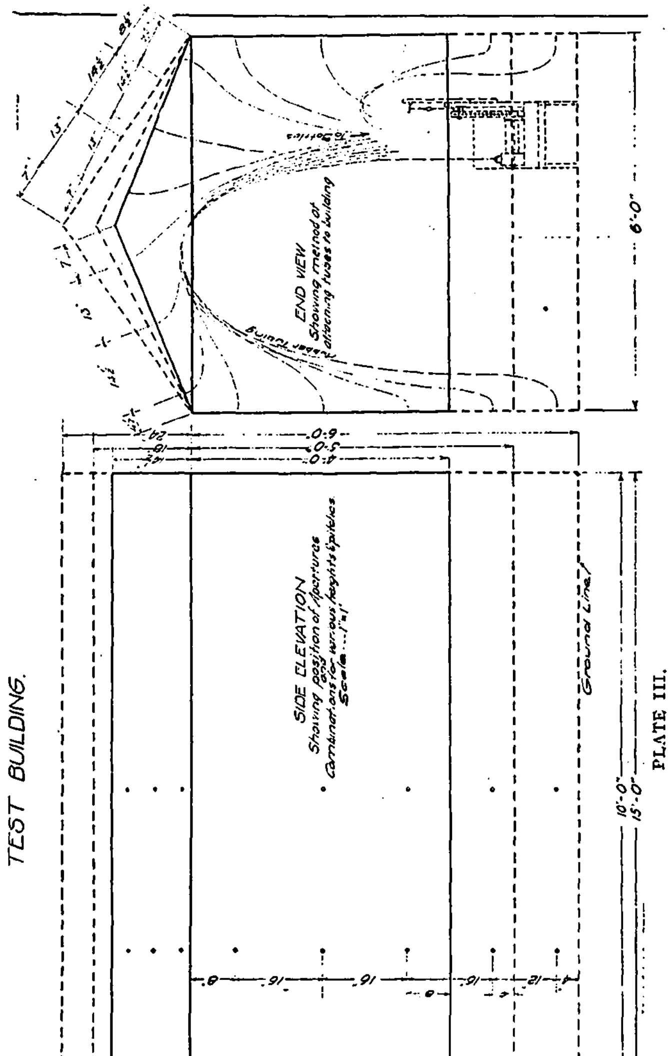


PLATE III.

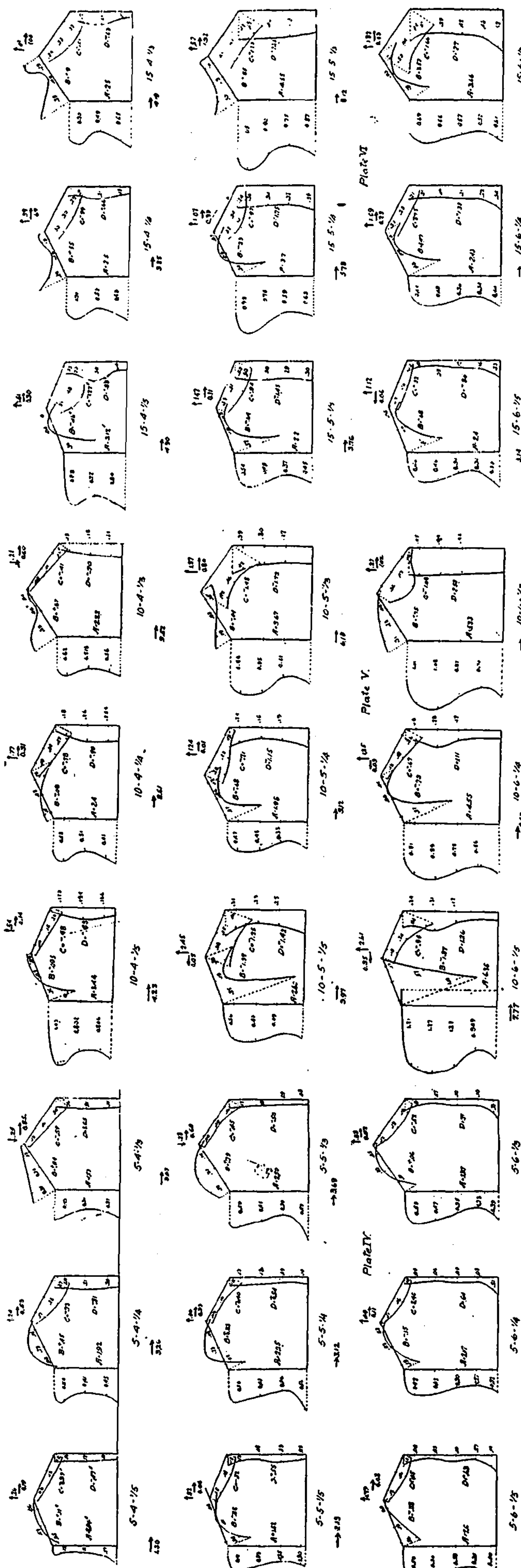


PLATE VI.

PLATE V.

PLATE IV.

Plate IX. The same plate also shows the effect of closing these openings on either side. Since our models were shorter in relation to their width and height than the ordinary building, it seemed best to approximate the conditions of a long closed building by leaving these openings in the walls, and thus secure more leakage through the walls than through the ends. No attempt was made to simulate the conditions of the buildings with louvres or open ventilator windows. A trial was made of the effect of opening the door in the end, during which the pressures were very greatly increased and the suctions nearly disappeared. The area of the door was about 15 per cent. of the area of one end. It is planned to make further tests under these conditions later.

Correction of Data.

There were two sources of measurable errors, for which correction factors were computed and applied. The error due to the change in the scale was combined with the error due to variation in the *diameter* of the tubes and bottles. The factors are given in the table following.

The glass tubes used in these experiments were the ordinary glass tubes supplied to chemical laboratories, and these were found to have not only variation of diameter but *curvature* as well. These sources of error were partially removed by selection, and that due to curvature was finally computed for each tube and each reading thereof, and the corrections applied to the data. The method of computation was as follows: Assuming the curve of the tube to be a parabola, we call the error in rise in the tube above zero point X, the reading in inches R, and the curvature ordinate at the middle C. We have, then, $X=R^2C/116.6$, where 116.6 is the square of the half length of the tubes, 10.8 in. Since the total difference in level for 1 in. reading is, theoretically, 0.034 in., the percentage of error will be $X/0.034\,R$, or, Error factor$=R^2C/116.6\times0.034\,R=RC/116.6\times0.034$. For a reading of one-tenth on the scale, and a curvature ordinate of 0.01 in. at center, this gives 0.002. For curvature ordinates of 0.02 in., 0.03 in., 0.04 in., 0.05 in., we have factors of 0.004, 0.006, 0.008, 0.010, respectively. For any tube, then, the proper factor multiplied by any number of tenths read, will give the correction to be applied to the diagram.

Table No. I.—Correction Factors.

Tube. No.	Curvature.	Diameter and Scale.
1	+0.0012N	1.42
2	+0.0022N	1.26
3	—0.0008N	1.35
4	—0.0028N	1.36
5	+0.0012N	1.26
6	—0.0018N	1.26
7	+0.0003N	1.29
8	+0.0024N	1.28
9	+0.0004N	1.29
10	+0.0020N	1.31
11	—0.0052N	1.23
12	+0.0050N	1.17
13	—0.0054N	1.26
14	+0.0020N	1.33
15	—0.0030N	1.29
16	+0.0024N	1.29

In the above table, the middle column gives the correction factor for curvature of the tubes. N is the number of tenths read on the scale. For small readings the value of these factors were all very small. The largest correction applied was about 3 per cent. The correction factors for the varying diameters and for the changed scale, were computed as follows: $L\times D_2^2\times\pi/4=H_1\times D_1^2\times\pi/4$ where L is the length on scale for 1 lb. force, H_1 the drop of the liquid in the bottle for the reading L, and D_2 and D_1 the diameters of tube and bottle respectively. Then $H_1=LD_2^2/D_1^2$ and, since the difference in height for 1 lb. force is 0.202 in., and the tangent of the tube slope is 0.024, $L\times0.024+LD_2^2/D_1^2=0.202$ in.

Solving for L and dividing 8 in. by the result, we have the correction formula: Factor$=0.95+39.6D_2^2/D_1^2$.

From this formula the values in the third column of the table above were derived.

Pressure Diagrams.

The corrected pressure readings were then laid out to a scale of 1 in.=½ lb. on diagrams of the models on Plates IV., V. and VI. Pressures were shown on the diagrams outside the building and suctions inside. The corrected force observation is marked at the point at which it was laid out.

Lines were then drawn connecting the ends of the force ordinates, and, beyond, to the edges of the different surfaces. The areas of the surfaces included by the different curves were then computed, giving the forces on a mid-section of each model 1 ft. in length. The total horizontal force on the 1 ft. section was then computed and noted below the diagram. Also the total horizontal and vertical forces on each roof were computed and noted above the diagram.

Accuracy of Observations.

The adjustment of the liquid to the zero point of the tube, which was accomplished by the addition or subtraction of liquid at the open end of the tube, was made within 0.01 lb. on the reading scale. This setting was found to endure from day to day when the apparatus was undisturbed, although moving the house and instrument often made it necessary to make new settings. The third hole in the bottle stoppers was opened after each series of observations, to check the return to zero. The percentage of error, from error in setting to zero might be very large in the case of small readings, but it is to be noted that the effect on the pressure area determinations is quite small.

A rather indeterminate error, which is believed, however, to be of small amount, in the relative values, comes into the readings from the lag of the instrument. Due to skin friction, friction of flow in the tubes, and the length of air column over which air pressure is carried, the instrument requires an appreciable interval of time to register pressures. This time interval was approximated as follows: The wall tube was disconnected, the position of the liquid in the tube changed five divisions on the scale by blowing and by sucking at the wall end, and the time of return noted. At the end of five seconds the meniscus had returned to 0.15; at the end of ten seconds to 0.05; at the end of fifteen seconds to

0.02; and at the end of twenty seconds to 0.01. The remainder of the return occupied more than a minute. If moved a lesser distance, the return in the same time was, of course, closer, and for a larger movement, farther away. If it had been possible to close the third holes in all the bottles simultaneously, just as a gust was reaching its maximum intensity, a correction could have been figured for the reading of each tube, and applied to the diagrams. This, however, did not seem to be practicable in this instrument.

It appears quite certain that the error of registration of tubes moving different distances is not proportional, but, due to the care taken to obtain readings after the gust had reached its maximum, the observers are confident that the error from this cause is within 2 or 3 per cent.

Another possibility of error comes into the pressure area determinations. It is obvious that between any two readings on the same surface the true pressure ordinates would have for their locus a smooth curve. There are many places, however, in which the curves might be laid out in a different manner from that used. At the top of the windward wall, for example, the readings give no clue of the rounded corner of the pressure area shown. It is certain,

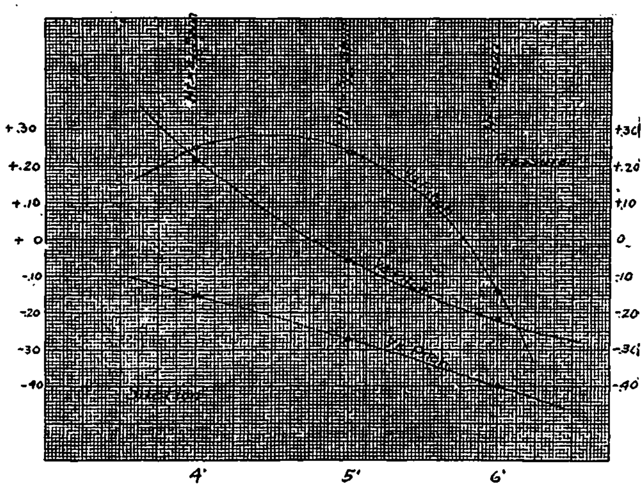


PLATE VII.

Amount of force on windward roof in terms of per cent. of unit pressure on both walls.

however, that on roofs where the lowest reading is a large suction, this suction continues down to the edge of the roof and is probably, as shown, even larger at the edge. Now this suction is due to the velocity head of the air, and it follows that the upper horizontal laminæ of the air in front of the wall have their pressure diminished by their nearness to this air current. It may be that the pressure passes through zero a little below the top of the wall, though the writer preferred the assumption illustrated. In a similar manner it was decided to curve the upper ends of the windward roof curve, when the leeward roof had forces of the opposite sign. Where the curves are irregular, as in some of the leeward walls, there is some chance for varying curves, but these variations of the curve give areas very little different from the ones shown.

It is to be noted that the lag error is almost entirely eliminated from the small readings, while on the other hand the percentage value of errors in area determinations will be smallest in the large readings.

Considering these various sources of error, the writer feels justified in claiming for the corrected force ordinates a relative accuracy such that they are within 3 per cent. of the truth, and for the pressure area determinations a final accuracy such that, when stated in terms of percentage of total horizontal force, they are not more than 2 per cent. away from the truth.

Since no use has been made of the absolute pressure amounts, although the observed data have been corrected to make them absolutely, as well as relatively, true, no discussion of accuracy in that respect is necessary.

Table II.—Tabulation of Pressure Area Relations.

Length.	Height.	Pitch.	Total Horizontal.	Windward Wall, Per Cent. of Total.	Leeward Wall, Per Cent. of Total.	Roof Horizontal, Per Cent. of Total.	Roof Vertical, Per Cent. of Total. +Up.
		1/5	1.30	49	36	15	21
	4 ft.	1/4	3.26	59	28	13	07
		1/3	3.03	51	22	28	—26
		1/5	2.13	71	26	03	39
5 ft.	5 ft.	1/4	3.12	72	17	11	02
		1/3	3.69	68	14	18	—08
		1/5	3.26	80	19	01	24
	6 ft.	1/4	2.82	73	23	04	17
		1/3	3.40	70	21	09	11
		1/5	4.23	81	15	03	13
	4 ft.	1/4	3.61	67	24	09	21
		1/3	3.52	63	20	17	—06
		1/5	3.97	65	36	—01	61
10 ft.	5 ft.	1/4	3.12	63	37	00	40
		1/3	6.19	59	28	13	22
		1/5	7.77	88	17	—05	33
	6 ft.	1/4	5.63	81	19	00	22
		1/3	8.93	60	29	11	03
		1/5	4.30	73	20	07	37
	4 ft.	1/4	3.85	65	17	18	10
		1/3	4.19	60	15	25	02
		1/5	3.76	59	38	03	39
15 ft.	5 ft.	1/4	5.78	64	30	06	19
		1/3	8.12	56	28	16	07
		1/5	3.14	77	25	—02	36
	6 ft.	1/4	4.04	60	34	06	27
		1/3	6.99	52	39	09	26

Comparison of Data.

Table II. shows the effect on each portion of the surface in terms of percentage of total horizontal force on the building.

Table III. shows the total vertical effect on the roof, in terms of percentage of total horizontal force on the building. It is especially interesting to note that this may be, for some shapes, as much as 61 per cent. of the total horizontal force.

Table IV. gives the total force on leeward wall in terms of percentage of total force on both walls. Both in this table and in Table III. the three vertical columns under each pitch are for the 5, 10 and 15 ft. lengths of building, respectively.

Windward Roof.—The ratio of unit pressures on the windward roof to the sum of the unit pressures on both walls was computed for the 15 ft. model. The result is shown graphically in Plate VII.

Table III.—Vertical Uplift in Percentage of Total Horizontal Force.

Wall Height.	1/5 Pitch.			1/4 Pitch.			1/3 Pitch		
4 ft.	21	13	37	7	21	10	—26	—8	2
5 ft.	39	61	39	2	40	19	—8	22	7
6 ft.	24	34	36	17	22	27	11	3	26

From the table above; the average of the 1/5 pitch figures is 30 per cent., of the 1/4 pitch, 17 per cent., and of the 1/3 pitch, .03 per cent.

Increases of height and length both tend to increase the amount of the vertical force.

Table IV.—Force on Lee Wall in Percentage of Total Force on Walls.

Wall Height.	1/5 Pitch.			1/4 Pitch.			1/3 Pitch		
4 ft.	42	16	18	32	26	21	30	24	20
5 ft.	27	36	39	19	37	32	17	32	33
6 ft.	19	16	24	24	19	36	23	32	44

Plate VIII. shows graphically the change in lee wall percentages for different heights of wall for the three pitches. Only the 15 ft. model observations were used in this plate. The curves for the 10 ft. length resemble these, although the points of maximum percentage are moved to the left, and are in the same order as to pitch. In the 5 ft. length of model the curves do not agree with each other so well or resemble so closely the curves of the 15 ft. model observations. The shape of these curves is given them arbitrarily, as the three points given by the observations do not completely locate them. There are some general conclusions which the pressure diagrams enable one to draw, and which guided the writer in making these curves.

(a) The increase of height of wall tends to decrease relatively the average amount of pressure on the windward wall. The decrease of wall height, while the roof height remains unchanged, tends to produce pressure on the windward roof. The pressures then do not pass through zero at the top of the wall, but at a point some distance up the roof, and the average on the wall is increased.

(b) The increase of height tends to increase relatively the average amount of suction on the leeward wall. The direction of the filaments, as the air leaves the leeward slope, is evidently an important factor in determining the suction on the leeward wall. The more nearly horizontal the direction of these, the greater will be the leeward wall suction. But the longer the roof, in relation to the height, the more nearly will the air filaments at the leeward eave be brought parallel to it. Turning these filaments into a direction parallel to the surface of the ground, develops a higher absolute pressure and therefore a lower suction, than when the filaments are more nearly horizontal. Where, then, the roof is long in comparison with the height, or, the span being constant, where the height is small in comparison with the span, the leeward suctions will be relatively small.

(c) The relative amount of the air flowing around the end of the building increases as the height increases. When the building is short in comparison with its height, the flow of air around its ends has more influence upon the relative amounts of the pressures and suctions than the flow over the top. On a thin plate exposed in an air current, the maximum pressure is found on the windward side midway between two edges around which free flow takes place, and the minimum suction will be found on the leeward side directly opposite the same spot or line. As the amount of the end flow increases, the tendency of the leeward suction at the middle section to become a minimum, as also the tendency of the

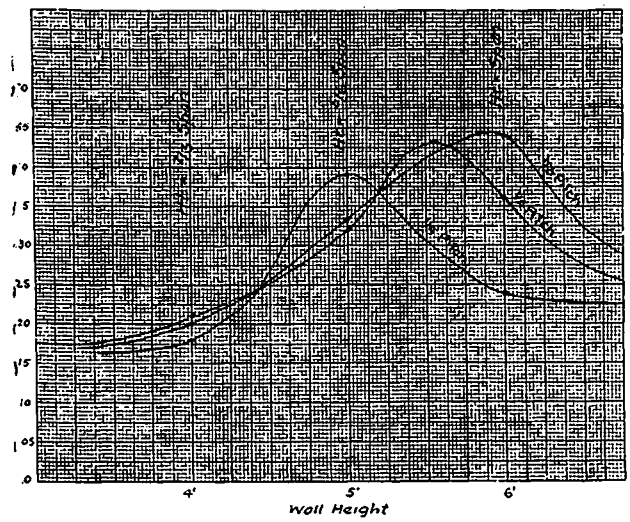
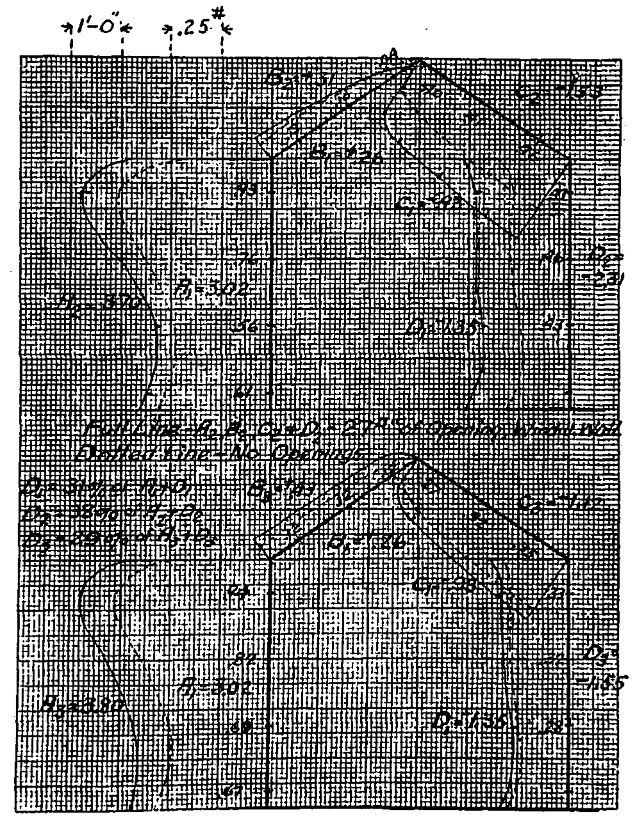


PLATE VIII.

Variation of lee wall suction, 15 ft. house.



Full line, A3, B3, C3 and D3—27°" of opening, lee wall. Dotted line, no openings.

PLATE IX.

Effect of openings in walls 15 ft. length, 5 ft. height, 1/3 pitch.

windward pressures to become a maximum, increases.

The effect of (a) is probably not very large. But from (b) we have the relative amounts of the leeward suctions steadily increasing as the height increases. The limit of the ratio will be the ratio of lee suctions on a very long thin plate with one edge resting on the surface of the ground. We have no test data on this case, but these tests seem to indicate that this limit is very nearly 50 per cent. As the height increases, however, the influence of the end flow on pressures and suctions at a middle section steadily increases, finally overcoming the tendency of the lee pressures to increase, and actually causing them to diminish. They will then continue to diminish until, the confined edge of the building becoming very small in comparison with its height, it approaches as a limit the ratio of suction for a long rectangular plate in air, which, as shown by Stanton, is about 35 per cent. In the smaller pitches of roofs the maximum percentage of the leeward wall suctions will be arrived at more rapidly, throwing the points of maximum curve ordinates on Plate VIII. to the *left*, for low pitches.

In view of these results, the ordinary methods of assuming wind loads on mill buildings ought to be somewhat revised. For the case of roof trusses on masonry walls, or on steel bents with long diagonals, a suction effect in the neighborhood of 0.4 of the unit wind pressure should be placed on the leeward roof of all closed buildings, and a pressure or suction derived from the curves drawn from the observations, placed on the windward roof. The resulting stresses will not only be different in amount from those computed on the present basis, but will in many members, differ as to sign. Wind loads on purlins might in most cases be entirely omitted, and where considered they might be made much less than at present. The necessity for secure anchorage, not only to prevent sliding, but to prevent actual uplift, is strongly confirmed by these tests.

In buildings with knee-braced bents, in addition to the preceding points, the suctions on the leeward wall should be considered. Approximate curves might be made for each pitch and for each height ratio, and the leeward wall unit derived therefrom in any given case. This, beside being troublesome to the computer, still leaves his results inaccurate, since if the pressures on the two walls be unequal the points of contraflexure will be actually at different heights, though in view of the labor otherwise involved, he must consider them to be at the same height.

Where there is an opening as great as 2 per cent. or 3 per cent. of the outside surface, the suctions will be seriously reduced or augmented, according to which side the openings are on. If on both sides, the pressures and suctions will not be seriously affected, except locally, unless the openings are very much greater than this.

IT IS HOPED the efforts of R. G. Halford, secretary of the Manitoba Association of Architects, in behalf of the establishment of an architectural course at the University of Manitoba will be more than successful. Mr. Halford, in communicating with the proper officials, pointed out that a thorough education is becoming essential for the practice of architecture, and that it is impossible for intending architects to obtain the necessary training by working in an office. The only means at present for a Western Canadian to obtain this education is by attending a University in Eastern Canada or the United States. The matter has been favorably received by the faculty and augurs well for the future development of the draftsmen in that section of the Dominion.

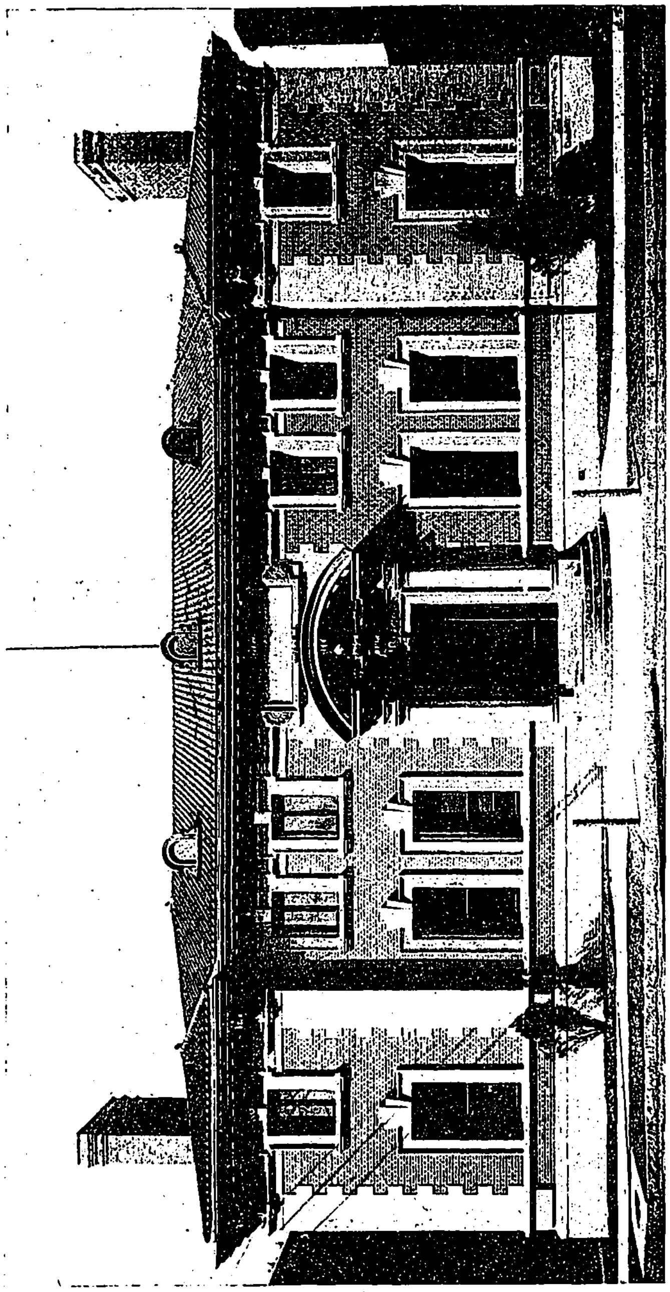
ALBERTA Architects' Association at its annual convention in Edmonton, January 23 to 25, elected the following officers: President, R. W. Lines, Edmonton; honorary president, G. M. Lang, Calgary; first vice-president, James Henderson, Edmonton; second vice-president, J. J. O'Gara, Edmonton; secretary, W. D. Cromarty, Edmonton; treasurer, G. H. McDonald, Edmonton; council—R. P. Blakey, C. Lionel Gibbs, R. P. Barnes, Edmonton, and George Fordyce and W. S. Major, Calgary. G. M. Lang, retiring president, said that the membership now consisted of 67 with seven student associates. Thirty-one applications were received during the year and 17 were admitted to membership. In conclusion, after speaking of the success in handling the year book, he finished by saying: "An epoch was marked during the year just passed when affil - ation with the University of Alberta was consummated, this puts the association upon the same basis as the medical, legal, dental and land surveyors bodies and at the same time the association has lost none of its rights and privileges, in fact, they have really been extended, for under the agreement with the university the association has representation on the university senate, and names, in conjunction with the president of the university, the examiners for papers set in our examination."

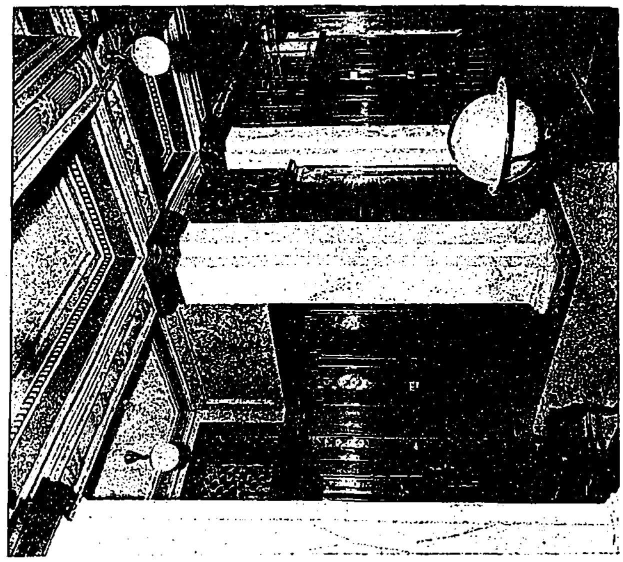
THE FIRST ANNUAL banquet of the Vancouver chapter of the B.C. Society of Architects was held at the University Club's quarters, January 23. Some sixty members and guests were present. G. A. Birkenhead, responding to the toast on Vancouver, spoke in high terms of the great building progress of the city and stated that the work done and being done by the architects was and would be a great credit to the Terminal City. Mayor Baxter, in response, talked on the enormous possibilities of Vancouver and advised the architects to stand together in the work of beautifying the city. It would be a great work to build up Vancouver to what she would some day become. Other toasts eliciting interesting and eloquent responses, helped to make the gathering a really delightful one.

MAIN STAIRWAY.
GREAT TERRACE.

IFORD MANOR, BRADFORD-ON-AVON, ENGLAND.

From Architectural Review, London, Eng.

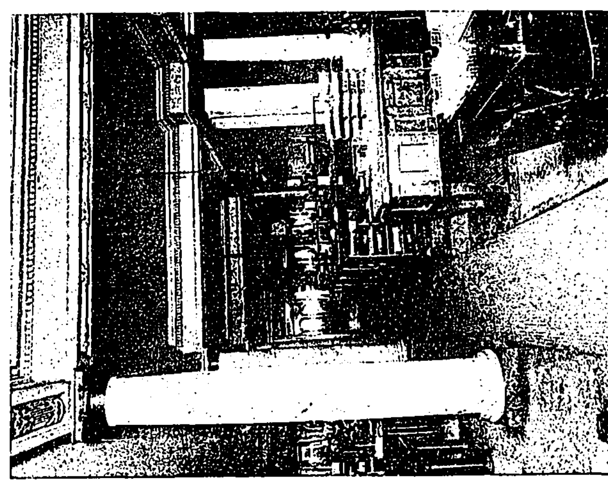




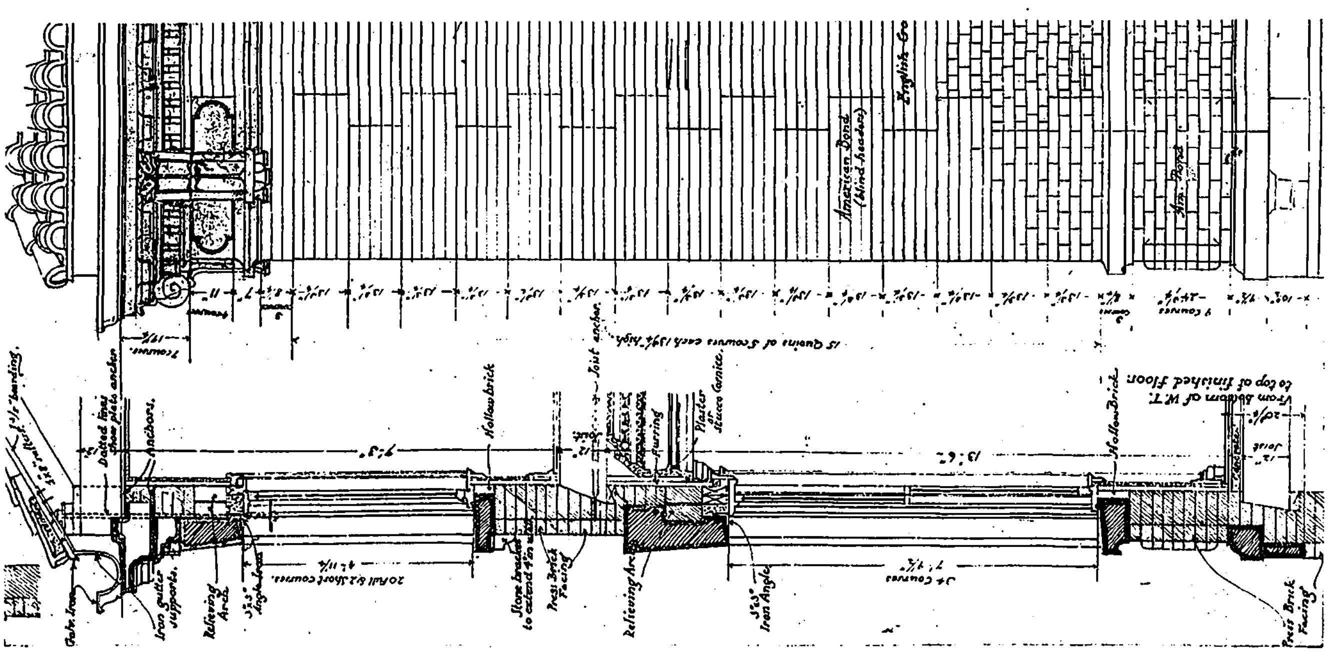
VIEW OF LOBBY.

BERRY BROTHERS' BUILDING, DETROIT, MICH.

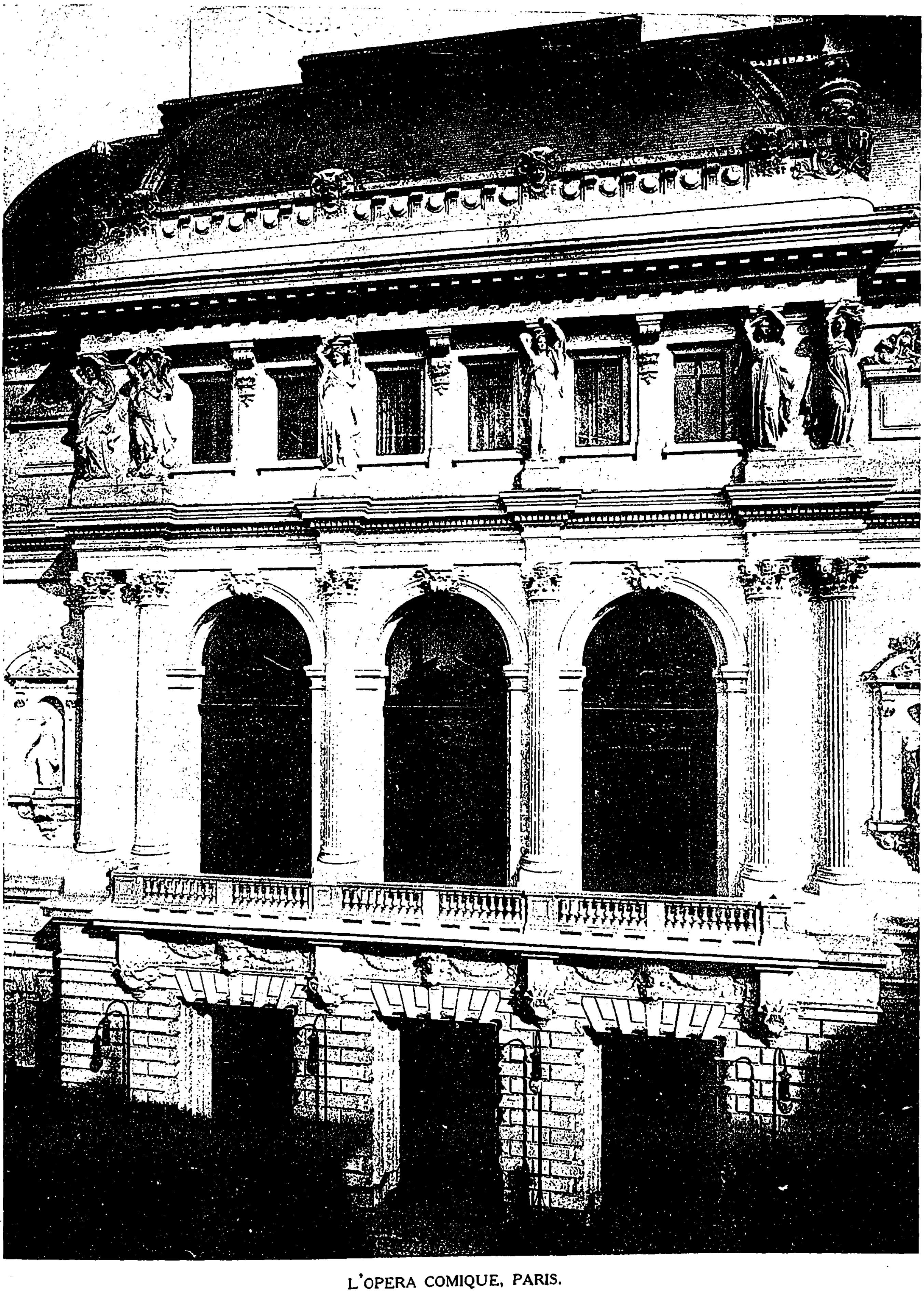
GEORGE D. MASON, ARCHITECT.



VIEW OF OFFICE.



EXTERIOR DETAIL.



L'OPERA COMIQUE, PARIS.

THE FOLLOWING CODE of ethics was endorsed at a recent meeting of the Vancouver Chapter of the B.C. architects. They are intended to assist their members in relation to each other, to builders and to contractors, they may perhaps be of interest to other members of the profession.

1. An architect is both an artist and a practitioner. His functions are to conceive and study the composition of an edifice, to direct and superintend the execution, to verify and regulate all accounts of expenses.

2. His is a liberal and not a commercial profession. This profession is incompatible with that of contractor, manufacturer, or furnisher of materials or objects employed in the construction. No member should enter into partnership in any form or degree with any builder, contractor or manufacturer. A member having any ownership in any building material, device or invention, proposed to be used on work for which he is architect, should inform his employer of the fact of such ownership. He is remunerated solely by fees paid by his clients.

3. The architect, being neither a mercantile nor a business agent, shall have nothing to do with operations giving allowances, deductions or commissions. He should not be a party to a building contract except as owner. He shall abstain from making, from personal motives, any advertisement or offer of services by means of newspapers, circulars, signs, prospectus or other means of publicity usual in commercial professions. He may, however, have his card with his name, profession, office hours, and title, if any.

4. He shall abstain from seeking employment or clients by means of concessions, commissions, deductions on his fees, or other advantages offered to third parties, such as manager, business men or proprietor's agents, and avoid in general all acts which require secrecy from present or future clients. No member should offer drawings or other services (on approval) and without any pecuniary compensation.

5. He shall abstain from plagiarism from his fellow-members and from disregard for those delicate rules of conscience imposed upon artists worthy of the name in their intercourse with others. He must not seek to acquire the position or patronage enjoyed by a brother architect. If he should be appointed to such a position or patronage after the death, the resignation or revocation of a fellow member, the new architect shall consider himself the guardian of the honor and the interest of his late confrere. A member should not criticize in the public prints the professional conduct or work of another architect except over his own name or under the authority of a professional journal. A member should not furnish designs in competition for private work or for public work unless for proper compensation and unless a competent professional adviser is employed to draw up the "condition" and assist in the award.

6. He shall recognize the quality and give the title of fellow member to every architect exercising honorably his profession.

7. When an architect employs, as draughtsmen or clerks, young men who are at the same time students, he shall give them the benefit of his experience and treat them with all the consideration due to the confraternity.

8. The architect owes to his clients the help of his knowledge and experience in the study of the projects submitted to him in the direction and superintendence of his work, and all proper and needed advice. All his attention and skill must be devoted to the interests confided to him.

9. Nevertheless, the architect shall not help operations which would conflict with the rights of other parties, even if asked to do so by a client. Neither shall he lend a hand to operations of such a nature as to implicate him, or a third party, or which might be the cause of accident. In such a case he must tell his client that it is impossible to acquiesce in his demands. He must not guarantee an estimate or contract by personal bond.

10. He is remunerated by his client, and by his client only, by means of fees. He must, therefore, not only refuse any remuneration whatsoever from contractors, dealers, sellers or buyers of land or building, having contracted or being supposed to contract with his client, but, moreover, when the remuneration for his work is left over to a third party he must accept only the fees paid by his client, who can be refunded by those whom it may concern.

11. The architect must declare himself competent to act as expert in any affair in which his client is interested. He shall do the same if he has already given an option concerning the contestation.

12. When he is appointed as expert by his client, for instance, in a question of insurance, valuation, etc., he is no longer the mandatory of his client, he is only an expert. When he acts as arbitrator, his obligations are the same.

13. The architect shall endeavor to ensure harmony, cordiality and honorable conduct amongst all persons occupied in the work under his supervision.

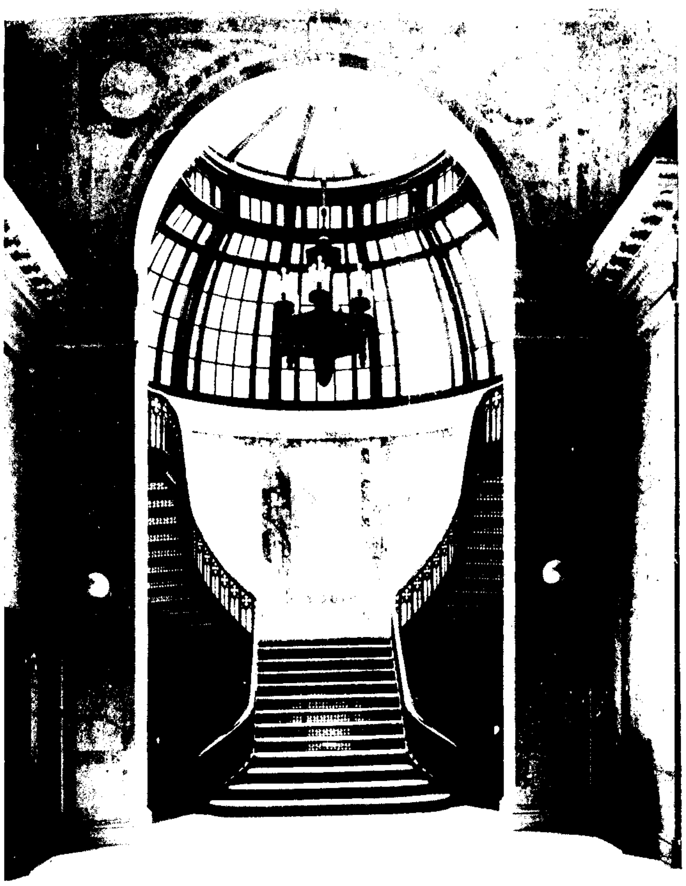
14. Towards the contractors or dealers the architect shall refrain from accepting any deduction, commission, or present, whether in money or kind, whether these contractors or dealers be employed by him or not.

15. When the architect has as client a contractor or dealer he is still in this case remunerated merely by fees.

16. The architect who becomes contractor, contractor's clerk, quantity clerk, or clerk of works, loses his title of architect. He does not lose it by working for another architect.

17. The schedule of charges of the B.C. Society of Architects represents minimum rates for full and competent services.

18. It is not derogatory to the profession of an architect to sign his buildings in an unostentatious manner, similar to that adopted by artists and sculptors.



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Murray-Kay Co., Ltd.

Fire Proofing.
Canadian Johns-Manville Co.
Dartnell, E. F.
Don Valley Brick Works.
Noble, Clarence W.
Port Credit Brick Co.
Pedlar People, The.
Steel and Radiation, Ltd.
Trussed Concrete Steel Co.

Fireproof Steel Doors.
Dennis Wire and Iron Works.
Metal Shingle and Siding Co.
Mussens Limited.
Ormsby, A. B., Ltd.
Pedlar People, The.
Steel and Radiation.
Stinson-Reeb Builders' Supply Co.

Fireproof Windows.
Galt Art Metal Co.
Hobbs Mfg. Co.
Metal Shingle and Siding Co.
Ormsby, A. B., Ltd.
Pedlar People, The.
Stinson-Reeb Builders' Supply Co.

Flooring.
Bird, F. W. & Son.
Seaman-Kent Co.

Furnaces and Ranges.
Clare Bros., Ltd.
Pease Foundry Co., Ltd.
Steel and Radiation, Ltd.
Taylor-Forbes Co., Ltd.

Galvanized Iron Works.
Metal Shingle and Siding Co.
Ormsby, A. B., Ltd.
Pedlar People, The.
Sheldons Limited.

Galvanized Iron.
Leslie & Co., A. C.
Metal Shingle and Siding Co.

Glass.
Consolidated Plate Glass Co.
Hobbs Mfg. Co.
Toronto Plate Glass Co.

Grille Works.
Dennis Wire and Iron Works.
Meadows, Geo. B. Co., Ltd.
Steel and Radiation, Ltd.
Taylor, J. & J.

Hangers.
Ormsby, A. B., Ltd.

Hardware.
Canadian Yale & Towne, Ltd.
Taylor-Forbes Co., Ltd.

Hardwood Flooring.
Canadian Fairbanks-Morse Co.

Heating Apparatus.
Clare Bros., Ltd.
Dominion Radiator Co.
Dunham, C. A. Co.
Goldie & McCulloch Co., Ltd.
Kerr Engine Co.
Pease Foundry Co., Ltd.
Sheldons Limited.
Steel and Radiation, Ltd.
Taylor-Forbes Co., Ltd.

Heating Engineers and Contractors.
Sheldons Limited.

Hoisting Machinery.
Mussens Limited.
Olts-Fensom Elevator Co.

Hinges.
Taylor-Forbes Co., Ltd.

Hydrants.
Kerr Engine Co.

Hydraulic Machinery.
The John McDougall Caledonian Iron Works, Ltd.

Iron Doors and Shutters.
Dennis Wire and Iron Works.
Metal Shingle and Siding Co.
Taylor, J. & J.

Iron Stairs.
Canada Foundry Co.
Dennis Wire and Iron Works.
Meadows, Geo. B. Co., Ltd.

Iron Supplies.
Kerr Engine Co.

Installation.
Bird, F. W. & Son.
Canadian Johns-Manville Co.
Kent Co., Ltd.

Interior Woodwork.
Blonde Lumber Co.
Seaman-Kent Co.

Jail Cells and Gates.
Dennis Wire and Iron Works.
Goldie & McCulloch Co., Ltd.
Taylor, J. & J.

Joist Hangers.
Taylor-Forbes Co., Ltd.
Trussed Concrete Steel Co.

Lamp Standards.
Canada Foundry Co.
Canadian Tungsten Lamp Co.
Dennis Wire and Iron Works.
Seaman-Kent Co.

Lath (Metal).
Galt Art Metal Co.
Greening Wire Co., Ltd.
Metal Shingle and Siding Co.
Noble, Clarence W.
Pedlar People, The.
Steel and Radiation, Ltd.
Stinson-Reeb Builders' Supply Co.
Trussed Concrete Steel Co.

Laundry Tubs.
Toronto Laundry Machinery Co.

Leaded Glass.
Hobbs Mfg. Co.

Marble.
Dartnell, E. F.
Dominion Marble Co., Ltd.
Hoidge Marble Co., Ltd.
Missisquoi Marble Co.
Robertson Co., James B.

Metallic Sash.
Hobbs Mfg. Co.
Metal Shingle and Siding Co.
Steel and Radiation, Ltd.

Metal Shingles.
Galt Art Metal Co.
Pedlar People, The.

Metal Store Fronts.
Dartnell, E. F.
Dennis Wire and Iron Works.
Hobbs Mfg. Co.
Metal Shingle and Siding Co.

Metal Walls and Ceilings.
Metal Shingle and Siding Co.
Noble, Clarence W.
Ormsby, A. B., Ltd.
Pedlar People, The.

Municipal Supplies.
Mussens Limited.

Non-Conducting Coverings.
Ault & Wiborg.
Canadian Johns-Manville Co.

Ornamental Iron Work.
Canada Foundry Co.
Dennis Wire and Iron Works.
Meadows, Geo. B. Co., Ltd.
Steel and Radiation, Ltd.
Turnbull Elevator Co.

Packing (Steam).
Canadian Johns-Manville Co.

Packing.
Canadian Fairbanks-Morse Co.
Gutta Percha and Rubber Co.

Paints (Steel and Iron).
Brandram-Henderson Co.
Canadian Bitumastic Enamels Co.
Dartnell, E. F.
Imperial Varnish & Color Co.
International Varnish Co.
Pinchin, Johnson Co.

Paints and Stains.
Berry Bros., Ltd.
Brandram-Henderson Co.
Canadian Bitumastic Enamels Co.
Dartnell, E. F.
Imperial Varnish & Color Co.
International Varnish Co.
Pinchin, Johnson Co.
Robertson, James B.

Perforated Steel.
Greening Wire Co., Ltd.

Pipe Covering.
Canadian Johns-Manville Co.

Pasters.
Brandram-Henderson Co.
Canadian Johns-Manville Co.
Hynes, W. J.

Plaster Corner Beads.
Metal Shingle and Siding Co.
Pedlar People, The.

Plate and Window Glass.
Consolidated Glass Co.
Hobbs Mfg. Co.
Toronto Plate Glass Co.

Plumbers' Brass Goods.
Canadian Fairbanks-Morse Co.
Robertson Co., James B.
Standard Ideal Co., Ltd.
Steel and Radiation, Ltd.

Plumbing Fixtures.
Robertson Co., James B.
Standard Ideal Co.
Standard Sanitary Co.

Pneumatic Tools.
Mussens Limited.

Porcelain Enamel Baths.
Robertson Co., James B.
Standard Ideal Co., Ltd.
Standard Sanitary Co.

Pumps.
The John McDougall Caledonian Iron Works, Ltd.

Radiators.
Dominion Radiator, Ltd.
Steel and Radiation, Ltd.
Taylor-Forbes, Ltd.

Refrigerating Machinery.
Linde British Refrigeration Co., Ltd.

Refrigerator Insulation.
Bird, F. W. & Son.
Canadian Johns-Manville Co.
Metal Shingle and Siding Co.

Radiator Valves.
Kerr Engine Co.
Steel and Radiation Co., Ltd.

Reinforced Concrete.
Metal Shingle and Siding Co.
Noble, Clarence W.
Pedlar People, The.
Steel and Radiation, Ltd.
Trussed Concrete Steel Co.

Relief Decoration.
Hynes, W. J.

Roofing Paper.
Canadian Johns-Manville C.o
Bird, F. W. & Son.
Pedlar People, The.
Metal Shingle and Siding Co.

Roofing.
Asbestos Mfg. Co.
Bird, F. W. & Son.
Canadian Johns-Manville Co.
Metal Shingle and Siding Co.
Patterson Mfg. Co.

Roofing (Slate).
Ormsby, A. B., Ltd.

Roofing (Tile).
Dartnell, E. F.
Metal Shingle and Siding Co.
Pedlar People, The.

Rubber Tiling.
Gutta Percha and Rubber Co.

Safes (Fireproof and Bankers').
Canadian Fairbanks-Morse Co.
Goldie & McCulloch Co., Ltd.
Taylor, J. & J.

Sanitary Plumbing Appliances.
Robertson Co., James B.
Standard Ideal Co., Ltd.
Standard Sanitary Co.

Sand Screens.
Steel and Radiation, Ltd.
Greening Wire Co.

Screens.
Watson-Smith Co., Ltd.

Shafting, Pulleys and Hangers.
Canadian Fairbanks-Morse Co.
Goldie & McCulloch Co., Ltd.

Sheet Metal.
Leslie, A. C.
Metal Shingle and Siding Co.

Sheet Metal Workers.
Galt Art Metal Co.
Metal Shingle and Siding Co.
Ormsby, A. B., Ltd.
Pedlar People, The.
Sheldons Limited.

Shingle Stains.
International Varnish Co.
Pinchin, Johnson Co.
Robertson Co., James B.

Sidewalks, Doors and Grates.
Dennis Wire and Iron Works.

Sidewalk Lifts.
Otis-Fensom Elevator Co.

Sidewalk Prisms.
Hobbs Mfg. Co.

Slate.
Robertson Co., James B.

Stable Fittings.
Dennis Wire and Iron Works.

Staff and Stucco Work.
Canadian Johns-Manville Co.
Hynes, W. J.

Steam Appliances.
Canadian Fairbanks-Morse Co.
Kerr Engine Co.
Sheldons Limited.
Steel and Radiation, Ldt.
Taylor-Forbes Co., Ltd.

Steam and Hot Water Heating.
Dominion Radiator Co., Ltd.
Dunham, C. A. Co.
Sheldons Limited.
Steel and Radiation, Ltd.
Taylor-Forbes Co., Ltd.

Steam Turbines.
The John McDougall Caledonian Iron Works, Ltd.

Steel Casements.
Steel and Radiation, Ltd.

Steel Concrete Construction.
Noble, Clarence W.
Pedlar People, The.
Steel and Radiation, Ltd.
Trussed Concrete Steel Co.

Steel Doors.
Dennis Wire and Iron Works.
Mussens Limited.
Ormsby, A. B., Ltd.
Pedlar People, The.

Structural Iron Contractors.
Canada Foundry Co.
Dennis Wire and Iron Works.
Dominion Bridge Co.
Hamilton Bridge Co.
Reid & Brown.
Structural Steel Co., Ltd.
Toronto Iron Works.

Structural Steel.
Canada Foundry Co.
Dennis Wire and Iron Works.
Dominion Bridge Co.
Hamilton Bridge Co.
Mussens Limited.
Reid & Brown.
Sheldons Limited.
Structural Steel Co., Ltd.

Tanks.
The John McDougall Caledonian Iron Works, Ltd.

Telephone Systems.
Northern Electric & Mfg. Co.

Terra Cotta Fireproofing.
Carter & Co., Ltd.
Dartnell, E. F.
Don Valley Brick Works.
Missisquoi Marble Co.

Tile (Floor and Wall).
Carter & Co., Ltd.
Dartnell ,E. F.
Don Valley Brick Works.

Vacuum Heating System.
Dunham, C. A. Co.

Varnishes.
Ault & Wiborg Co.
Berry Bros., Ltd.
Brandram-Henderson Co.
Imperial Varnish & Color Co.
International Varnish Co.
Pinchin, Johnson Co.

Vaults and Vault Doors (Fireproof and Bankers').
Goldie & McCulloch, Ltd.
Taylor, J. & J

Valves.
Canadian Fairbanks-Morse Co.
Dunham, C. A. Co.
Kerr Engine Co.
Robertson Co., James B
Steel and Radiation, Ltd.
Taylor-Forbes Co.

Ventilators.
Metal Shingle and Siding Co.
Sheldons Limited.

Wall Finishes.
Berry Bros.
Brandram-Henderson Co.
Dartnell, E. F.
Imperial Paint and Color Co.
International Varnish Co.
Pinchin, Johnson Co.

Wall Hangers.
Taylor-Forbes Co.

Waterproofing.
Ault & Wiborg Co.
Bird, F. W. & Son.
Canadian Johns-Manville Co.
Dartnell, E. F.
Kerr Engine Co.
Mussens Limited.
Pinchin, Johnson Co.
Stinson-Reeb Bllrs. Supply Co.

Waterworks Supplies.
Mussens Limited.
Robertson Co., James B.
Standard Ideal Co., Ltd.

Wheelbarrows.
Mussens Lmiited.

White Lead, Putty and Oils.
Brandram-Henderson C.o
International Varnish Co.
Pinchin, Johnson Co.

Window Guards.
Dennis Wire and Iron Works.
Greening Wire Co.
Steel and Radiation, Ltd.

Wire Rope and Fittings.
Greening Wire Co., Ltd.
Mussens Limited.
Otis-Fensom Elevator Co.

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