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CONSTRUCTION

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



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SELDOME does an active, progressive man retreat from the field of activity during a critical period. Rather does he keep his work well advertised, and in so doing reap a rich harvest when conditions right themselves and commercialism starts again on its victorious march.

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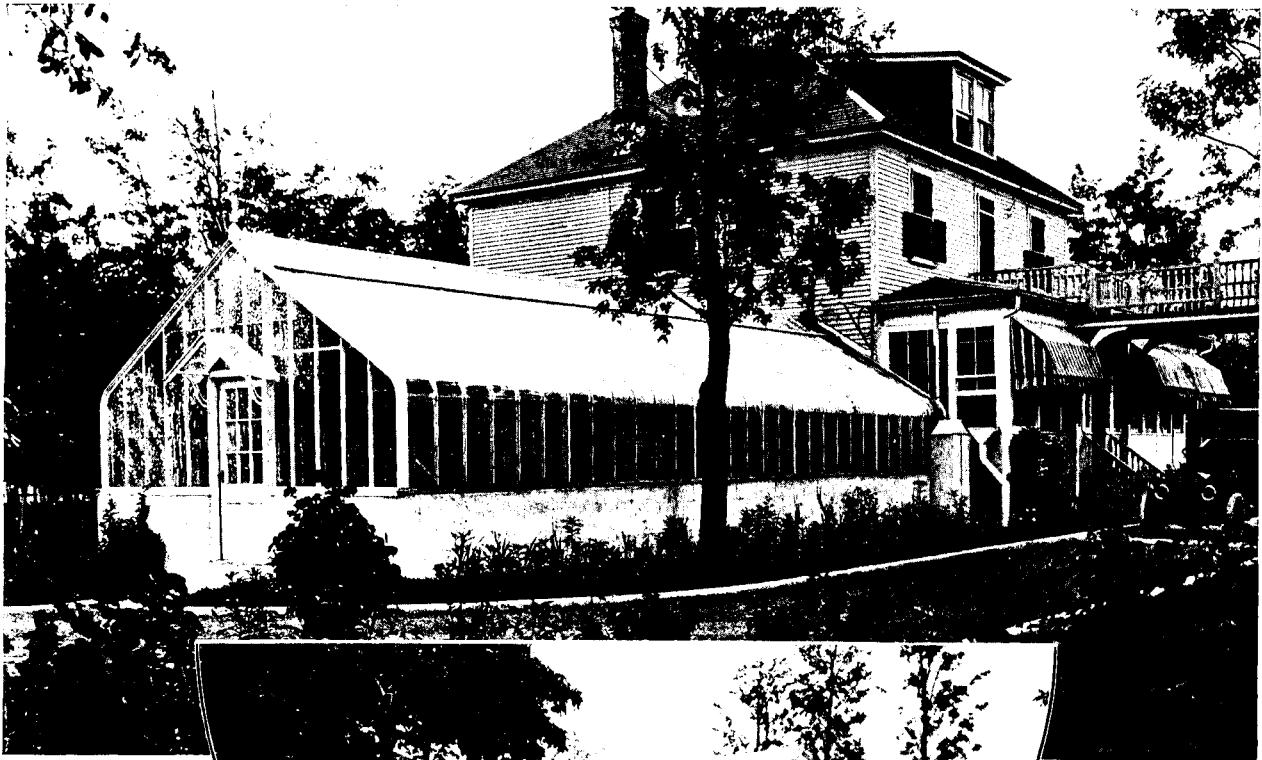
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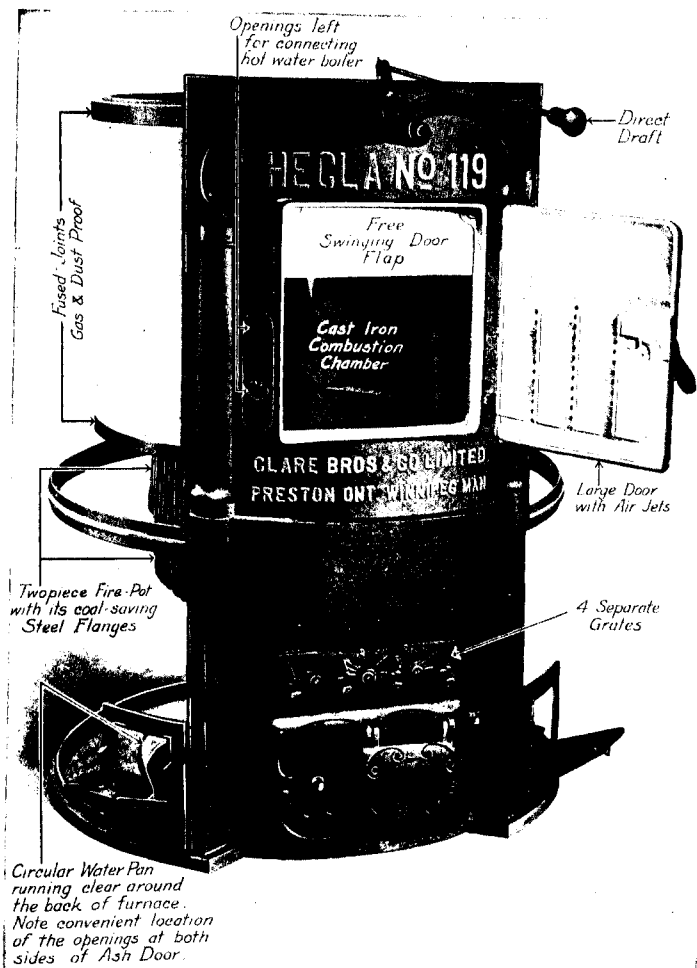
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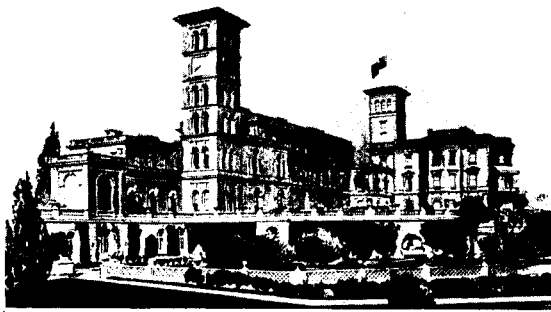
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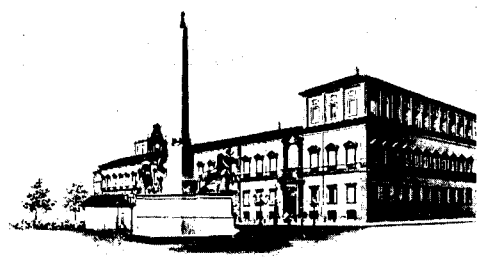
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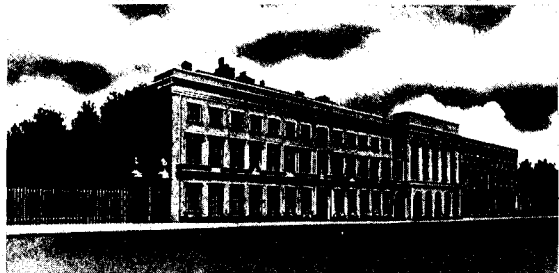
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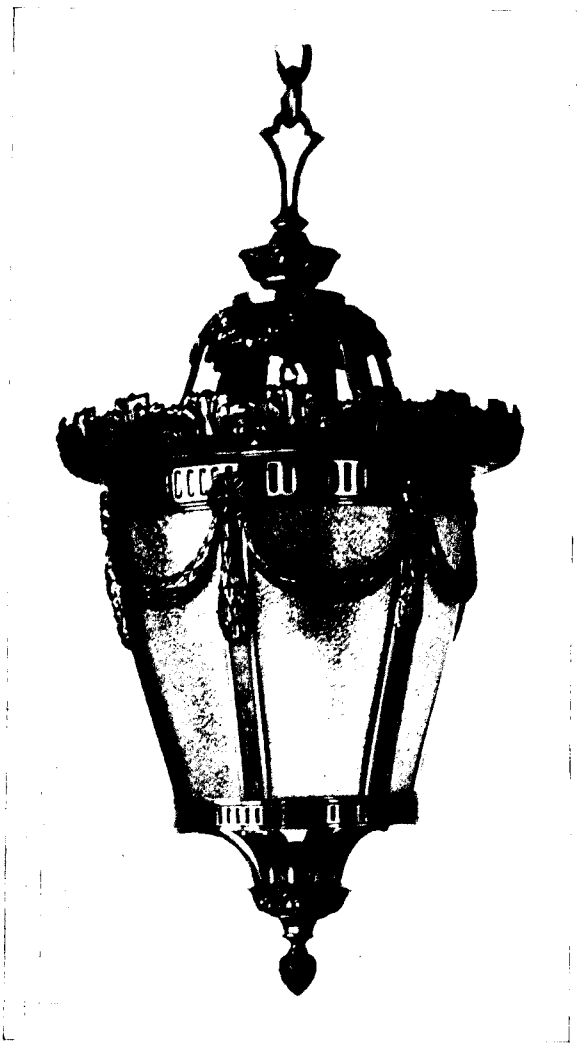
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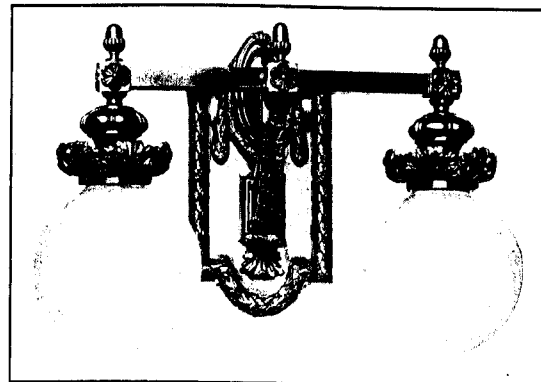
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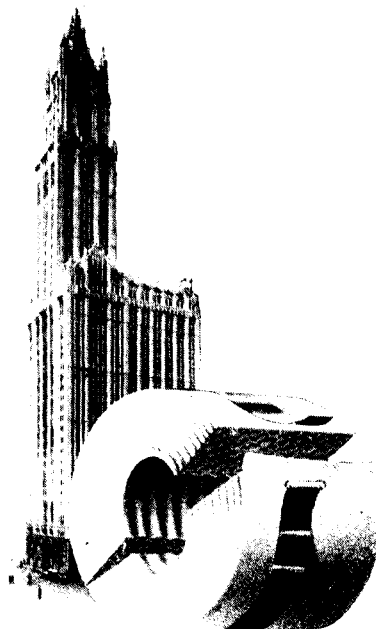
JOHNS-MANVILLE SERVICE TO THE ARCHITECT

This emblem is more than a trade-mark device. It stands for the experience, ability and business integrity of a long established house. So that any article upon which it appears is not merely offered for sale; it is meant to give service. And that every J-M Product shall give this service fully and permanently, is the whole meaning of J-M Responsibility.

Tell your client that J-M Insulation Service acts in their interest—you know that it acts in yours

Make them realize that pipe covering and insulation are as different as wall papering and decoration. That insulation means comfort to house holder and economy in all departments of heating.

And as your protection for these arguments let Johns-Manville Insulation Service perform the work. There are as many J-M Insulations as there are needs and one Service is responsible for all of them in your protection.



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Facts point to the J-M Sectional Conduit System as being the most efficient and economical



There are several considerations that must be given due thought in every underground steam line. (1) Efficiency—the ratio of the steam you send through the line to that which is received at the other end. (2) Cost—meaning total cost; that is, first cost, repairs, inspection and maintenance. (3) Durability—How long it will last, or “how soon must this system be renewed?” (4) Depreciation—which means the money you must earn, and save, to pay for the renewal of the installation when the present one is gone.

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Reliable Building and Engineering news for the exclusive use of Advertisers in "Construction." A daily Report regarding all activities in the building trades. For full particulars address "Construction," corner Richmond and Sheppard Streets, Toronto, Canada



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Ross & Macdonald, Architects. Success Brothers, General Contractor.

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Over 100,000 square feet of concrete floors were laid in this building by Master Builders Method, using Master Builders Concrete Hardner.

These Concrete Floors laid by Master Builders Method are wear-proof, dustproof and waterproof and are the most sanitary and satisfactory concrete floors obtainable.

It is a well-known fact that sharp, gritty concrete dust is bad for throat and lungs. Ordinary concrete floors will dust continually and are objectionable and dangerous to both teachers and pupils. Master Builders Method Concrete Floors are always Dustproof, and for that reason, if for none other, are especially desirable for school buildings.



Master Builders Method

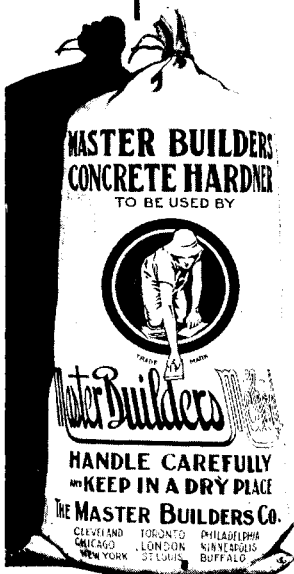
not only produces a floor that is dust, wear and waterproof, but it also saves in sand and cement used, by allowing the thickness of the topping to be reduced to three-quarters of an inch. It is not a surface treatment, but an integral part of the concrete mixture.

Master Builders Method is a scientific means of preventing porosity in concrete floors by the use of Master Builders Concrete Hardner, a finely-divided, chemically-treated and extremely hard material which has been proved right not only in theory, but in practice, under every possible condition.

Write to-day for information.

The Master Builders Co.

Main Office and Works, Cleveland, Ohio
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This bag and this trade-mark are your guarantee of genuine Master Builders Concrete Hardner.

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NEW TECHNICAL SCHOOL

This magnificent building, the largest of its kind on the Continent, has been equipped with ROBERTSON'S SANITARY Fixtures.

Discriminating Architects specify ROBERTSON equipment because of previous experience with its service in public institutions where it was subject to hard usage.

In the Toronto Technical School

The Lavatories were equipped throughout with ROBERTSON'S No. 7 Self-closing Basin Cocks, Kingdon Pop-up Waste, and cast brass "P" Traps.

The showers are fitted with ROBERTSON'S "Speakman" Non-Scalding Valves with cast brass heads.

ROBERTSON'S Royal Bubbling Fountains are installed throughout.

We are at all times prepared to advise Architects and Contractors upon Sanitary Equipment for Private Houses and Public Institutions.

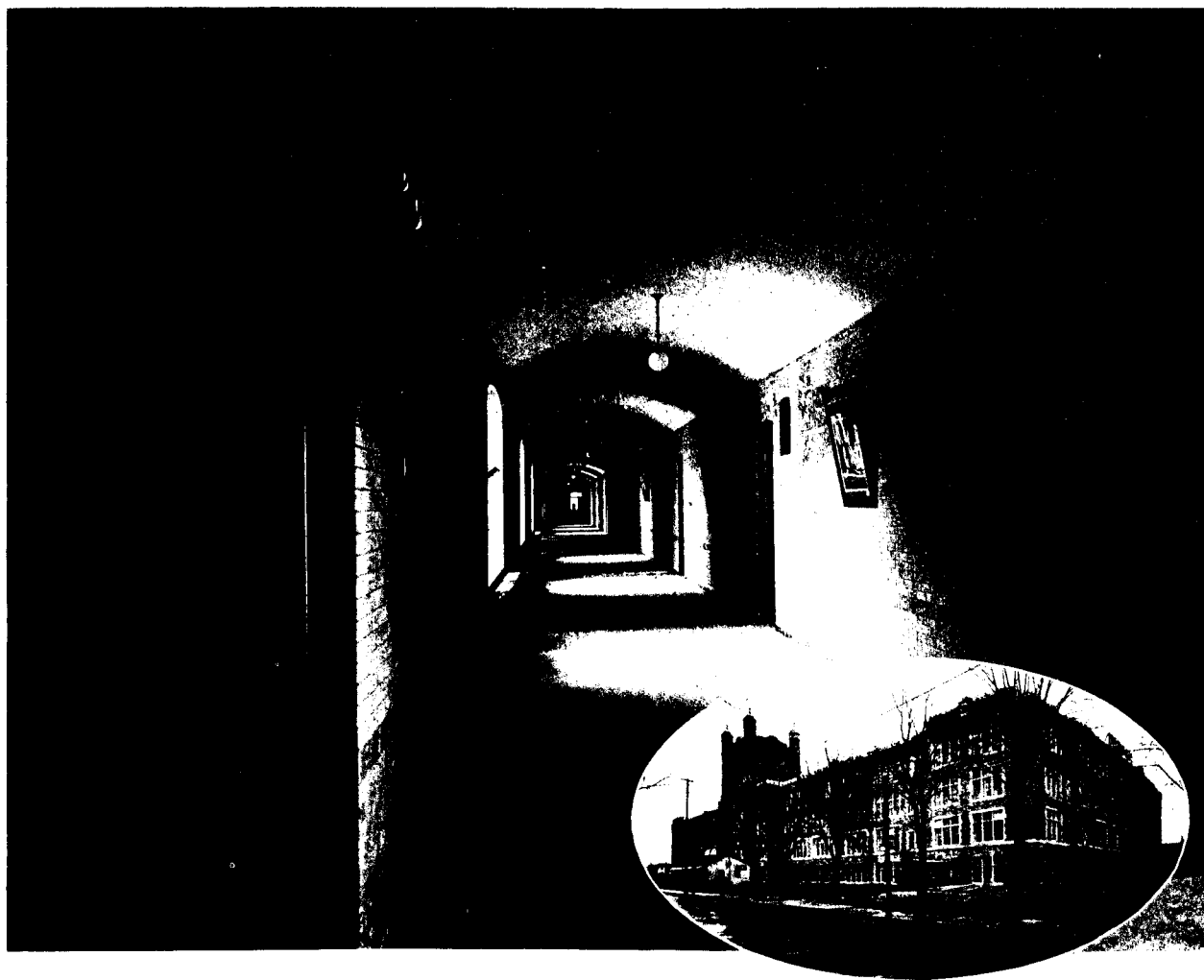
The James Robertson Co., Limited

Head Office—MONTREAL

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Toronto's Technical High School

ONE of the features of the new Toronto Technical High School are the immense corridors. Nothing more fully emphasizes the huge dimensions of the building or more strikingly impresses the visitor with the vastness of the place. They link together a great system of rooms and departments, and traverse a total distance of no less than a mile. From floor line to ceiling their height is 15 feet, so one can at least imagine to a vague degree the tremendous square area the walls of the corridors alone represent. Our point is that these corridors from top to bottom throughout their entire length, are built of Don Valley Bricks. It is but natural that we should pride ourselves on the extent to which our materials are used in this important structure—the best architecturally and most thoroughly equipped technical school on the American Continent, and in which the materials used have been selected, after careful comparison, as the best in each respective line. In evidence of this is the cost of the building, which exceeds the sum total of \$2,000,000. Not only in the corridors, but elsewhere in the building, the brick work represents the exclusive use of our products. In addition the fireproofing throughout is of Don Valley Porous Terra Cotta Fireproofing. Altogether our contract called for over 10,000,000 bricks and 250,000 sq. feet of fireproofing, one of the largest orders ever placed for a single building project. The choice of our materials here will perhaps interest you, and you may desire to learn more fully why almost without exception Don Valley Products have been specified for the largest and most important buildings of every class. We shall be glad to explain in detail. Briefly the reason is this: the highest value in quality, coupled with never disappointing deliveries, and dependable business methods throughout. We would be glad to have you visit our offices and practical brick exhibit.

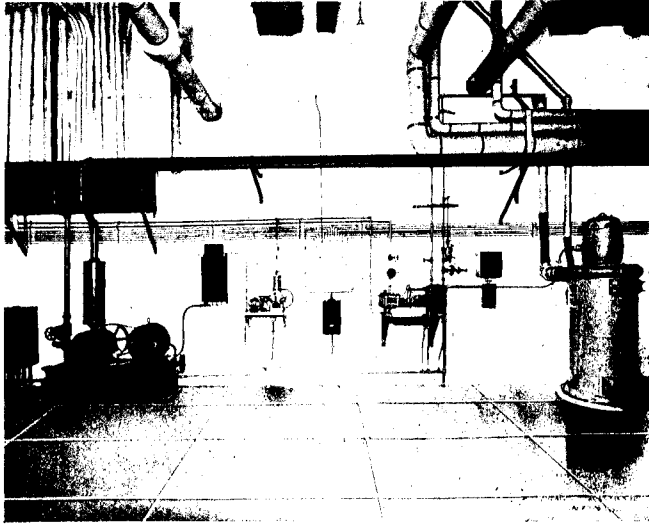
Prices and samples upon request.

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Electrical, Gas and Vacuum Equipment



Vacuum Plant, Damper Controls and Vacuum Cleaner.

Supplied by

A. R. RICE & CO.

For Toronto Technical School

This equipment consisted of the entire Electrical, Gas and Vacuum Piping and Equipment for all Laboratories, Tables and Desks in the various Science Rooms.

Some of the Vacuum Piping and Equipment installed is shown in accompanying illustration.

A. R. Rice & Co.

Electrical Engineers and Contractors

152 Bay Street

- - -

Toronto, Ontario

The Elmira Interior Woodwork Co., Limited

were the manufacturers of all the large tables, the Students' Tables, the Cupboards, Settees, Manual Training Benches and Shop Equipment in the new

Toronto Technical School

These were furnished through Toronto dealers and were all made to the drawings furnished by the School's Furniture Architect. It took over thirty cars to deliver the goods furnished which were all delivered on schedule time and were placed in position by us as required.

The "Elmira" facilities for handling School Furniture and Interior Woodwork contracts are unequalled. The work is of the highest quality, as only the best materials and experienced workmanship are employed.

The Elmira Interior Woodwork Co., Limited

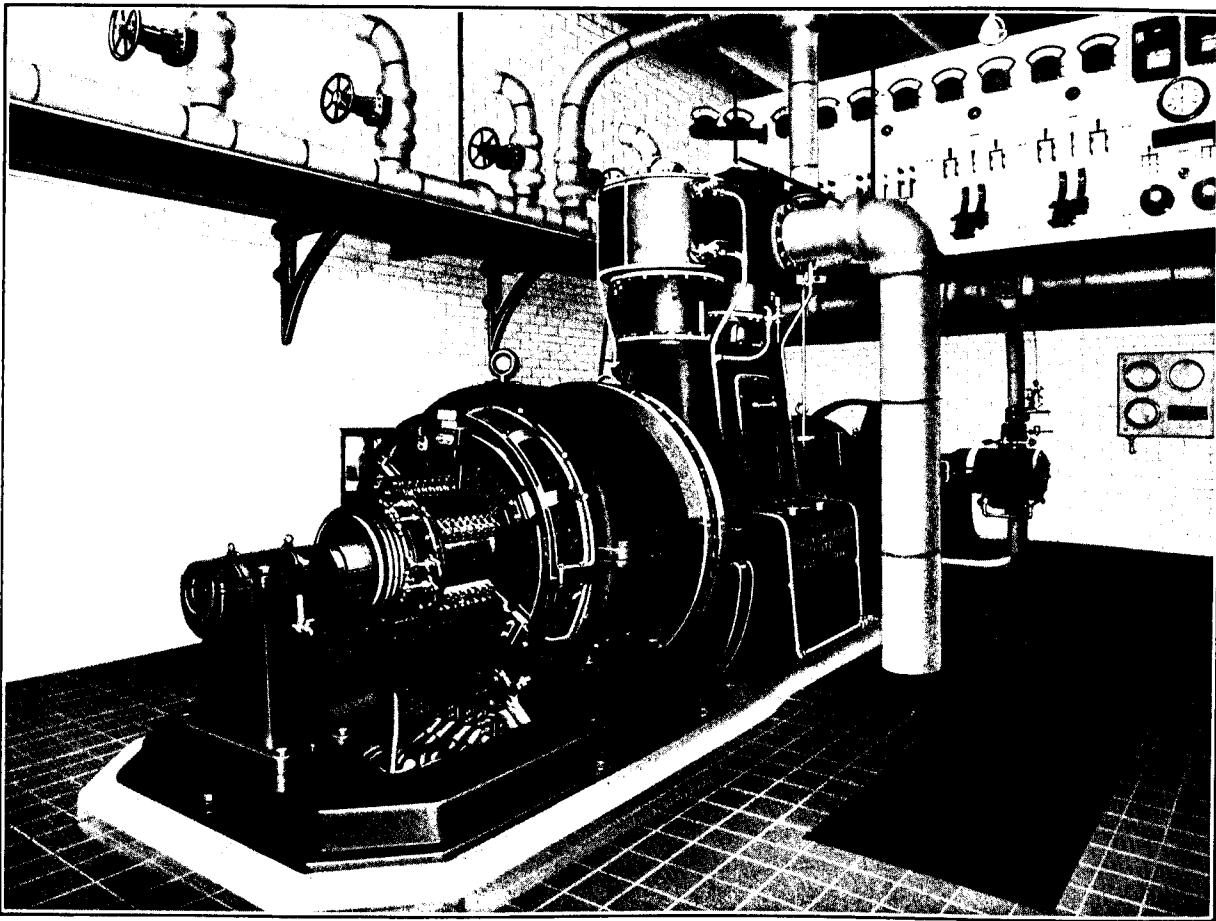
Elmira, Ontario



ELDOM does an active, progressive man retreat from a field of activity during a critical period, rather does he keep his work well advertised, and in so doing reap a rich harvest when conditions right themselves and commercialism starts again on its victorious march. The advertising columns of CONSTRUCTION not only enable progressive concerns to explain their products to architects, and other directly interested parties, but denote an enterprise which carries conviction that the goods advertised possess the degree of quality in material and workmanship which conforms with that standard of equipment and constructive utility demanded by the highest building requirements. In other words, it is that self endorsement which inspires confidence in others in the manufacturers line. CONSTRUCTION offers a plan of co-operation to the advertiser through its "Daily Report Service" which makes our proposition exceptionally attractive and which is well worth anyone's while to investigate.

Technical School Power Equipment

To be in keeping with the entire equipment of this building, the Engines of necessity had to be of the highest standard of efficiency and of the most approved design. The fact that our Engines occupy so prominent a place in this plant is evidence of the superiority of G. & McC. Co. Power Equipment.



Illustrating a portion of the Engine Room of the NEW CENTRAL TECHNICAL SCHOOL, TORONTO. In the foreground is shown a G. & McC. Co. Compound Vertical Enclosed, Quick Revolution Steam Engine, and in the background is located a G. & McC. Co. Ideal High Speed Steam Engine. Both are direct connected to Electric Generators. In addition to these we are also installing a small 15 H.P. Steam Turbine for demonstrating and experimental purposes. Ask for Catalogues, etc.

THE GOLDIE & McCULLOCH CO., LIMITED

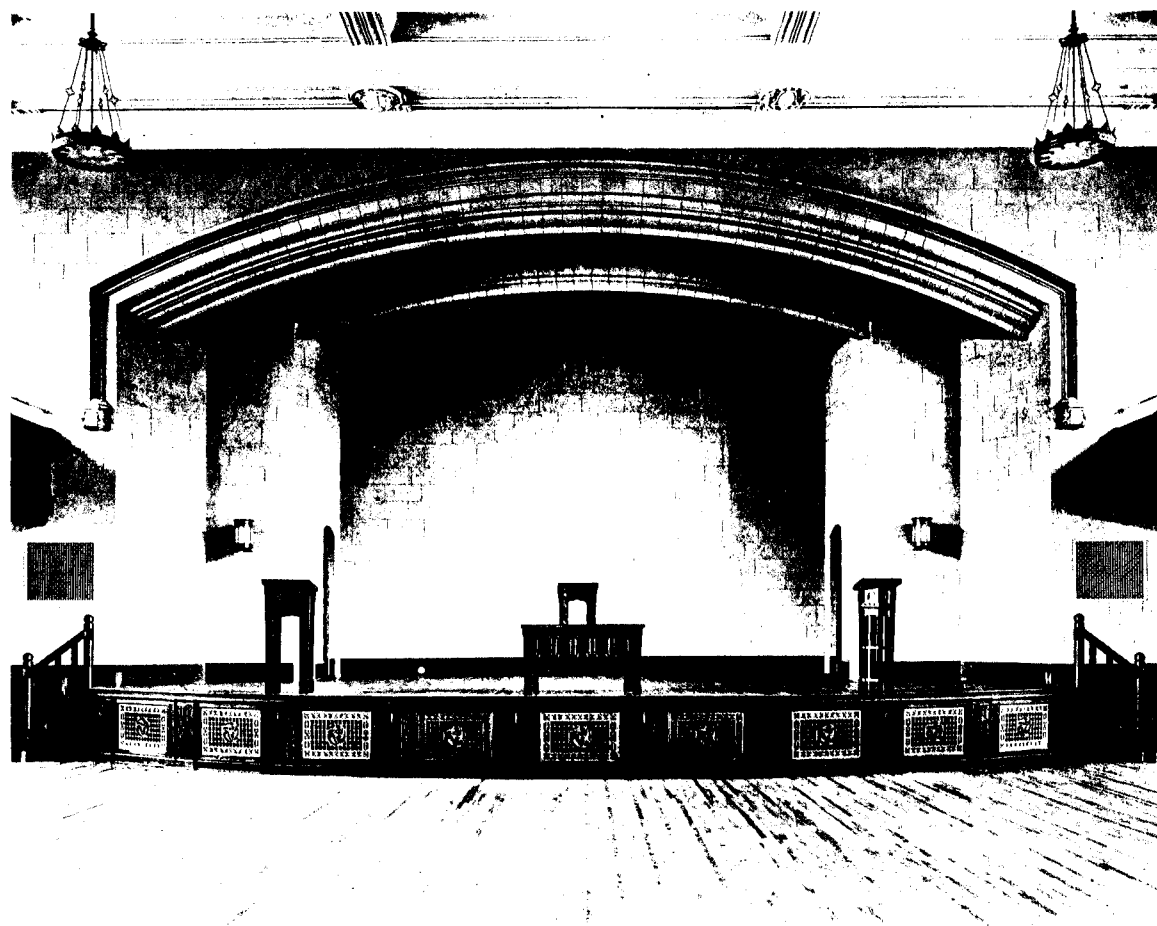
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Grilles in Auditorium Stage

Made From Architects' Detail

Technical High School, Toronto

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T & B MAKE

TUTTLE & BAILEY MFG. CO. OF CANADA, LIMITED

BRIDGEBURG, ONT.

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The Best in Woodworking Equipment

for

Toronto Technical School

The most important woodworking machines installed in the Toronto Technical School were supplied by the Preston Woodworking Machine Co., the equipment including:

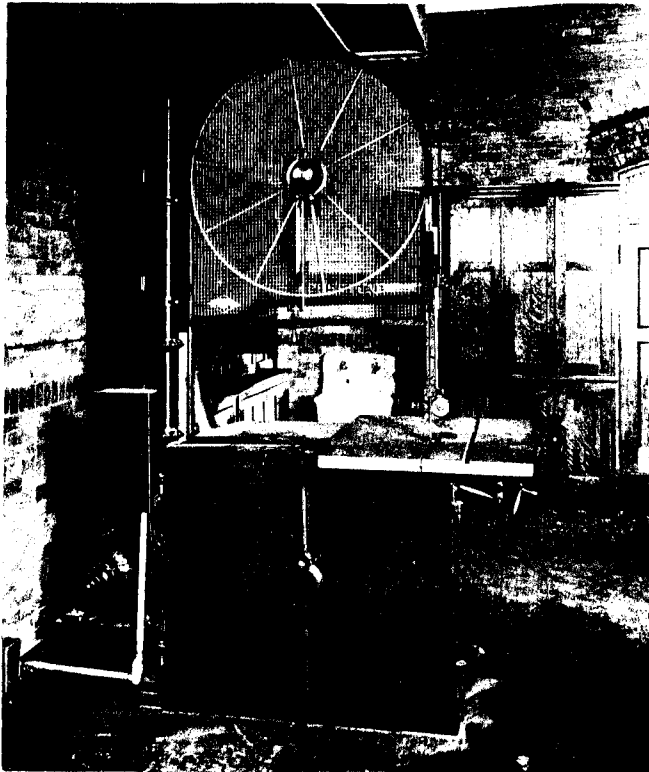
- 3 36 in. Band Saws, Ball Bearing (as illustrated).
- 23 Manual Training Lathes, complete and equipped with SKS Self Aligning Ball Bearings.
- 2 Buzz Planers and Jointers.
- 1 Ball Bearing, Roller Cut off Saw.
- 3 Hand Feed Rip Saws.
- 1 Power Feed Rip Saw.
- 1 High Speed Ball Bearing Snaper.
- 1 "Hodd" Patented Universal Belt Sander.

All these machines are motor driven direct, particular attention being given by us to the Motor Driven and Ball Bearing features as well as to the proper guarding of Woodworking Machinery.

The fact of the above equipment being installed in this new and modern school building is proof of the exceedingly good value which is contained in Preston Woodworking Machinery. Everything that goes to make up the construction and equipment of this building is absolutely the best and most up-to-date on the market to-day.

Our machines have stood the test of the biggest shops in Canada. They are produced by the most skilled labor in Canada and their design is the result of years of experience. Write us to-day for detailed information.

**The Preston Woodworking
Machinery Co., Limited**
PRESTON - ONTARIO



Advertising Value

Manufacturers of building materials and supplies deal with such a restricted number of people that they find advertising that appeals to the public generally, to be largely wasted effort.

Profitable advertising for them, must be directed to the people who buy or direct the purchase of their products.

Every advertisement they pay for must be read by a large percentage of their prospective customers.

"Construction" is published in the interests of the architects, engineers and contractors in Canada. It has a large circulation in every part of the country,

and the quality of its pages both from an editorial and mechanical standpoint, gives it an assured position in its particular field.

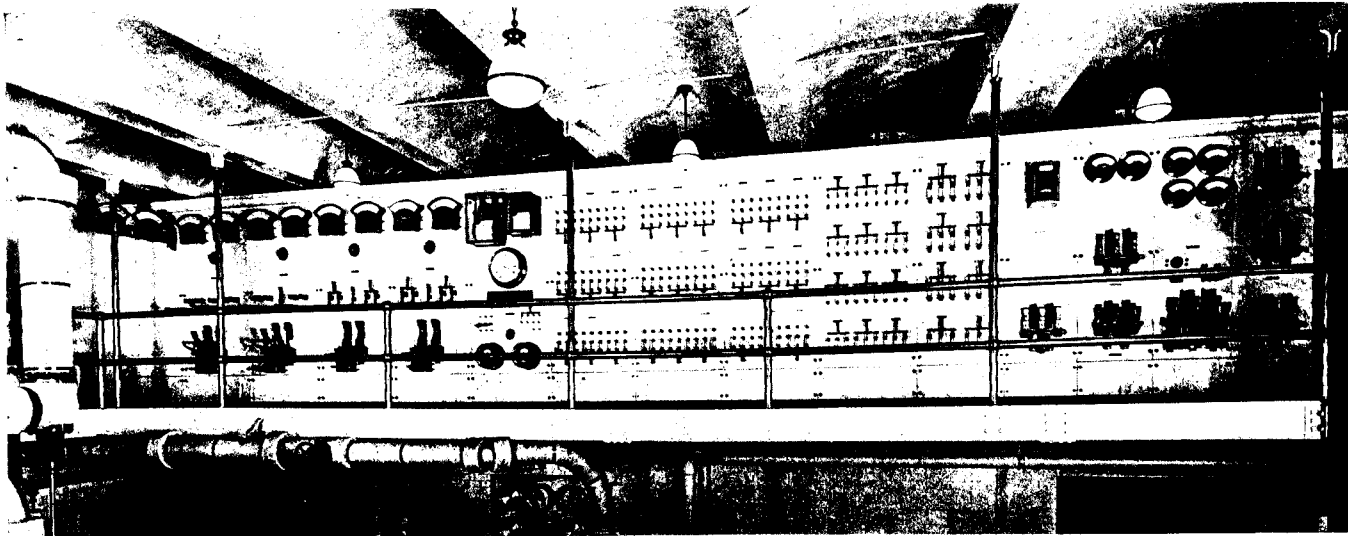
Its advertising pages are used by many of the leading manufacturers and dealers who wish to interest architects and builders in their products.

We would like to hear from you regarding your sales problems.

We know that "Construction" can help you secure the favorable attention of those you wish to interest, and we will gladly furnish you with full particulars about our rates and also tell you about our Daily Report Service.

"CONSTRUCTION"

Corner Richmond and Sheppard Streets, Toronto, Ont.



Cut of Switchboard supplied by KEITHS LIMITED.

Sub-Contractors, Northern Electric Co.

KEITHS LIMITED, Engineers and Contractors, of Toronto and Montreal, were awarded the contracts for the complete Electrical, Gas, Refrigeration, Switchboard, Fixtures and Motor Installations at the New Central Technical School. The magnitude of this undertaking can only be grasped by the fact that their total contracts amounted to approximately \$90,000.00. A detailed account of this firm's work is given below:

GENERAL CONTRACT.

The work installed under this heading consists of the installation of Electric Clocks, Fire Alarms, Call Bells, Telephones, Power and Light Wiring, Motor Equipment and Installation.

The Electric Clock System is one that merits particular mention. It consists of a Master Clock of Colonial design in quarter cut oak with a 14 in. dial. The Programme Instrument operating one hundred and twenty-seven 2 in. Classroom Bells, sixteen 10 in. Gongs, two 18 in. Gongs, and six 6 in. Gongs, is mounted inside of the Master Clock case. The period of the Programme Clock calls for continual operation of this system from 8 a.m. to 10 p.m. each day except Sunday. The Secondary Clocks, one hundred and twenty-seven in all, are of a round type, 12 in. in diameter. The case of these clocks in the upper classrooms and Directors' rooms is made of quarter cut oak. In the basement, owing to the nature of the surroundings, viz., woodworking shops, it was thought advisable to install dust-proof cases on the clocks. The type used is the same as for classrooms with a spun metal case finished a statuary bronze. The auditorium clock is made up of white Italian Marble inset with quartered oak and bronze numerals raised on the surface.

The batteries are two sets of nine cells each and of the Electrical Storage Battery Company manufacture. This system was sub-let to the E. Howard Clock Company, of New York, and is the largest installation of electric clocks in Canada.

The bells are of the Holtzer Cabot manufacture.

The Fire Alarm System consists of 18 stations of Holtzer Cabot manufacture mounted on surface of wall. The wiring is so arranged that by the breaking of the glass at any one of the 18 stations the number of the station appears on annunciators situated in the Assistant Principal's room as well as in the Engineer's quarters. The closing of the circuit also rings all fire gongs throughout the building simultaneously.

The Telephone System is on a very elaborate scale. From the engine room a system of conduits is run to the six wiring ducts located at the extreme ends of the building and up these to the respective floors. At each floor a terminal board is installed from which the branch conduits run to the various classrooms. The telephones used throughout the building are of the Western Electric Company manufacture flush type and were installed by the Bell Telephone Company. Keiths Limited installed the frames for the telephones and run all conduits (some 12,000 feet) for this system.

In connection with the power and light wiring 60,000 feet of conduits from ½ in. to 4 in. and 280,000 feet of wire from No. 16 to 1,000,000 CM Cable were used in this installation. From the main switchboard in the engine room the main feeders connect through the wiring tunnels under basement floor to standard panel boards located on the various floors throughout the building. The layout of this work is so designed that there are six distributing centres designated as Wiring Ducts A, B, C, D, E, F, and located one in each corner of the building and two in the centre. From these ducts a set of mains runs to each classroom where is located in the wall at standard height a cutout panel with Perkins Push Button Switch mounted in the trim. This arrangement in classroom makes an ideal "Safety First" proposition as no live parts are exposed to the non-expert or student who may operate the lighting in the respective rooms. Power outlets for 110-220 volt D.C. are provided in most all rooms of the Building and DC and AC Single Phase 110-220 Volt in the laboratories. The wiring in the basement is installed in exposed conduit. All metal switch and receptacle plates throughout are finished a statuary bronze to match the hardware of same.

We are prepared to give the most satisfactory service as regards workmanship and materials on all building contracts.

Let us know your requirements and we will send you quotations without delay.

SWITCHBOARD.

This very important unit of all electrical installations is developed to its highest form in the Central Technical School. (See illustration above).

The switchboard consists of fourteen panels of polished white Italian marble 2 in. thick, each panel being built of two sections and mounted with a cornice six inches deep and six inches wide. The total length of this switchboard is forty-three feet. There are four generating panels for 250 KW, 100 KW, 80 KW generators and 75 KW motor generators, one totalling panel containing two Sangamo Watthour Meters, two Westinghouse Graphite Meters, five panels containing forty-seven switches for light and power, one A.C. main feeder panel, two frequency changer panels, one A.C. branch feeder panel containing three ITC circuit breakers. There are eleven ITC circuit breakers on this switchboard.

All cables between generators and switchboard are paper insulated lead covered run in iron conduits. Balance coils for generators are set on switchboard platform at rear of switchboard.

Switchboard platform is erected eight feet up off engine room floor and is supported by 1½ in. rods securely fastened to iron girders on ceiling. This platform is U shaped, main portion being 43 ft. long by 9 ft. wide, and side projections are 20 ft. by 4 ft. Surface of platform in front and rear of switchboard is covered by a ¼ in. rubber mat. A 2 in. brass rail extends around the front of platform.

FIXTURES.

The total number of fixtures installed is 1800. Total number of Tungsten lamps, from 25-250 W. is 1900.

Type of fixture installed in classrooms,	"Phenixlite."
" " " " " " Directors' Rooms,	Semi-indirect,
" " " " " " with 5 in. canopy and Chain Drop.	
" " " " " " Basement, P & S Receptacles with	cord drop and Benjamin steel shades.
" " " " " " Basement, corridors and lavatories,	"Realite" fixtures.
" " " " " " Stair landings, brass ceiling band	
" " " " " " with ½ in. Holophane Hemisphere.	

All fixtures finished statuary bronze. Exposed lamps are three quarters frosted.

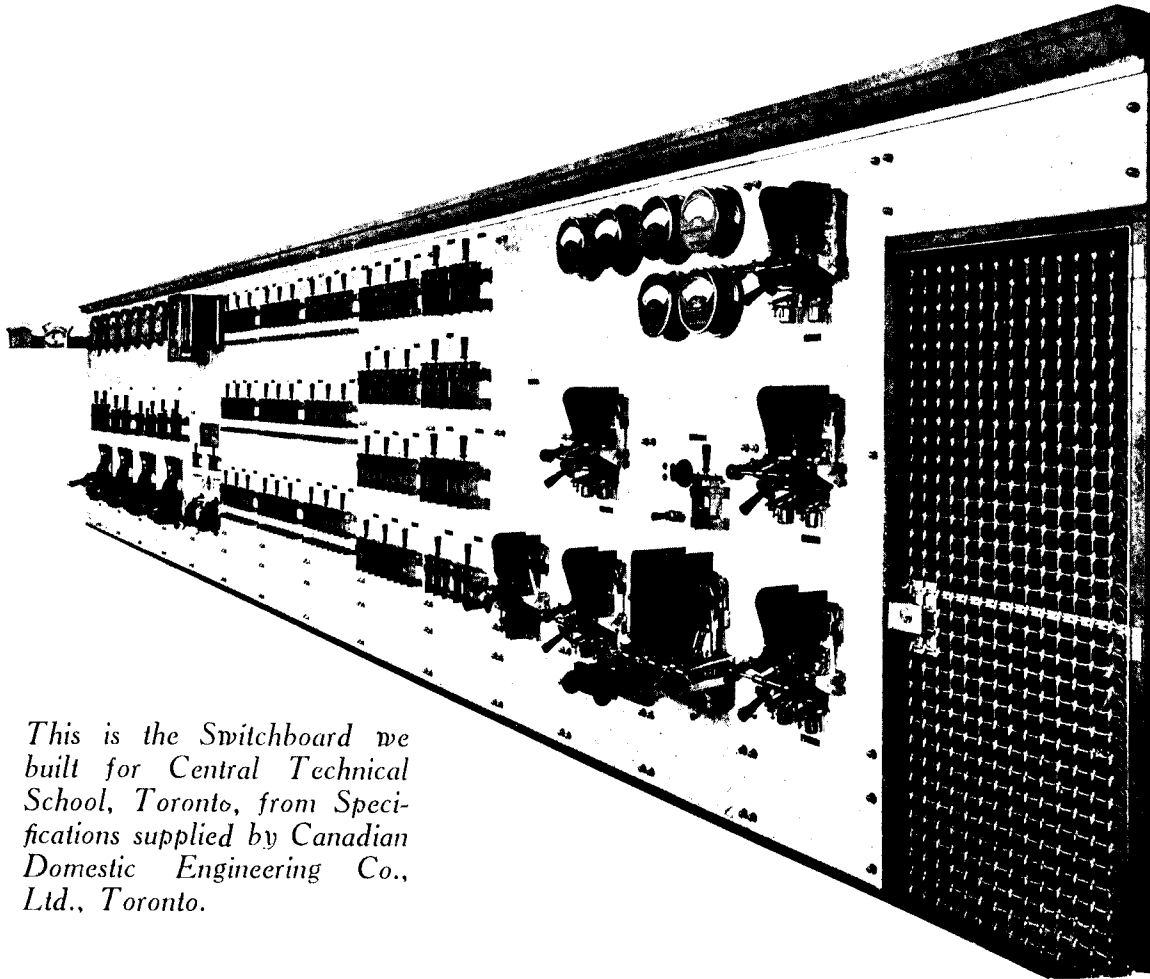
A unique system of lighting is installed in machine shop, same being lighted by indirect fixtures using Benjamin Steel Reflectors inverted. Insulating rings on canopies are all hard rubber. There are 24 different styles of fixtures.

Keiths Limited were awarded by the Board of Education the contract for the connecting of all electrical equipment in this building, same to be carried out under the direction of Dr. MacKay.

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- 1 testing transformer 10,000 V secondary ½ K.W.
- 1 3 phase 5 h.p. 25 cycle induction motor, 500 V.
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- 5 DC 5 h.p. motors
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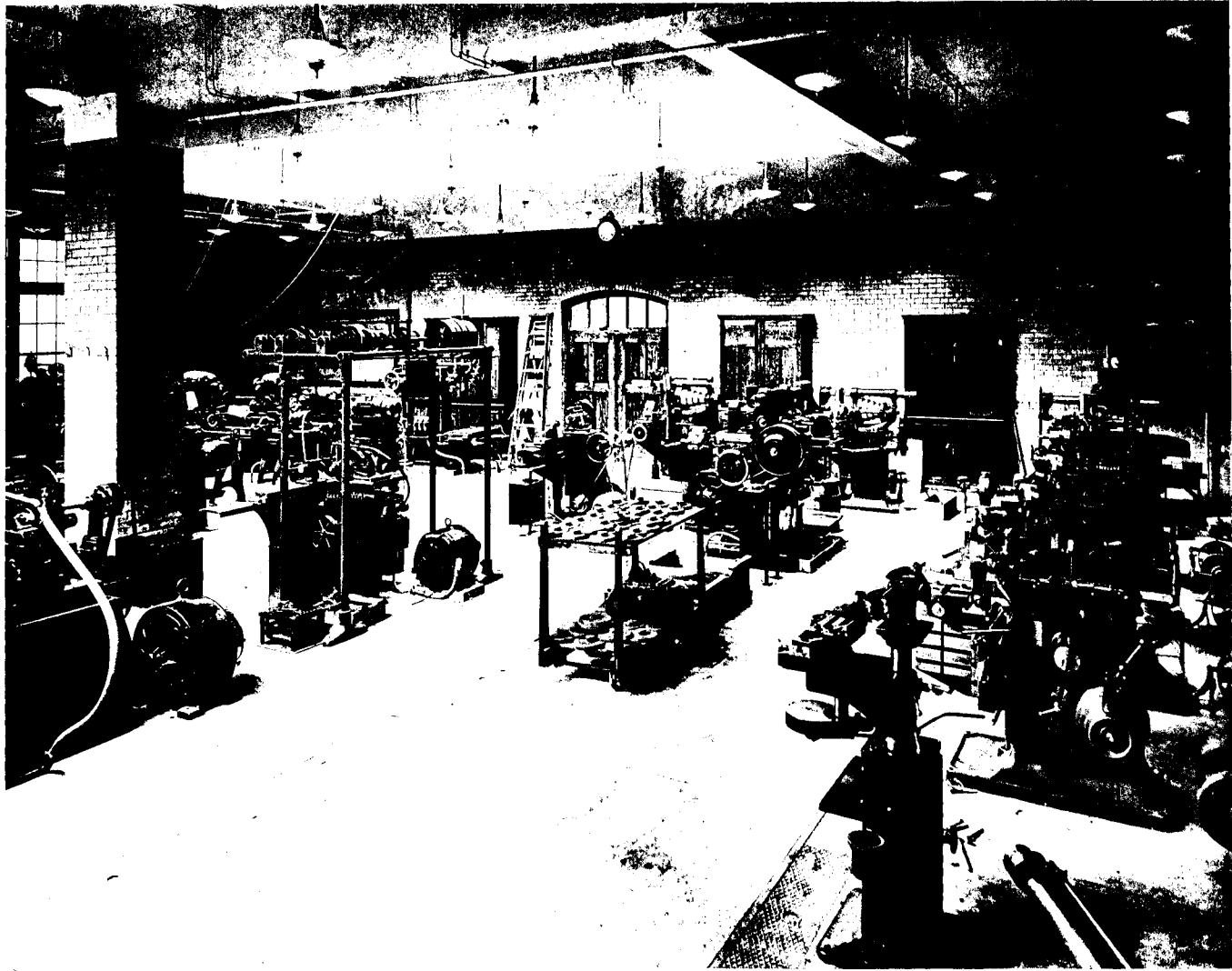
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View of Machine Shop in Central Technical School, Toronto

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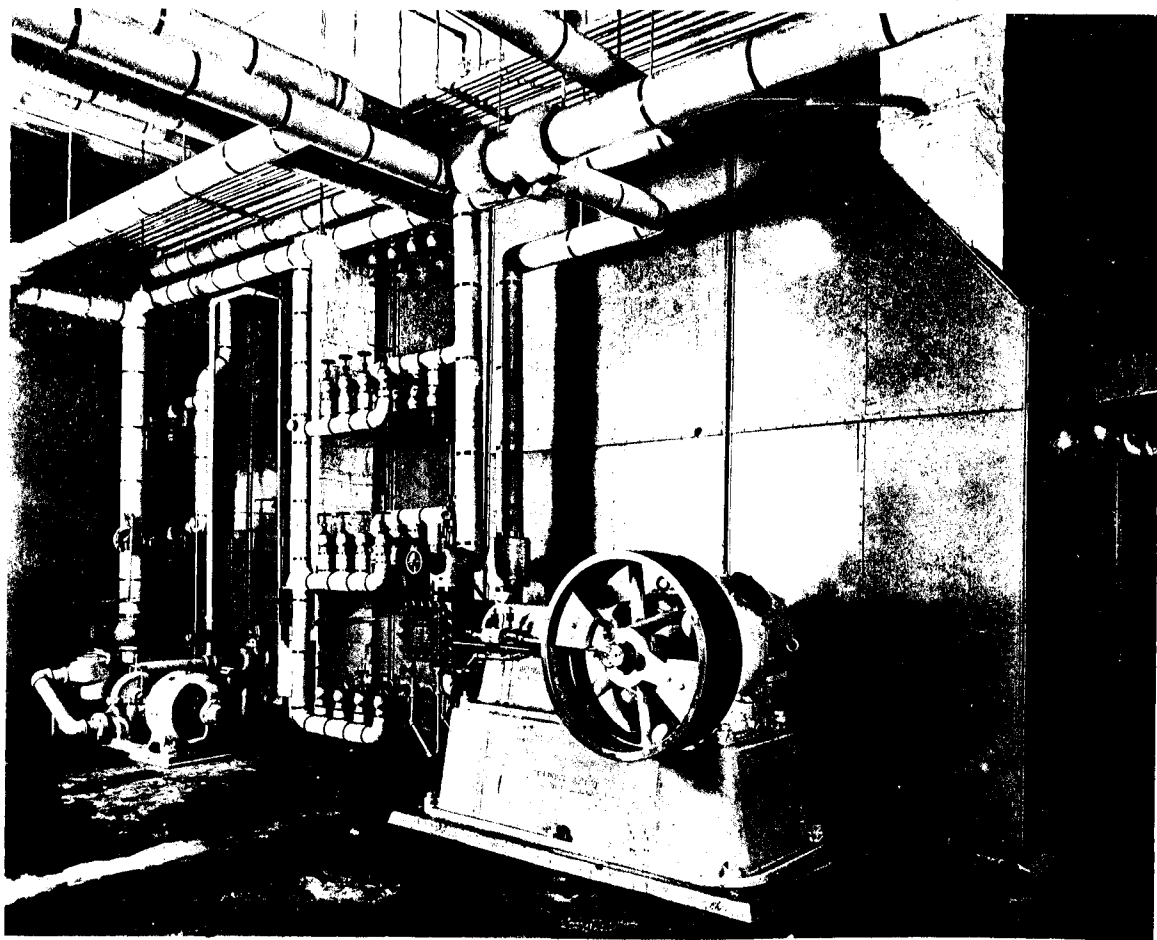
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4-5

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LONDON - CANADA

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The furnishings of the New Central Technical School are in keeping with the importance of the structure. Throughout it has been the aim of the Advisory Industrial Committee to choose those articles which would not only give the best service, but which would serve as examples of modern workmanship and manufacture to the students.

1,000 STEEL LOCKERS

New Central Technical School



were purchased after a painstaking examination of samples from every manufacturer in Canada and a number from the United States. We are proud to have secured this order. It is corroborative of our claim that our lockers are of the highest quality. See illustration on page 430.

Here we show one of our standard types of lockers. Note the clean-cut appearance. The construction is in keeping. When asking tenders on lockers, the wisest and fairest course is to request that samples be provided. Thus only, can a fair comparison be made. Price alone means little.

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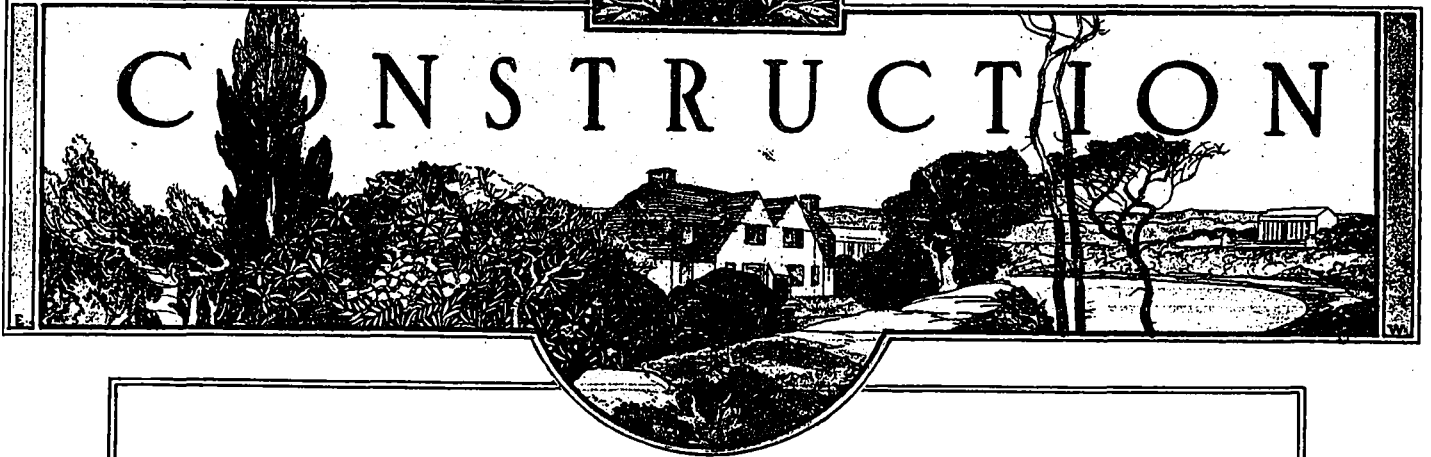
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CONSTRUCTION



October, 1915

Vol. 8, No. 10

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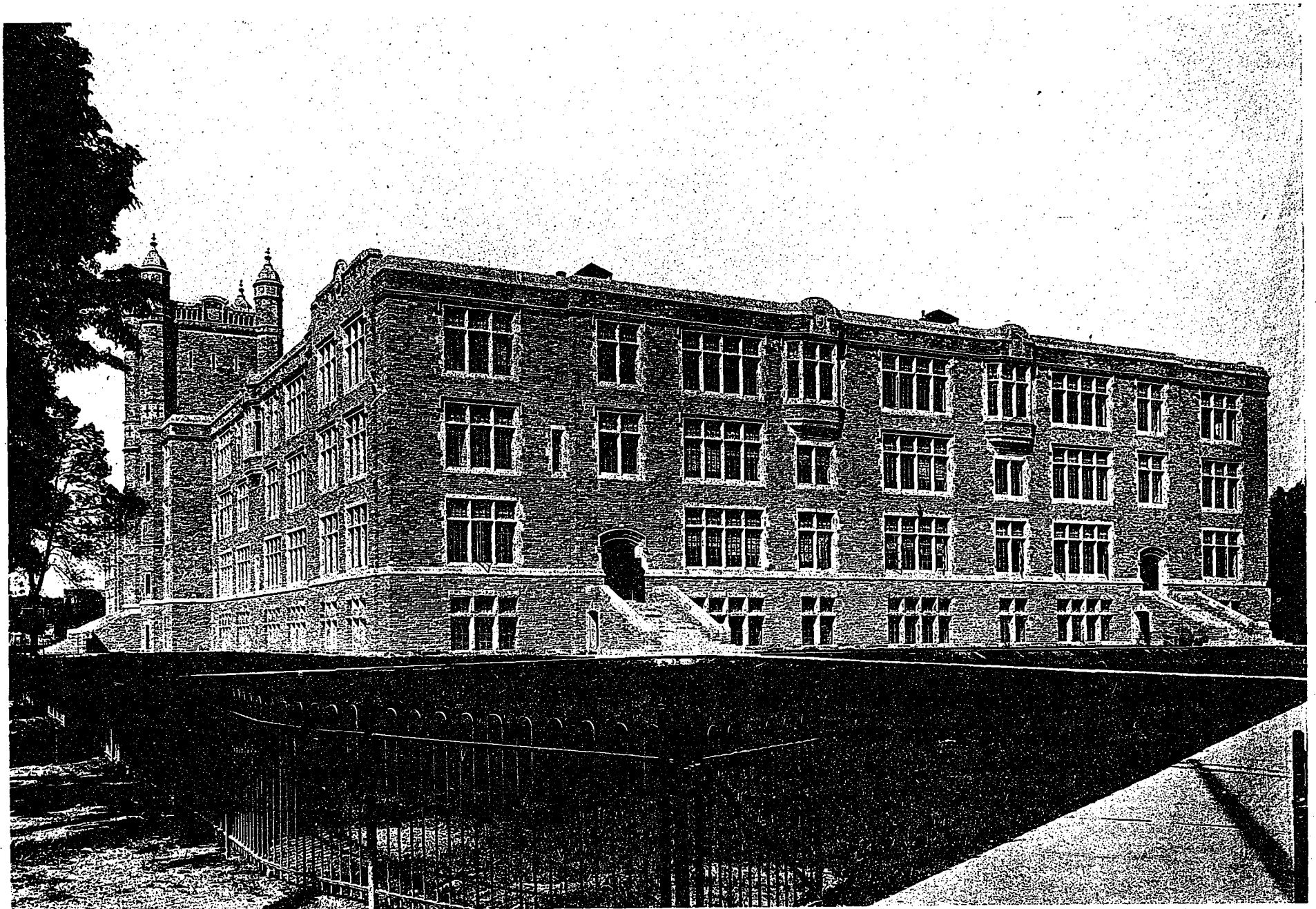
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CENTRAL TECHNICAL SCHOOL, TORONTO.

ROSS & MACDONALD, ARCHITECTS.

Editorial

NEW CENTRAL TECHNICAL SCHOOL, TORONTO

The new Central Technical School of Toronto marks an epoch in the progress of modern education. Its future will be a great accomplishment of the present ideas. No one can appreciate the influence such training will exert on the political as well as domestic trend of our country. It is well, therefore, that the institution has been housed in a modern up-to-date structure, for endeavors of this nature are not temporary. Taking up two city blocks, the site amply accommodates the building four hundred and twenty-five feet in length, and in time when the nearby shacks are demolished and a wide approach planned from Bathurst street, the work will be heartily commended by all. It will stand as a living monument to the common sense occasionally exhibited in the present generation.

REVIVAL IN BUILDING LINES

It is encouraging to see the disappearance of the pessimistic expression which has prevailed since the first day of the present struggle among the European powers. The Government, the moneyed corporations and the individual all seemed to encourage hard times by their attitude towards the stoppage of legitimate building projects. Gradually they have felt the wave of prosperity which is sweeping over the States and consequently are benefiting by it. That Canada should not go ahead in a certain ratio is a mistaken idea and what we all need is more confidence in the exhaustless resources scattered throughout the Provinces. One of the wholesome signs of a reversal of feeling is the activity shown in connection with the new Toronto station. The site will soon be in readiness for a rapid completion of the proposed structure, which will accommodate the new post office. This will mean renewed life in many factories and should be followed by other undertakings which have been temporarily shelved.

PUBLIC COMFORT STATIONS

Much valuable assistance has been obtained from foreign countries after a thorough study of their problems and the manner in which they have been met. Much more could be absorbed to our credit. One fact especially seems to impress us: the lack of public comfort stations. Every city and town should realize the extreme necessity of such conveniences from the stand-

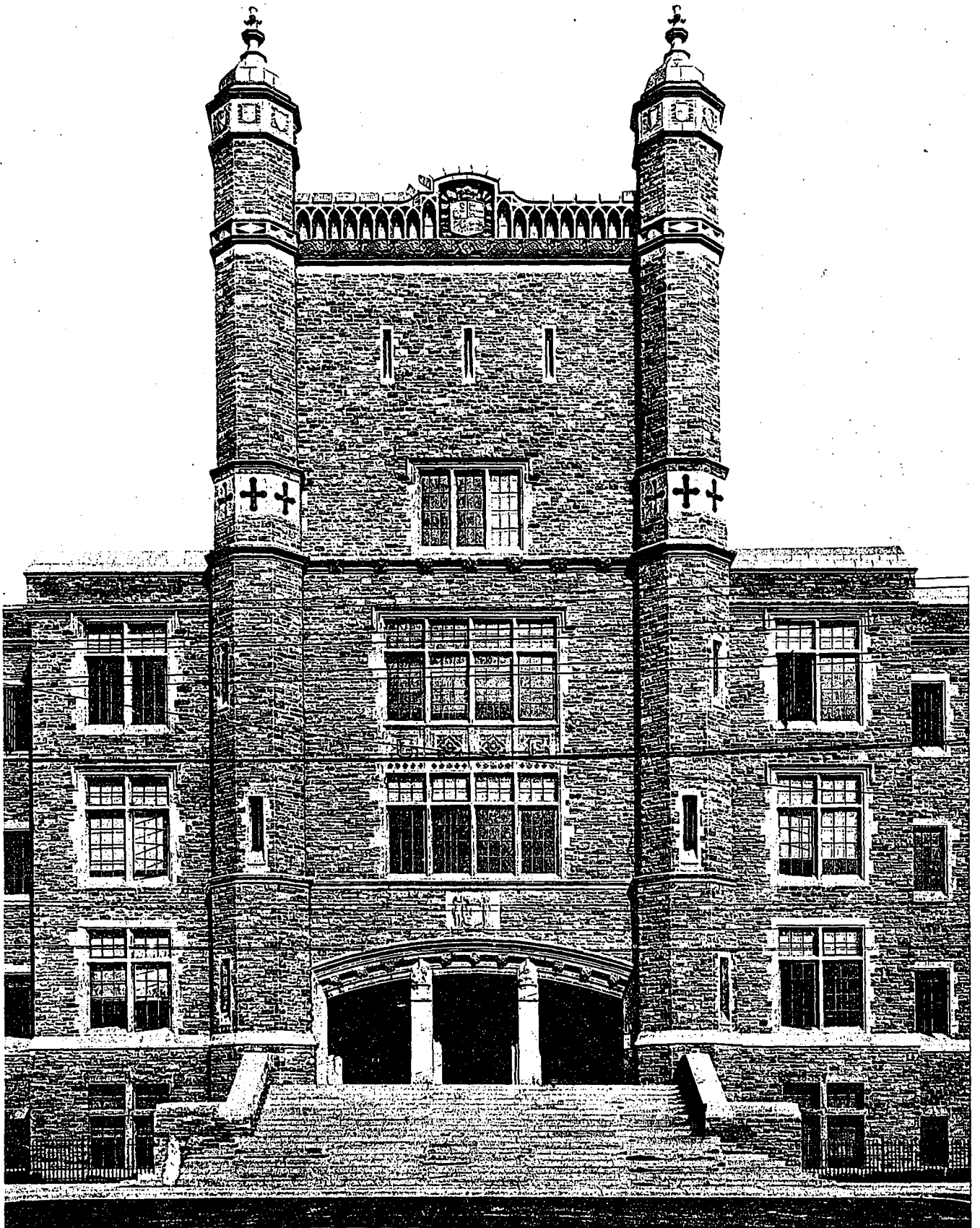
point of health alone. We appreciate the great need and still remain inactive to our general interests. Foreigners who know the value of this work are greatly surprised at progressive cities like Winnipeg, Montreal and Toronto neglecting to arrange proper facilities in a sanitary and esthetic manner. Our false modesty will at least provide artistic arrangements which would be quite commendable—but the main point is to consider the matter seriously and take some action in this direction. Every year of delay makes the work all the harder and more expensive.

SCHEME TO DESTROY NIAGARA FALLS

It seems impossible for a year to pass without some scare as to the mercenary tendencies of the present era stepping in and raising havoc with the natural beauties which have managed to escape up to this time. It is hardly creditable that schemes for injuring the Niagara Falls and the Rapids are entertained, but both the States and Canada have fought such propositions for years and will do so until they become broad-minded enough to settle it once for all. W. H. Barker, of Montreal, absurdly claims that a plan to generate 2,250,000 electrical horsepower under the falls by taking the water through penstocks projected into the falls would in no way injure the present effect. It is to be hoped that when this is submitted to the New York State Legislative Commission they will waste no time in discussing it, for such schemes should never be presented, let alone considered seriously.

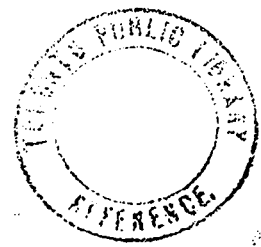
CHANGE IN EDITORIAL STAFF

CONSTRUCTION regretfully announces that this issue will be the last under the supervision of its present editor. Frederick Reed has been with the journal for three years, and the high standard maintained throughout that period is the greatest tribute which can be paid for his services. Mr. Reed wishes to thank the readers for their helpful criticisms; the architects and engineers for their co-operation in the presentation of Canadian work; and the contractors for their hearty support at this critical period. He asks a continuance of former loyalty towards CONSTRUCTION and sincerely trusts that all parties concerned will strive to keep its present wholesome character and thereby hold its place among the few leading architectural journals of Europe and America.



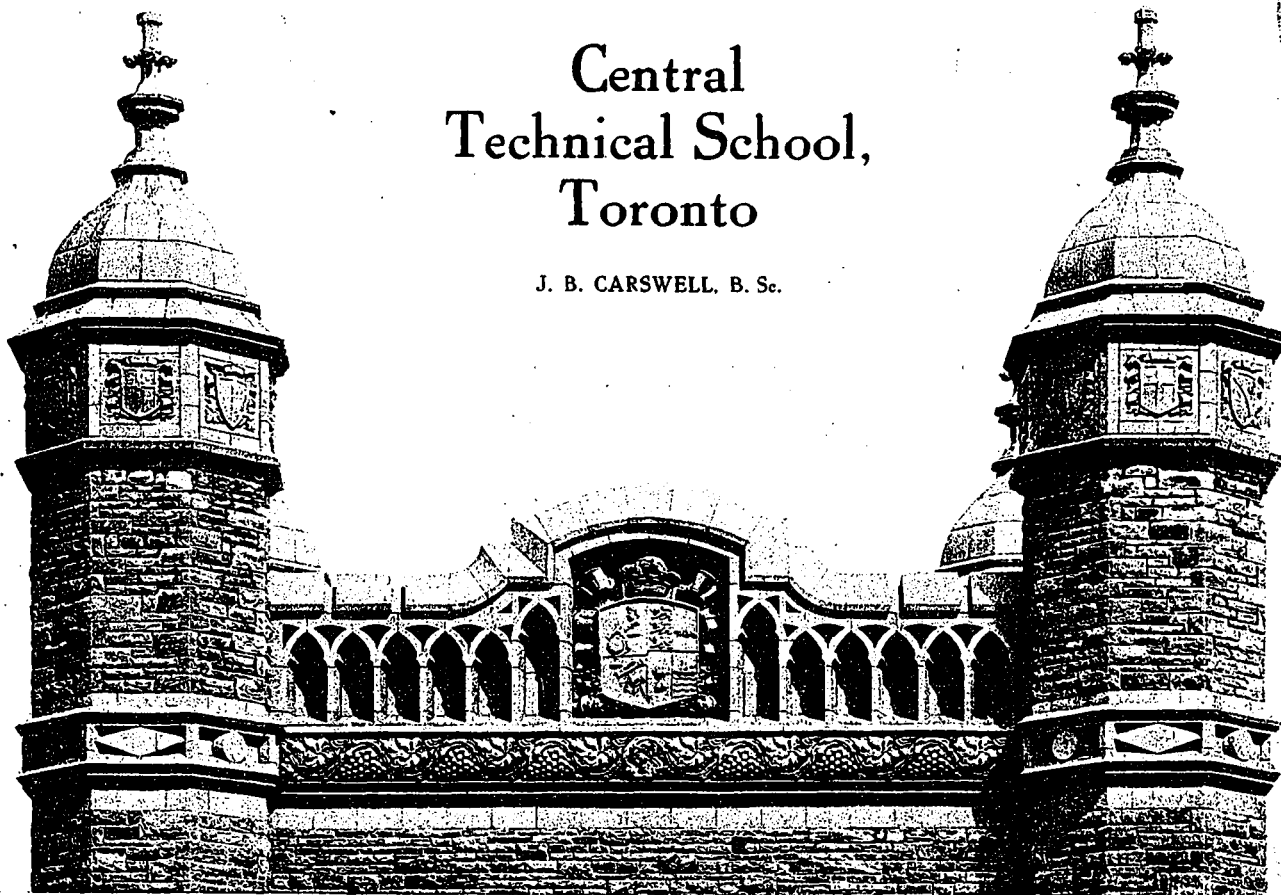
MAIN TOWER, CENTRAL TECHNICAL SCHOOL, TORONTO.

ROSS & MACDONALD, ARCHITECTS.



Central Technical School, Toronto

J. B. CARSWELL, B. Sc.



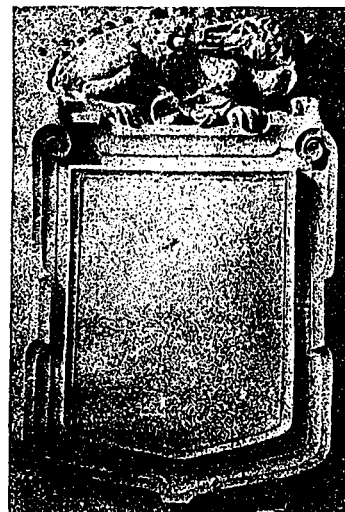
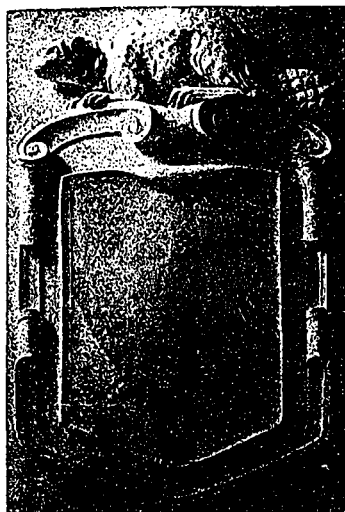
SITUATED in the geographical centre of the city and occupying two whole blocks, the Central Technical School stands completed to-day, a beautiful and lasting monument to the determination and energy of the little minority who realized the importance and the great future of technical education.

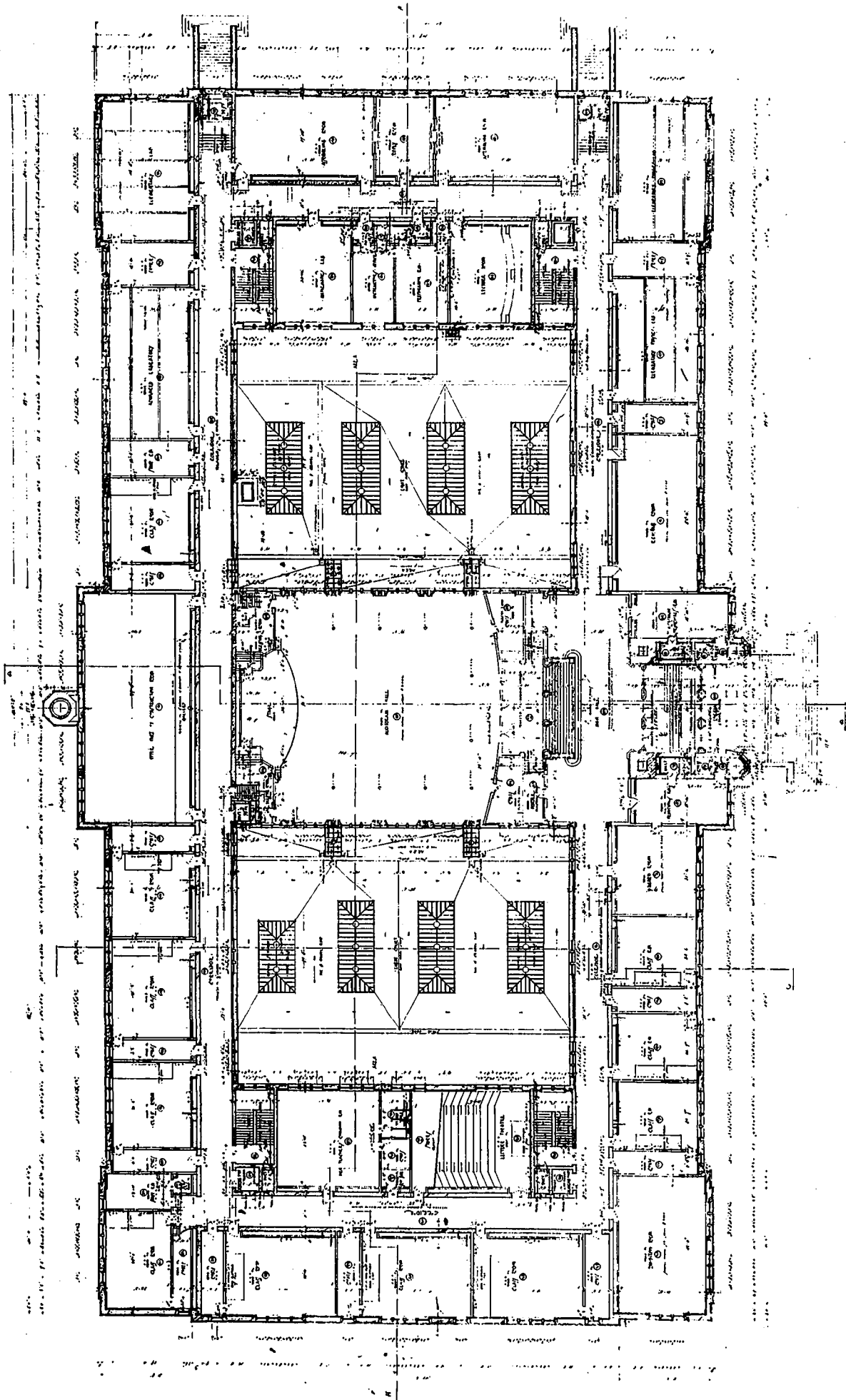
The building stands well back within its grounds and faces public streets on all four sides, so that each elevation is treated with almost equal value. The overall dimensions are four hundred and thirty feet along Lippincott and Borden streets, and two hundred and twenty-eight feet along Harbord and Lennox streets. The size of the site allows for the accommodation of a

football field at the north or Lennox street end, and tennis courts at the Harbord street end. There are four main floors with fourteen feet six inches clear ceiling height, including the basement, the floor of which is only four feet below grade. Above the main entrance on Lippincott street, raises a

large tower of imposing dimensions, which relieves the length and lends dignity to the whole structure.

The building is Gothic in character, the exterior being of local limestone laid up in Scotch rubble masonry, while a very pleasing color effect has been obtained by blending about twenty per cent. of pure grey with eighty per cent. of pink and grey or piebald stone. The steps, platforms leading to the entrances, and the base course are all of the same kind of stone, but cut from pure grey dimensioned stock. The trim to the basement windows, on account of the greater ease in cutting, was made from "Grey Canyon," and the match between the two stones is nearly perfect, so much so that only an experienced eye can detect the difference. The trim to these windows is rock faced to blend with the adjoining work, the endeavor being not to accentuate these openings. Above the moulded water-table at the first floor level which forms the top member of the base proper, the

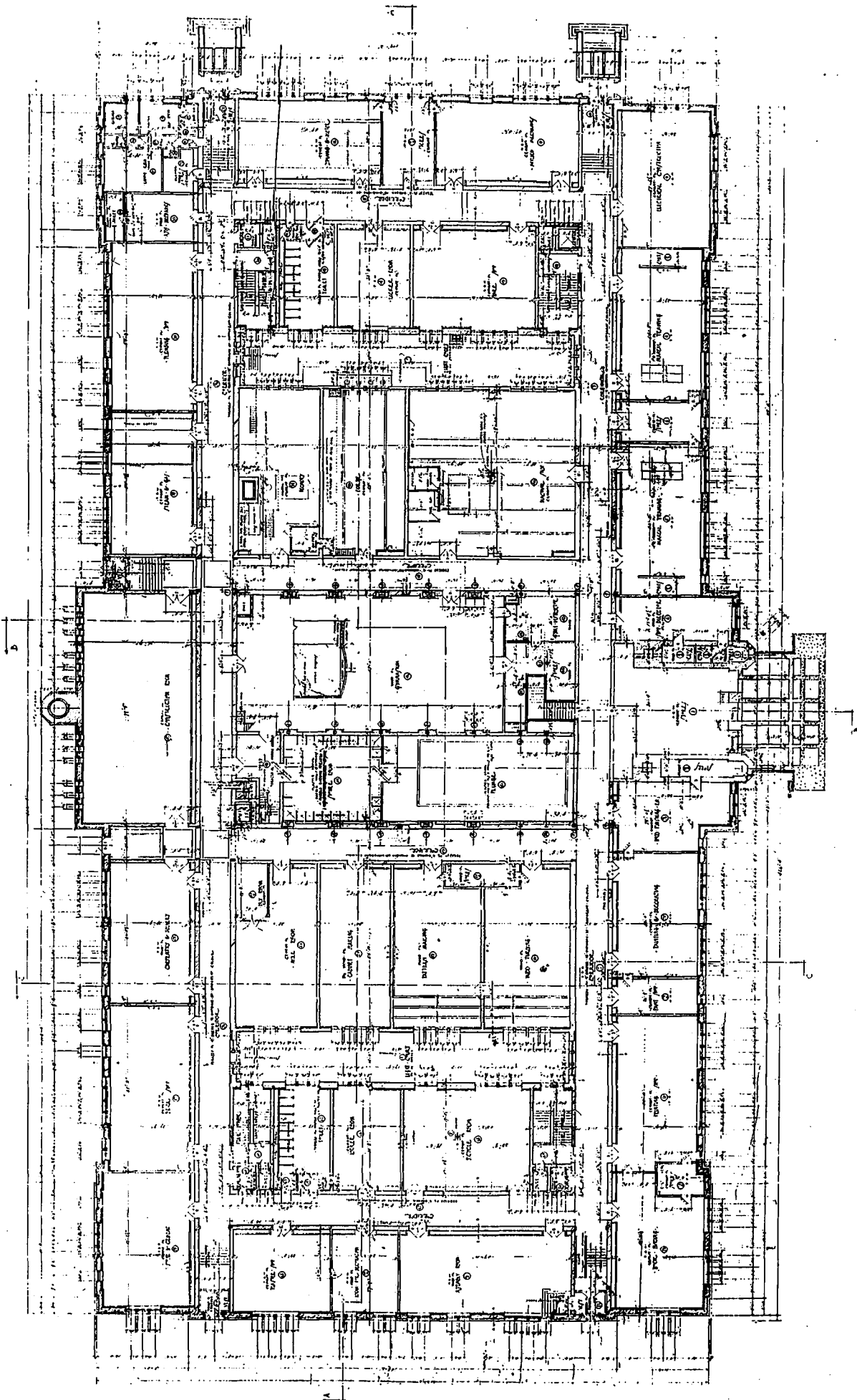




FIRST FLOOR PLAN.

CENTRAL TECHNICAL SCHOOL, TORONTO.

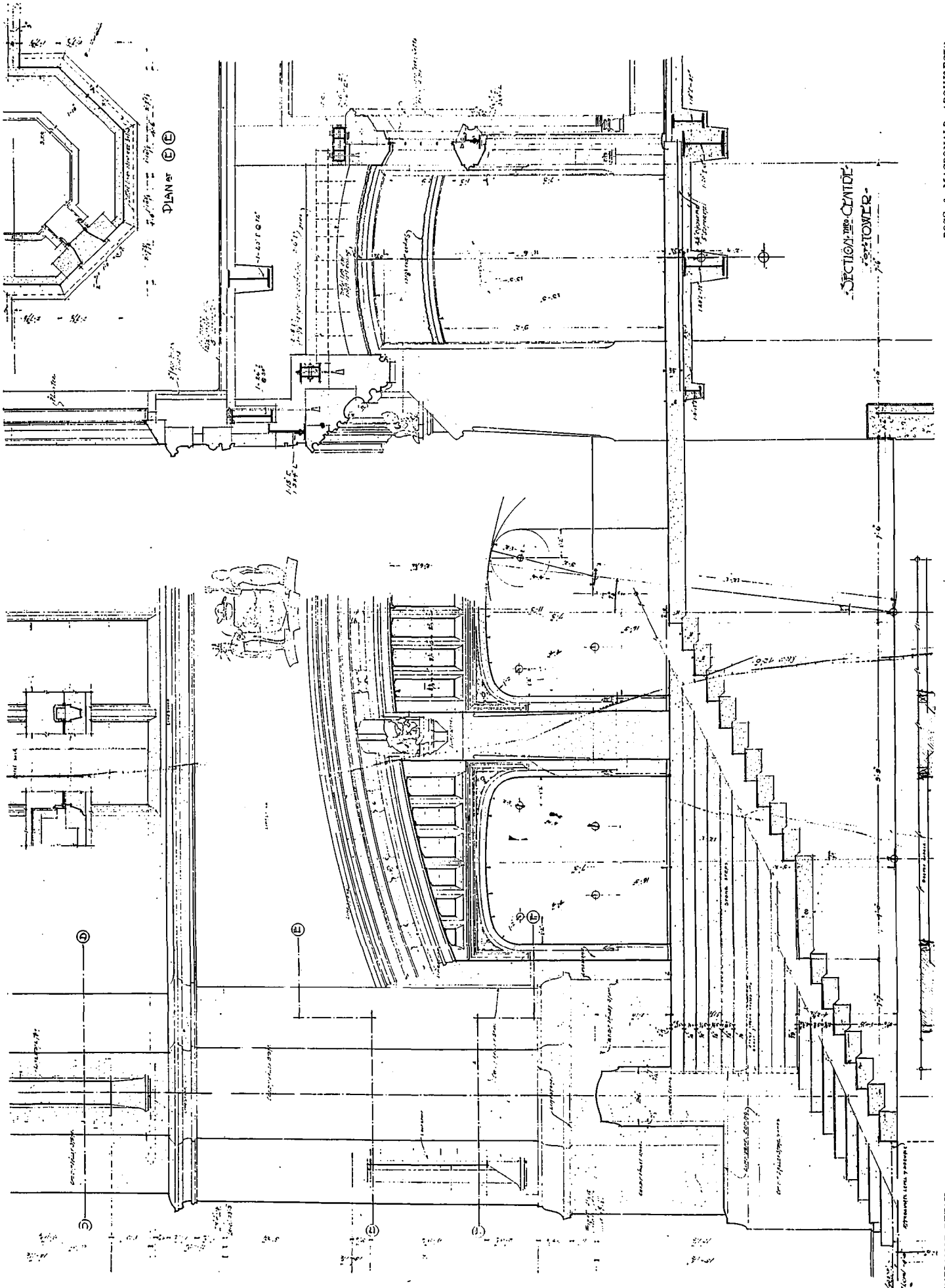
ROSS & MACDONALD, ARCHITECTS.



BASEMENT PLAN.

CENTRAL TECHNICAL SCHOOL, TORONTO.

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ROSS & MACDONALD, ARCHITECTS.

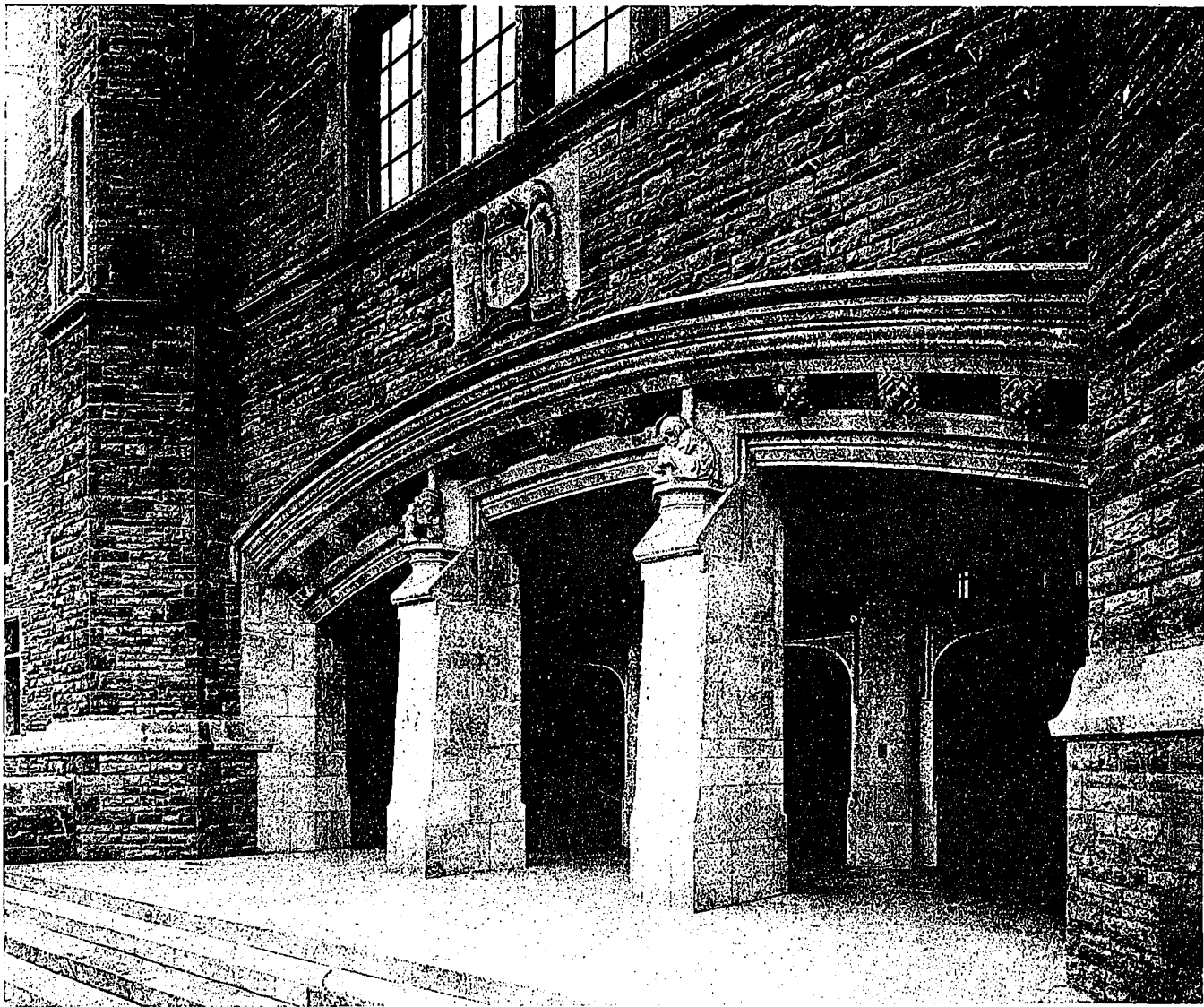
CENTRAL TECHNICAL SCHOOL, TORONTO.

ENTRANCE DETAIL.

window trim is all in dressed Indiana limestone. At the third floor ceiling line this changes again to glazed terra cotta to match with the Indiana stone. The cope all around the building and the ornamental work on the tower is in the same material. The two large interior courts of the building, each one hundred and fifteen feet by ninety feet, are finished with a light buff pressed brick.

There are eight subsidiary entrances to the building, apart from the main entrance. On Harbord street side two flights of steps lead to

doors, Gothic in design, lend interest to the entrance. From the vestibule a flight of marble stairs leads through another series of doors to the main hall executed in cream semi-glazed terra cotta. Facing the entrance is another flight of marble stairs leading up to the auditorium, continuing right and left up to the auditorium balcony, also to the second and third floors. Canadian marble was used for all these stairs, and it is interesting to note in this connection how successful was the effort to use Canadian material wherever possible. Every



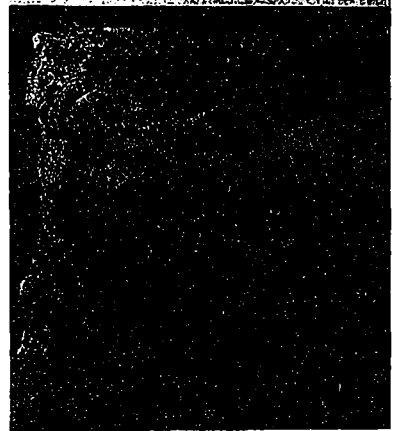
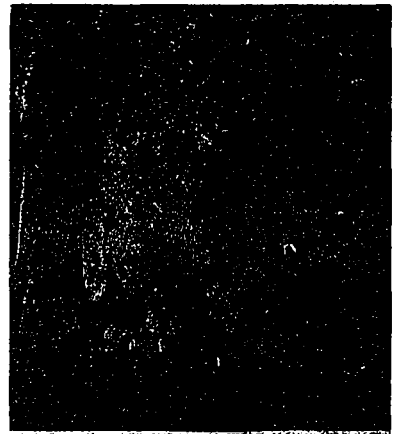
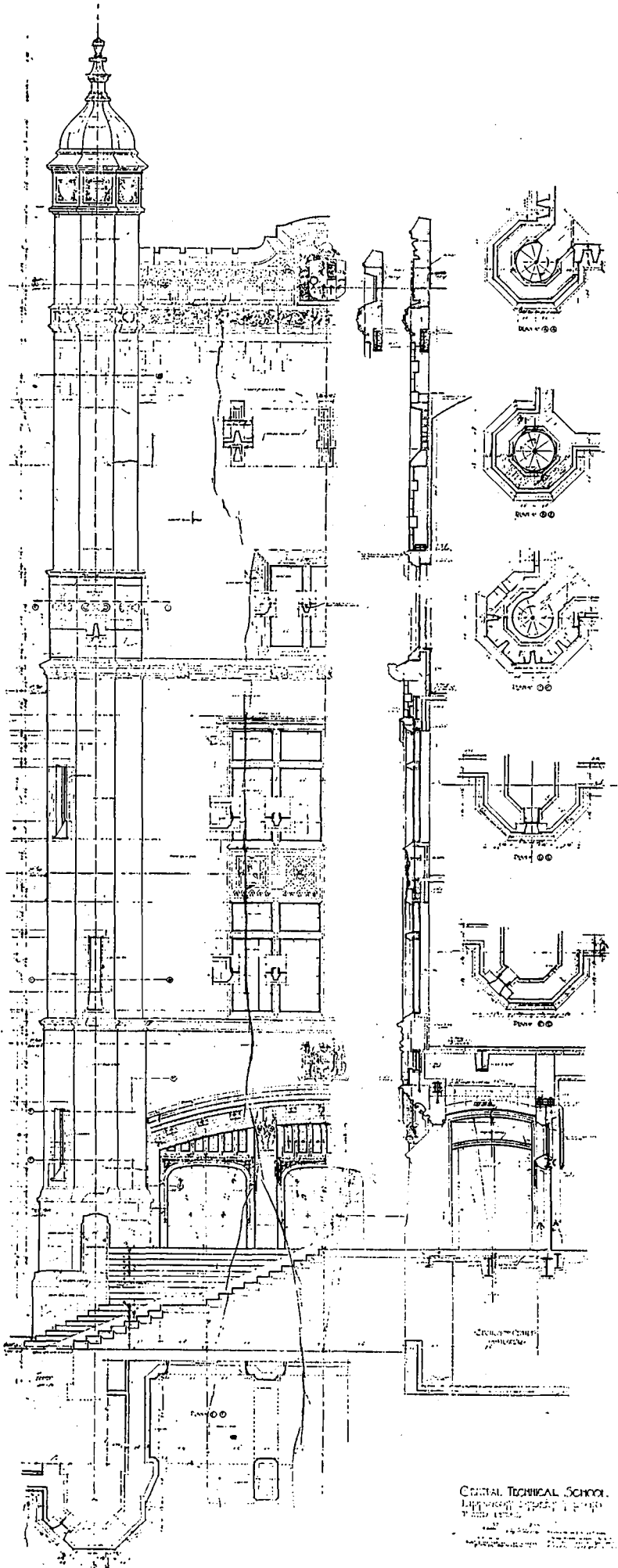
ENTRANCE DETAIL.

the girls' entrance on the first floor, beneath which stairs are entrances to the basement corridors. On the north side are two boys' entrances, one of which is provided with a bicycle ramp; while on the rear are two freight entrances, one being provided with a ramp for the handling of heavy material.

Entering by the broad flight of stairs on Lipincott street we pass under the heavy stone archway supported by two buttresses capped by stone grotesques representing "Industry" and "Science." The three pairs of main oak

brick in the building and the entire masonry shell are composed of Canadian goods, excepting the window trimmings.

Leading north and south from the main hall are the corridors which continue right round the building with class-rooms leading off on either side. These are repeated on all floors in the manner shown on the accompanying plans, there being close to one mile of these corridors, which are eleven feet broad, with terrazo floors, pressed brick walls ten feet six inches high and



DETAILS OF
CENTRAL TECHNICAL SCHOOL,
TORONTO.

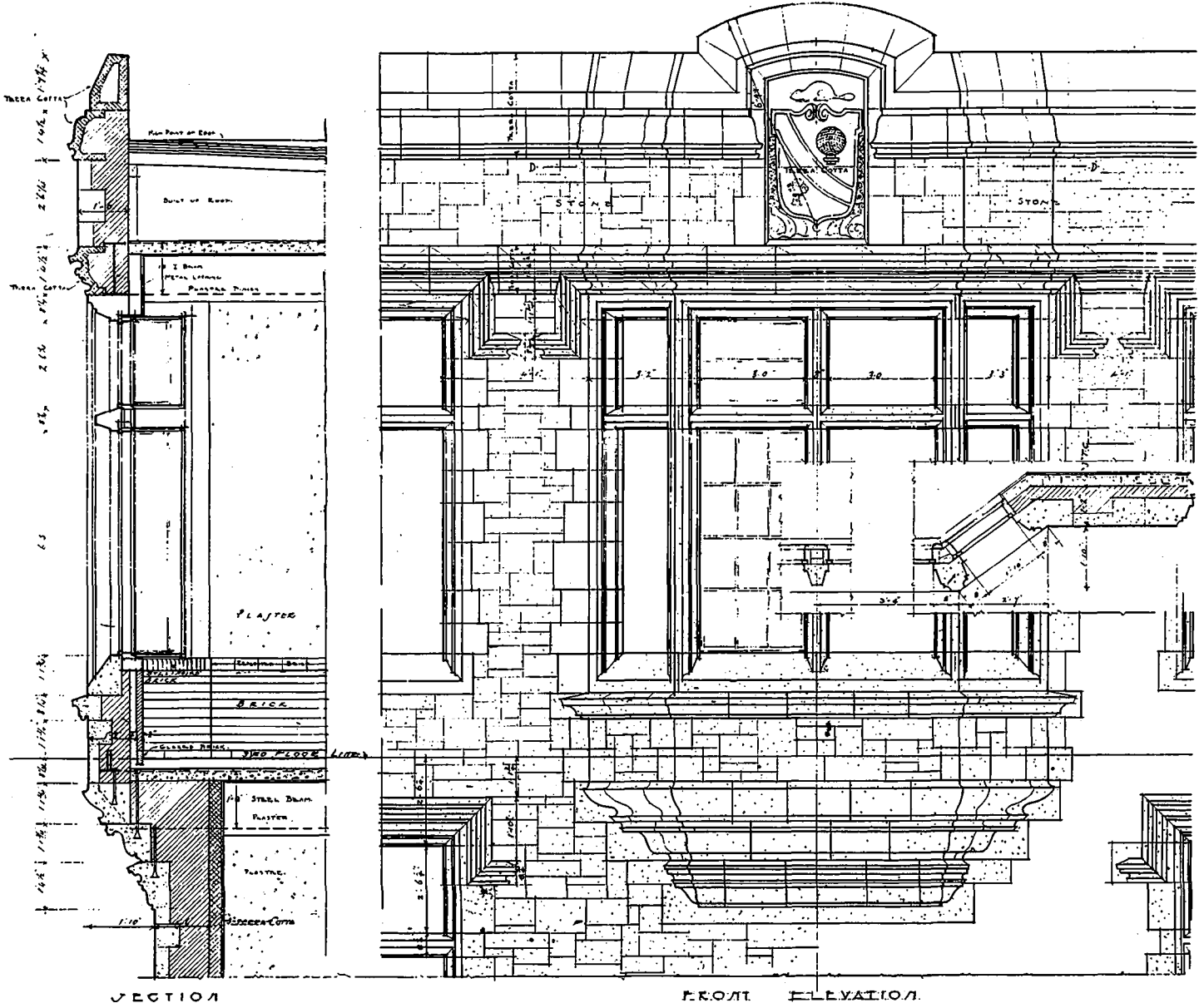
ROSS & MACDONALD, ARCHITECTS.



CENTRAL TECHNICAL SCHOOL.
Lippincott Street, Toronto.
1911-12.

barrel-arched ceilings in plaster. The walls start with a dark chocolate colored glazed brick course at the floor level, with a three foot six inch dado of dark buff unglazed brick above. The cap of the dado is a single header course on edge of a darker brown brick from which rises the main wall of light-colored buff brick. The top course is a simple moulded header course on edge, from which springs the plastered ceiling, the plaster being tinted to blend with the color scheme.

with oak stiles, surmounted by a heavy oak cap-rail. All the sand-finished plaster in these upper panels has been "scumbled" with a rich mixture of reds, browns and greens, the brown predominating, and the frieze above is treated with a stencilled design on the same scumbled field. The entrance to this room is emphasized by a richly carved doorway with the letters "C. T. S." in relief in the pediment; the ceiling is panelled in plaster, tinted in dark cream,



SECTION

FRONT ELEVATION

DETAIL OF ORIEL WINDOW.

The rooms calling for special mention on account of their architectural merit are the board room, exhibition room and reading room or library. The woodwork and plaster work, both ornamental and plain, through design, decoration, and surface treatment, harmonize with the Gothic exterior and at the same time stand as very fine illustrations of craftsmen's work. The first room above referred to is the board room. Red oak is used in this room, as throughout the building; the walls being panelled to a height of three feet, while above this are plaster panels

with light ribs running in both directions, wiped off in light brown. From the intersection of these beams hang inverted bowl fixtures, the glass etched with a grape and leaf design.

In the north-west corner of the same floor is the exhibition room, which has been treated very similarly to the board room, excepting that the plaster panels above the 3 ft. dado are replaced by a continuous cedar dado, finished with a dark oil stain, on which drawings and exhibits will be mounted. The ceiling in the



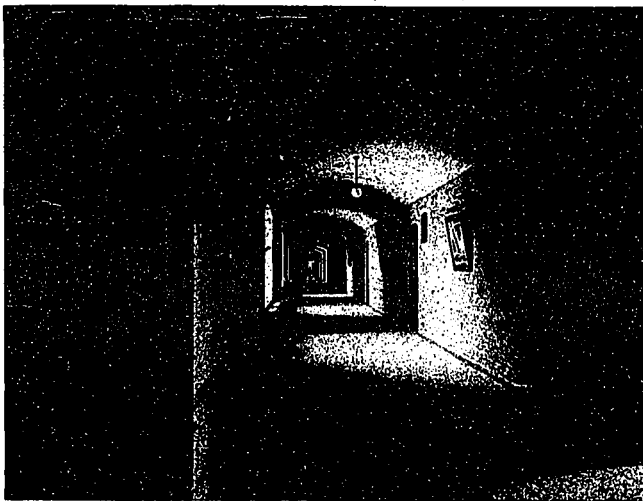
MAIN HALL.

field is plain sand-finished plaster, with one band of enrichment, showing the grape and leaf ornament, and a molded cornice, the ornamental work being wiped off in a slight neutral tone. Frieze, cornice, enrichment and ceiling are stepped up in tone from a grey cement to a light cream. Measuring forty-eight feet long by thirty feet broad, the room is beautifully light-

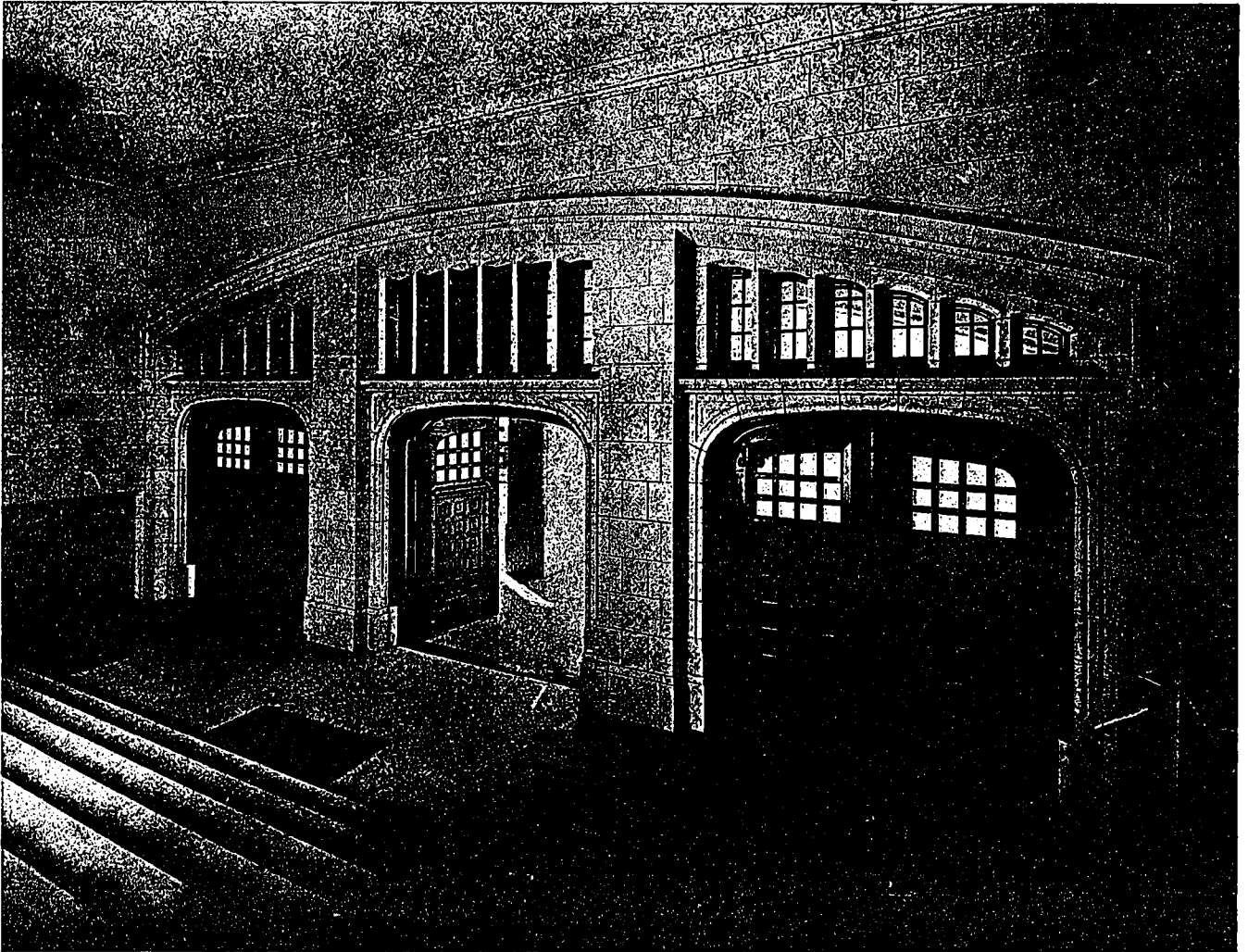
ed by the large casement windows on both sides.

The reading room to the south of the main hall is the only other room on this floor which departs from the regular severe treatment. It is lighted on the west side, and the other three walls are lined with red oak book-shelving nine feet high, the color necessary to the room is furnished by the books themselves. The dimensions are fifty-five feet by twenty-eight feet. The balance of the floor is taken up by a series of class rooms devoted to mathematics, physics, etc., the average size of which is thirty feet by fifty feet. At the south end are the physical laboratories, equipped very thoroughly with permanent tables specially designed for their immediate use and purpose.

Each floor has one general lecture room, with a preparation room leading off, and at the north end of the first floor is a large amphitheatre, which will be used principally for public lectures, having a seating capacity of over 200, with a ceiling height of two storeys. At the rear there is a moving picture cabinet. The rooms on the second floor, devoted entirely to the needs of women students and equipped for domestic science and domestic art, including cooking, housekeeping, laundry work, sewing,



CORRIDOR.

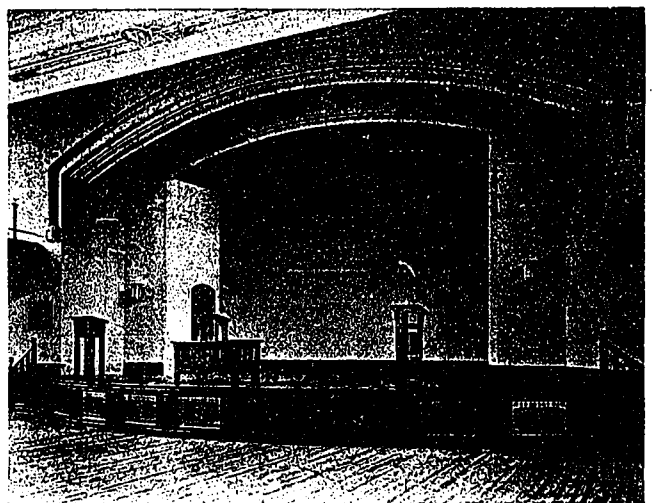


INTERIOR VIEW, MAIN ENTRANCE DOORS.

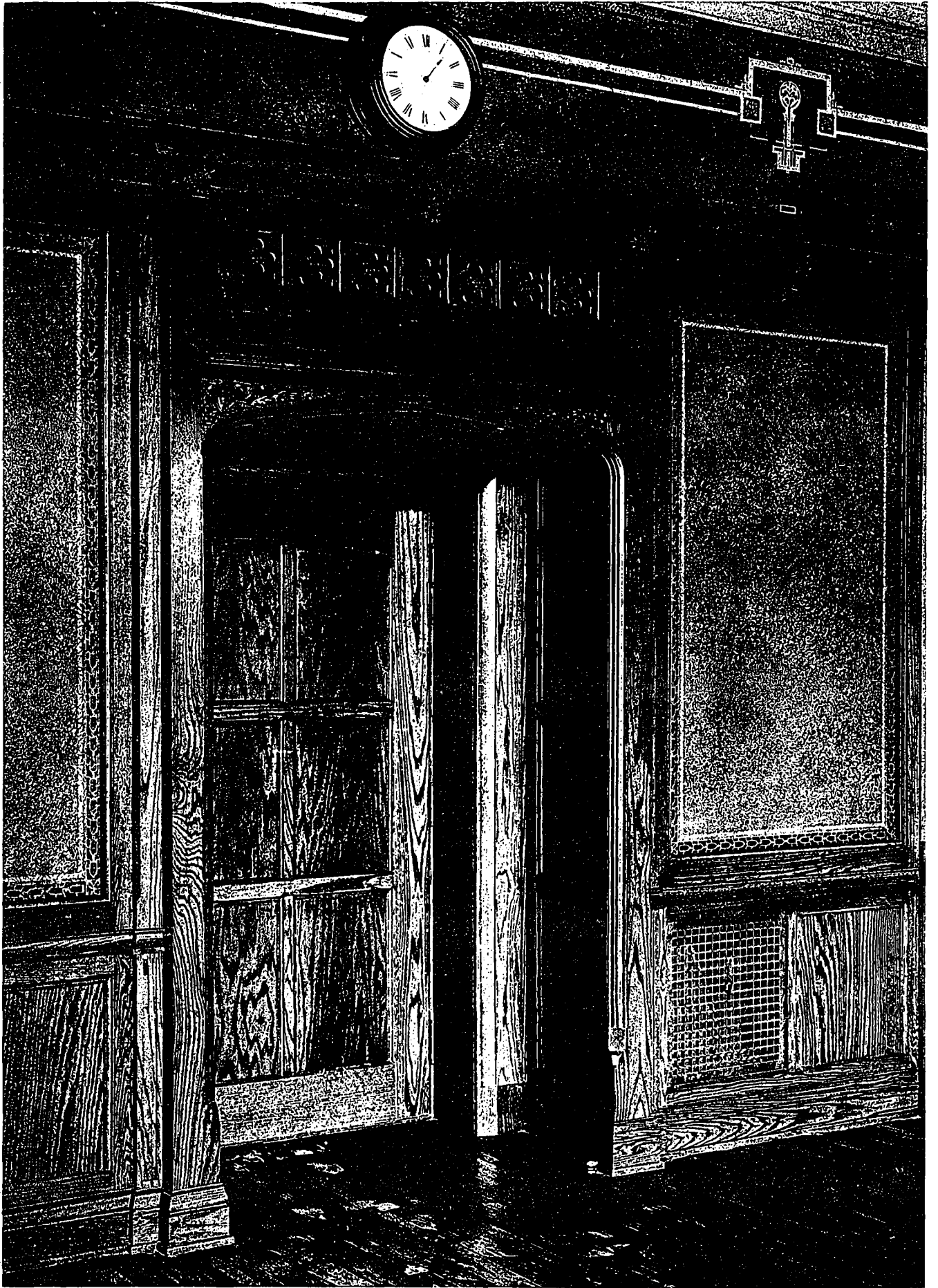
millinery, dressmaking, etc., and also the rooms on the third floor equipped for chemistry, machine drawing, architectural drawing, etc., from a construction point of view are all treated alike. The walls are faced with pressed brick to a height of three feet, the color scheme in this dado being the same as described for the corridors, the bricks, however, being set up on edge to show what is usually the bed. The cap of the dado and all corners, angles and window sills are bull-nosed, and the plaster-face of the wall above is set back three-quarters of an inch; the ceiling is plastered right on the floor slab, with beam-haunching exposed, the plaster being tinted a rich buff stepping up from the brickwork to the lighter ceiling above; the window shades are a subdued olive green tone. All the rooms are flooded with light, and the result is very pleasing.

The building of the partitions between rooms was rather interesting. Up to the three-foot height the wall consisted of two faces of pressed brick on edge, as explained, with a three-inch terra cotta core. By increasing the terra cotta to four inches above the dado, and adding on two thicknesses of plaster, the necessary step-back was obtained to accommodate the bull-nosed cap and furnish a pleasing effect.

The exterior walls and the main corridor walls take all the floor loads, transmitted in the typical spans by twenty-inch I-beams, No. 72, eight feet on centres; the auditorium section in the centre of the building is, however, of skeleton steel construction. The ceiling of the auditorium, which also forms the floor of the third floor high level, is spanned by six eighty-foot girders, six feet deep, and each weighing about



AUDITORIUM STAGE.

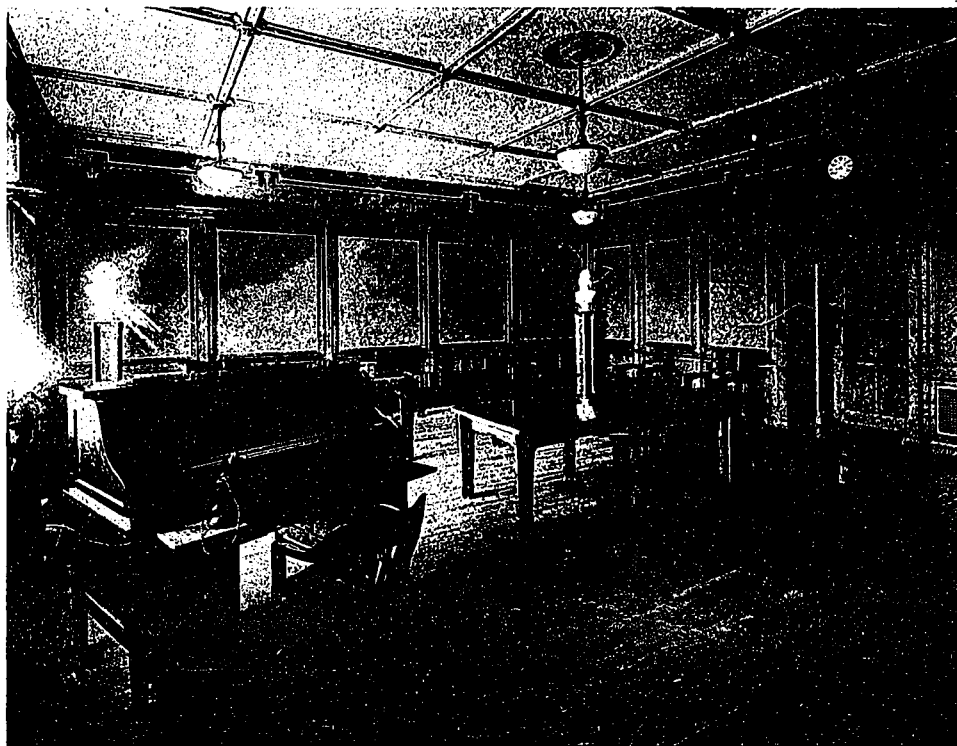


DETAIL OF DOORWAY, BOARD ROOM.
CENTRAL TECHNICAL SCHOOL, TORONTO.

twenty-three tons, mounted in two pieces, the centre joint being finished by field rivetting.

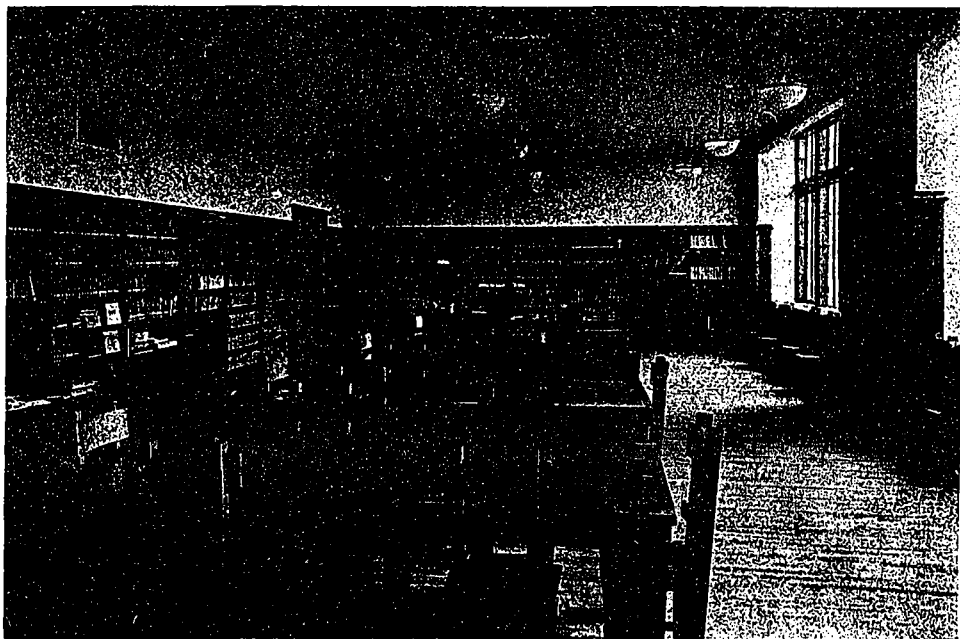
The auditorium is a handsome room, eighty feet broad and ninety feet long, consisting of the main floor approached from the entrance hall and the gallery leading off the second floor hall. It has a seating capacity of practically one thousand three hundred people. The walls are panelled in red oak to the height of the window sills, both on the main floor and on the gallery, above which is sand-finished plaster toned to a neutral cement color and lined off in imitation masonry. It is lighted both on the north and south through hope metal casements with leaded glass. At the east end is the stage, capable of seating comfortably about one hundred people, and above a large, simple-molded proscenium arch. The ceiling has heavy plaster beams running across the breadth, with smaller beams intersecting, the intersections being finished with modelled bosses. The main beams rest on massive corbels, each beautifully enriched with varied grotesques of a Gothic type, which tend to relieve the severe lines of the beams themselves. From the centre of each ceiling panel hangs a solid cast bronze lighting fixture, also Gothic in design. The Gothic treatment, the general proportions and the subdued tones create a very restful atmosphere in this room. Immediately over the auditorium is situated the art department, a series of class-rooms with maple floors, plastered walls, panelled to a height of nine feet, with cedar dadoes, and lighted both from the light courts and from the roof.

The basement of this building consists of a series of workshops, each one allocated to a different trade. These rooms are about fifty feet by thirty feet; the window sills being level with the grade outside, so that the lighting is in no way

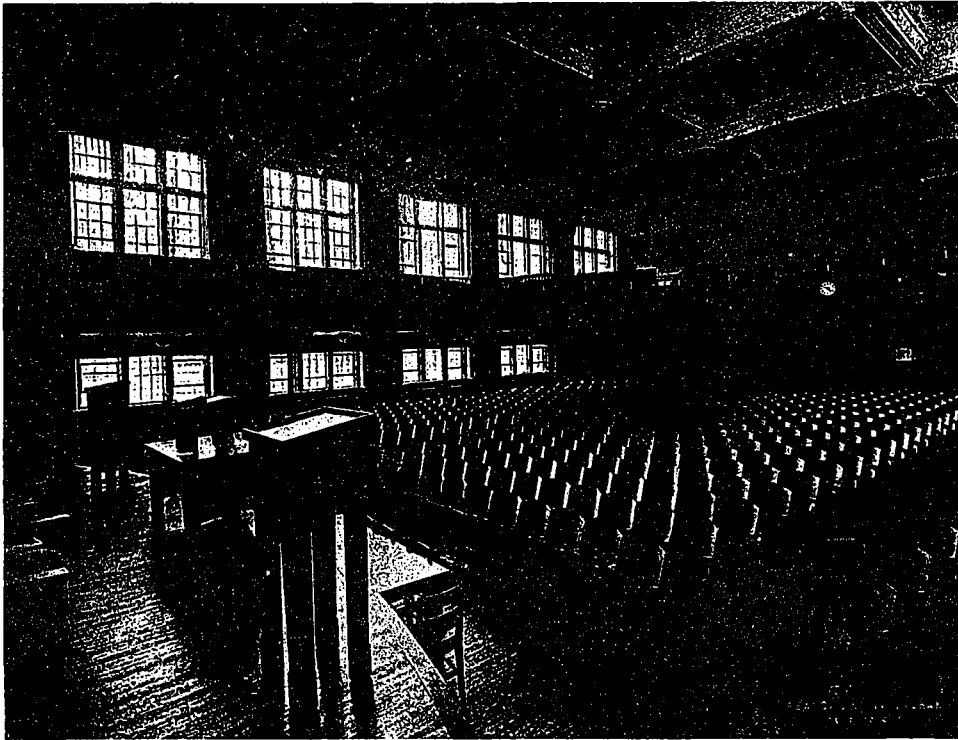


BOARD ROOM.

interfered with. The walls are lined by pressed brick to the level of the soffits of the ceiling beams; the dado in the corridors is carried round these rooms; the ceilings are plastered, and the floors have a hardened cement finish; the walls, as in all the class-rooms above, are generously lined with four-foot slate blackboards; in fact there is just three-quarters of a mile of these blackboards in the building. Sliding sections are provided behind the lecturers' tables, with fixed sections behind. In the rear of the basement is a large construction room, eighty feet long, thirty-seven feet broad, with a thirty-foot ceiling, the walls of which



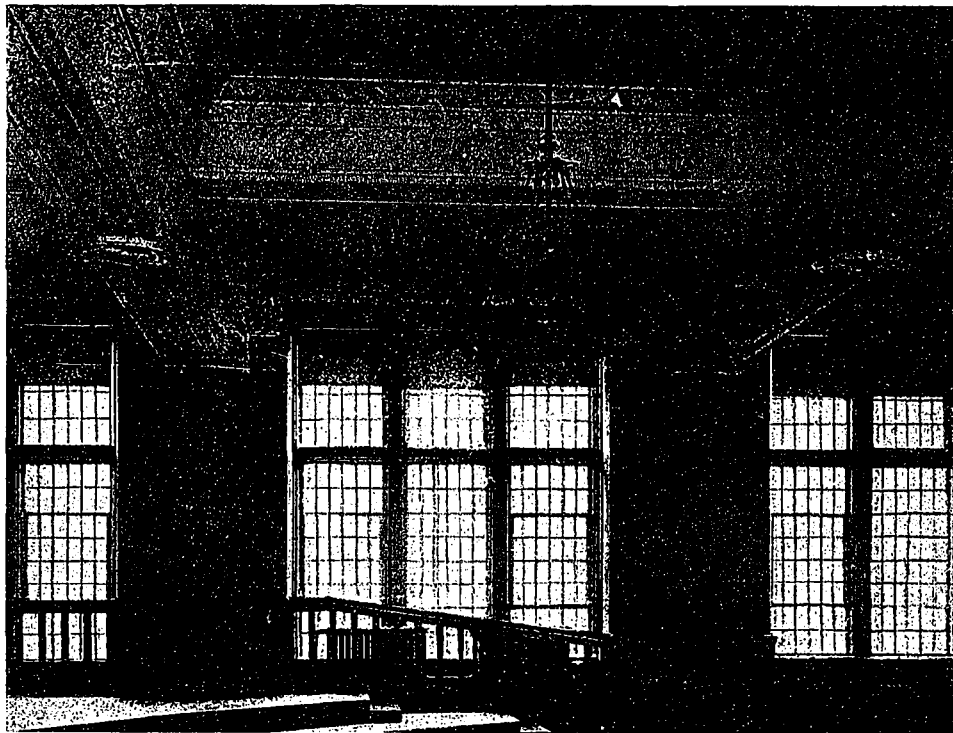
LIBRARY.



AUDITORIUM HALL.

are lined the full height with pressed brick. Four large clerestory windows give ample light. It is the intention to build two full-sized houses at the one time in this room, the students from every workshop in the basement taking part in the operation.

Immediately below the auditorium are placed the rooms for physical instruction. These consist of a well-equipped gymnasium, ninety-two feet by forty-eight feet, with a running track above; a dressing room with forty dressing



DETAIL OF AUDITORIUM.

boxes, a shower room with twenty-four showers equipped with anti-scalding valves. This room has a terrazzo floor, and partitions between showers of white marble. The plunge leading off from the showers is fifty feet long by twenty-two feet broad, completely lined with white ceramic mosaic tile, which is carried across the floor and up the walls to a height of six feet. Above the sand-finished plaster is a white oil paint treatment toned with a slight touch of grey.

On all floors, except the first, large toilet rooms are provided at either end of the building, with terrazzo floors, white marble

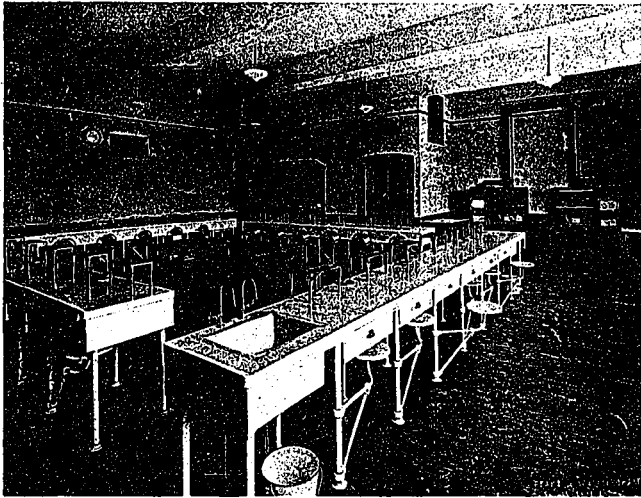
divisions and wall dadoes. A battery of twenty-two cast iron enamelled wash-hand-basins occupies the centre of the room. On one wall is a row of fifteen solid porcelain urinal stalls, and on the other wall are ten water closets with vents and oil flush valves. The slop sinks are in separate rooms off the main corridor.

The sub-basement of the building is at a depth of twenty-seven feet below the sidewalk, reached by a stair from the basement corridor. There are four large units in the sub-basement—the fan room, engine room, boiler room and

pump room. The fan room, containing the ventilating plant and other miscellaneous equipment, is a large room eighty feet long by forty-five feet broad, with a twenty-foot ceiling. The heavy concrete walls forming the sides of the room were rubbed down after the forms were removed and whitewashed, the ceiling being plastered and whitewashed also.

The engine room, leading off the fan room, is finished in a more pretentious manner. Measuring forty-three feet by forty feet, with a twenty-foot ceiling, the walls are finished in six by three-inch white glazed tiles to

a height of nine feet, above which the plaster is



DOMESTIC SCIENCE KITCHEN.

finished in white enamel paint. The floor is of six by six-inch red Welsh quarry tiles struck off in grey joints. A large mezzanine gallery runs around three sides of this room, accommodating the main switchboard, and giving access to the operating engineer's office and storeroom.

The boiler room, containing the battery of boilers, and the pump room leading off, are each finished in the rough, the same as the fan room, the latter being an inside room, while all the others are lighted from the street by large windows looking into light areas.

The building throughout is entirely fireproof. Four fire stairs are located one at each corner, and these, in conjunction with the numerous exits and the wide corridors, ensure the perfect safety of the pupils and staff. Accommodation is provided for four passenger elevators, one alongside each of the fire stairs, but for the present only one has been installed, at the south-west corner.

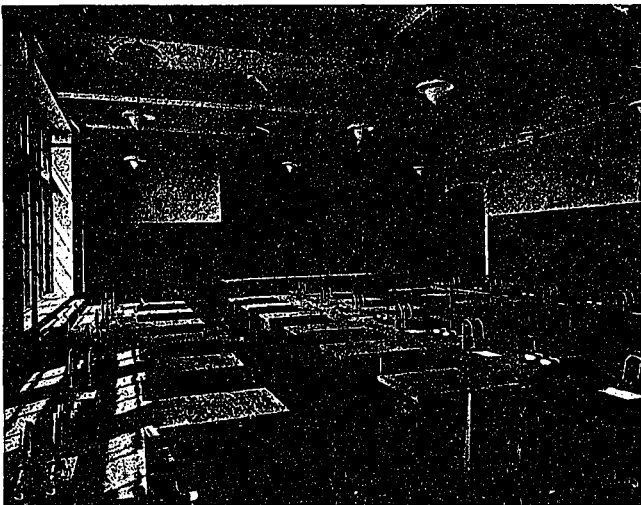
The conditions of competition for the selection of an architect were issued by the Board of Education on March 30th, 1912. The ensuing winter was spent by the successful competitors in studying the big problem and pre-



EXHIBITION ROOM.

paring the working drawings and specifications, and on April 29th, 1913, the building contracts were signed and work on the site was commenced.

Two whole city blocks are occupied by the building. These had previously been cleared of the old structures, and the steam shovels got off to a good clean start. About five feet below the surface the clay commenced to harden up, and fifteen feet down it became so hard that dynamiting had to be resorted to. At the extreme depth of thirty-five feet practically no impression at all could be made on the material with the pick. Six weeks later a start was made on the main exterior walls, commencing on the north wing, and during the summer this work proceeded rapidly. The heavy concrete walls in the sub-basement were simultaneously pushed ahead, and when winter set in it found the walls well up towards the second floor level, the basement and first floor steel laid, a portion of the floor slabs poured, and the sub-basement roofed over and protected. For practically three months the work was suspended by the very severe weather experienced during this winter. The building lay in this exposed condition, sub-



PHYSICAL LABORATORY.



TYPICAL CLASSROOM.

ject to continuous zero weather, and it is interesting to note that a very careful examination failed to reveal the slightest damage when the spring weather set in, despite the fact that no protection was given to either the floors or the footings. With the advent of spring a start was made with the steel skeleton for the auditorium section in the centre of the building. The brickwork was also pushed ahead rapidly, and as this comprised finished pressed brick interiors as well as backing brick, it became necessary to employ quite a little army of laborers clearing away debris, protecting the finished work, and keeping things clean.

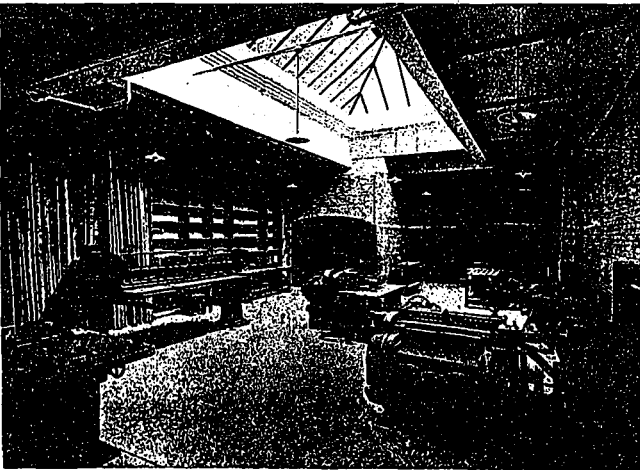
In the height of the summer months, between five and six hundred men were employed on the job, of whom about one hundred and fifty were bricklayers, and it took the little quarries sixty miles from Toronto all their time to supply the necessary amount of limestone. By the end of November the plaster work was finished and the building all closed in. The carpentry was commenced about Christmas time, and the entire building finished and handed over to the board on the 5th of June, 1915, five weeks after the contract date.

Meantime the work of equipping the school was well under way. This big task, entailing the outlay of close on \$300,000, was carried out prin-

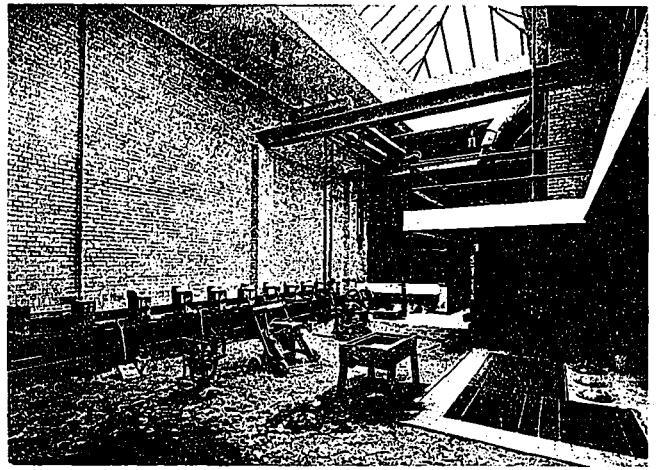
cipally by Dr. McKay and his staff, the architects and engineers assisting where constructional features were involved. Towards the end of August of the present year this equipment was pouring into the edifice in an endless stream, and by the 31st of the month everything was in its appointed place and the structure opened for business, complete in every detail.

The cost of the building, exclusive of the equipment, but including all the mechanical features, and all architects' and engineers' fees, has been \$1,426,400.00, giving a cubic cost of 26 cents. The site cost approximately \$300,000.00, so that in round figures the whole expenditure has been two million dollars.

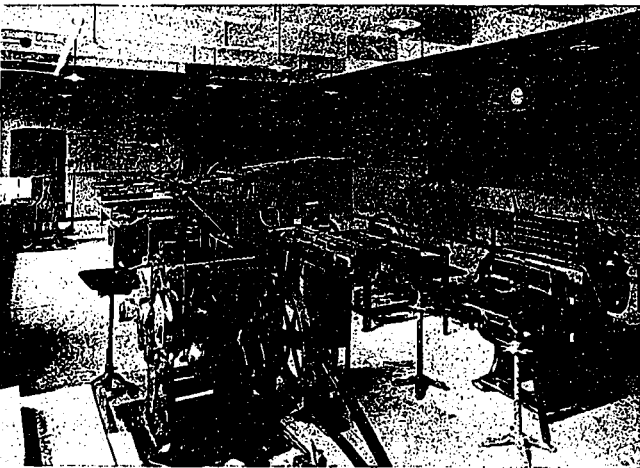
The floor area is one hundred and eighty-four thousand seven hundred and fifty square feet, and the accommodation is estimated at five thousand night students and two thousand five hundred day students. The safety, health and comfort of both students and staff have been subjects of very serious study, and the plumbing, heating, ventilating and other service features installed by the consulting engineers, and described elsewhere, are indeed worthy of examination. All the materials used in the building have been selected with a view to economy in first cost, as well as in maintenance, combining constructional value and architectural merit.



MILL ROOM.



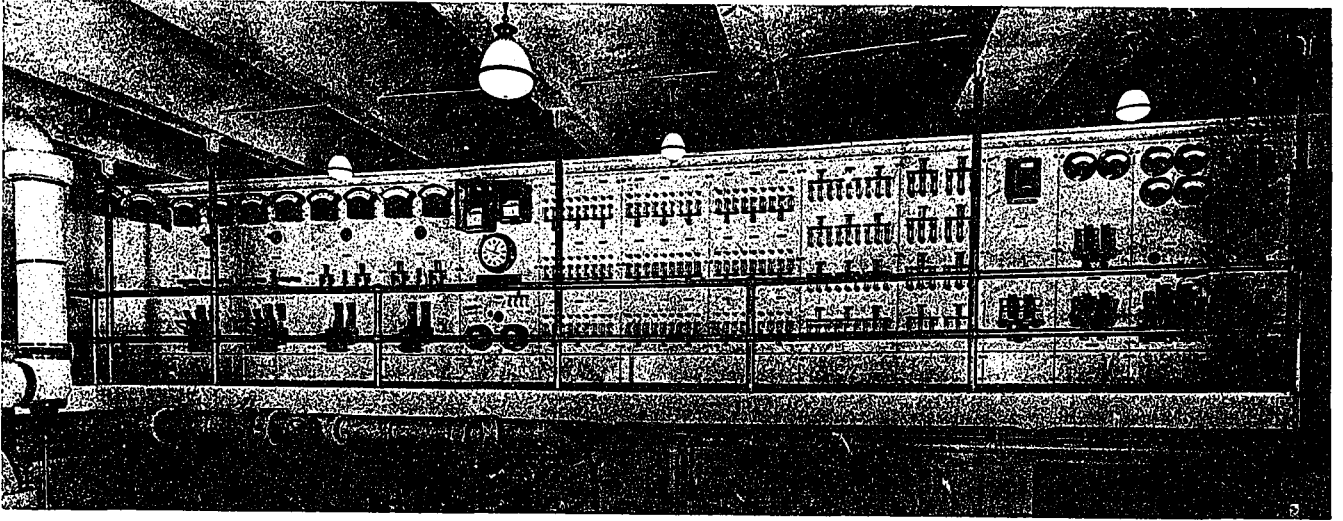
FOUNDRY.



PRINTING SHOP.



MACHINE SHOP.



Central Technical School, Toronto

Mechanical, Electrical and Domestic Engineering Equipment

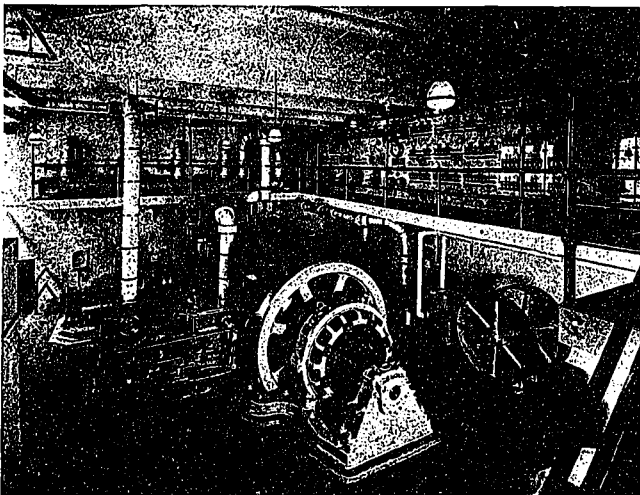
ALMOND D. WOODMAN

THE engineering equipment of a technical school is one of the most important and difficult parts of the building construction. It forms the sinews, muscles and nerve sinews through which the whole body acts, and if in any particular it is at fault, incomplete, or goes wrong, the entire teaching and student body suffers. Special engineering talent and a free hand for the designer to do his best are, therefore, most essential, and the Advisory Industrial Committee of the Toronto Board of Education early recognized these facts, and in preparing the programme of architect's competition for new Central Technical School stipulated that the board would "retain the joint services of architects and engineers."

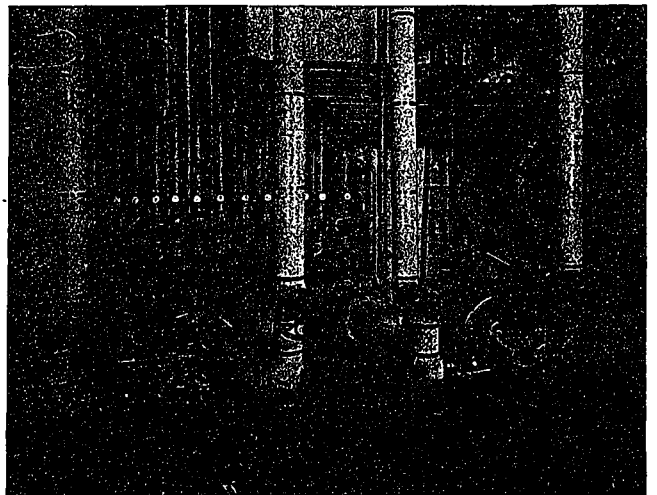
The total works placed under the engineers' jurisdiction amounted to some \$350,000, which the engineers, being guided by previous experience, divided into twenty odd contracts, so as to eliminate agents' and middlemen's commis-

sions and obtain a maximum of value for a minimum outlay. The works thus divided consisted of complete steam and electric power plant, heating, ventilating and plumbing, switchboards, wiring and illumination, elevators and refrigeration, filtration, cold storage boxes, clocks, bells, phones, vacuum cleaning, and the fitting of all laboratory cabinets with engineering requirements. Some idea of the magnitude of works involved can be gathered from the following summary of gross quantities:

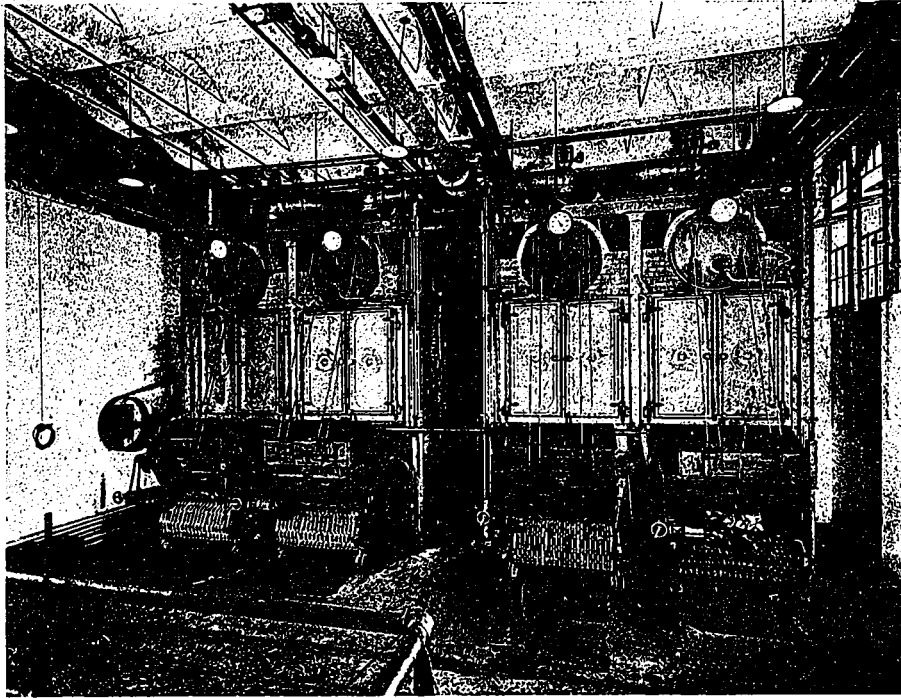
Boilers	4	750 h.p.
Engines	4	650 h.p.
Generators	3	475 k.w.
Motor generators	1	75 k.w.
Air compressor	1	314 cu. ft.
Ammonia compressor .	1	12 tons.
Filter plant	1	4,000 gal. hour.
Main switchboard	1	42 ft. x 8 ft.
Number of panels	17	
Switchboard cap		550 k.w.



ENGINE ROOM.

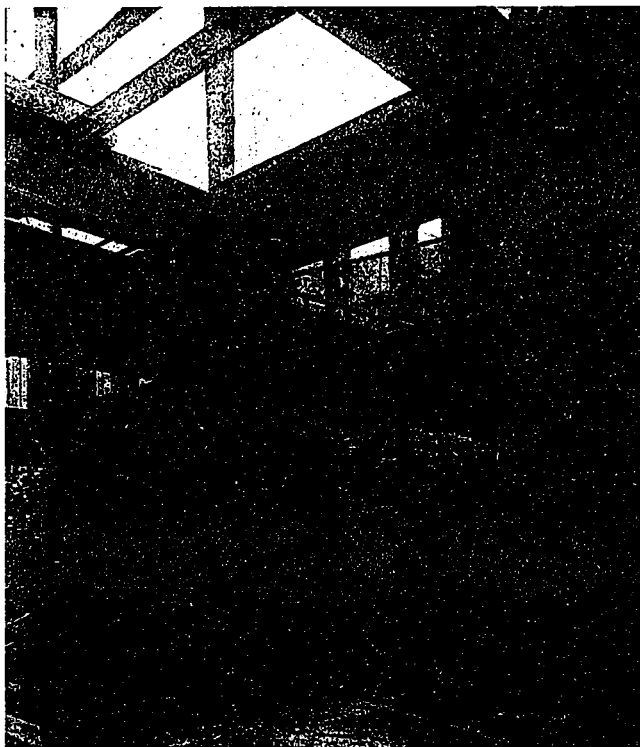


FORCED HOT WATER MACHINERY.



BOILER ROOM.

No. distributing panels—light.	24
No. distributing panels—power	18
Main circuits	4
Branch circuits	55
Lineal ft. conduit	30 miles
No. lighting fixtures	2,000
Total candle power	550,000
Cu. ft. ventilation per min. ...	180,000
Fresh air fans	2
Exhaust fans	3
Area fresh air intake	25 ft. x 10 ft.
Area fresh air duct	5 ft. x 10 ft.



STEEL FRAMING SHOWING ADVANCED PIPING.

Length gal. iron ducts .	5 miles
Air washers..	2
Sq. ft. direct radiation .	50,000
Sq. ft. indirect radiation	17,000
No. rooms ventilated .	330
No. plumbing fixtures ...	600
Capacity coal bunkers ...	1,000 tons

Special engineering problems were observed and arranged as follows: (1) To use Canadian material and apparatus wherever possible. (2) To provide a mechanical engineering equipment that could be relied upon to furnish light,

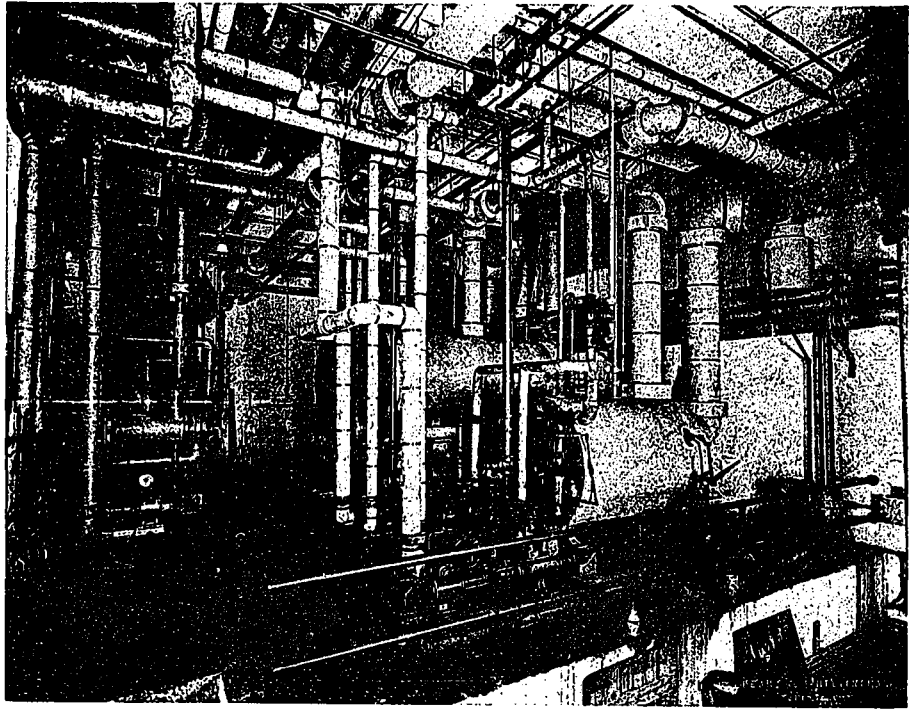
heat and power at all times and for both day and night use; to arrange large portions of the same so as to give a duplicate, or breakdown service, and as regards electricity for light and power to further provide for using current from outside sources or from school plant, either one or both simultaneously, as desired. (3) To include in the specifications such an assortment of apparatus as to familiarize the student with all the leading makes of engines and other units most likely to be encountered in later life. (4) To so distribute and supply outlets for gas, electricity, compressed air, hot and cold water, etc., at all experimental and demonstration tables and in shops, laboratories, etc., that demonstrations and classes could move like clock work. (5) To further provide that entire departments could be later changed over, if desired, the vocational pursuits studied being entirely different from those previously allocated, and the requisite changes in lighting and power circuits, gas, water, air, etc., be made without demolition of floors, walls, ceilings and other permanent works. (6) To provide such a domestic engineering equipment as would render the building perfect from a sanitary and utilitarian standpoint—good ventilation and heating; ample supply of continuous hot and cold water; adequate toilet and lavatory accommodations, including plunge and shower bath facilities; good uniform and scientific illumination, both day and night classes being regularly held from September to June. (7) To keep the cost as low as might be found consistent with all the above and many other requirements, and to provide for the board the service which the public demanded without incurring the charge of extravagance which the public so readily advances. How all the above has been provided

can only be fully realized by an inspection of the building, but the more general lines adopted can be gathered from the following abbreviated description:

The light, heat and power plant is of sufficient capacity to provide for every requirement, and all units are the best the market affords, each one being considered the standard of its particular type. It is the intention of the board to generate its own light and power, for both economic and educational motives. A most favorable contract has, however, been arranged with the Hydro Commission whereby a constant amount of current is continually purchased and used, the same being equal to the summer peak-load at which time the plant may not be operated; all current needed in excess of this amount being generated on the premises.

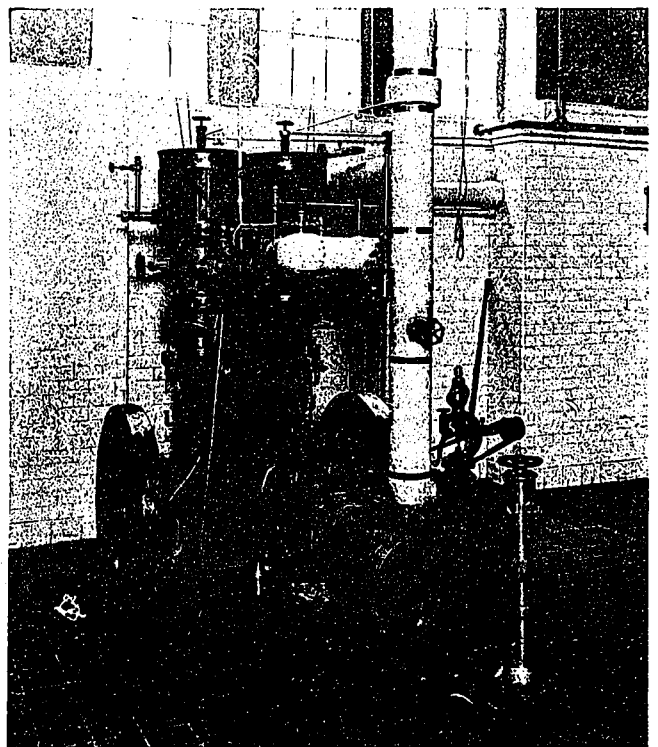
The boiler plant consists of four water-tube boilers, having a total capacity of seven hundred and fifty horse-power, the same being fitted with chain grates and super-heat. Special meters are provided for measuring steam generated by each boiler; also for weighing coal, a carbon dioxide recorder for measuring unconsumed combustible in the smoke, pyrometers for recording temperature of flue gases at various heights in the chimney, draft gauges, and many other accessories for conducting scientific tests and teaching pupils how to reduce the cost of boiler operation to a scientific minimum.

The engine room is most beautifully finished with flooring of red Welsh tiling, side walls of white tile dado, and white enamel finish above; a large mezzanine balcony accommodates the switchboard, and commodious quarters for engineers are provided leading from the same; space occupied forty-three feet by forty feet, height of ceiling twenty feet. The engine equipment is most complete, and presents a considerable assortment, all the most approved types being in evidence. A vertical compound high speed engine of the combined throttling and cut-off type, three hundred and sixty-five horse-power capacity, is direct connected to a two hundred and fifty k.w. three-wire d.c. interpole generator. A four-valve Corliss type engine of one hundred and fifty horse-power capacity is direct connected to an interpole three-wire d.c. generator of one hundred k.w. capacity. A simple horizontal engine of the fly-wheel governor type, seventy-five horse-power capacity, is direct connected to a three-wire d.c. generator

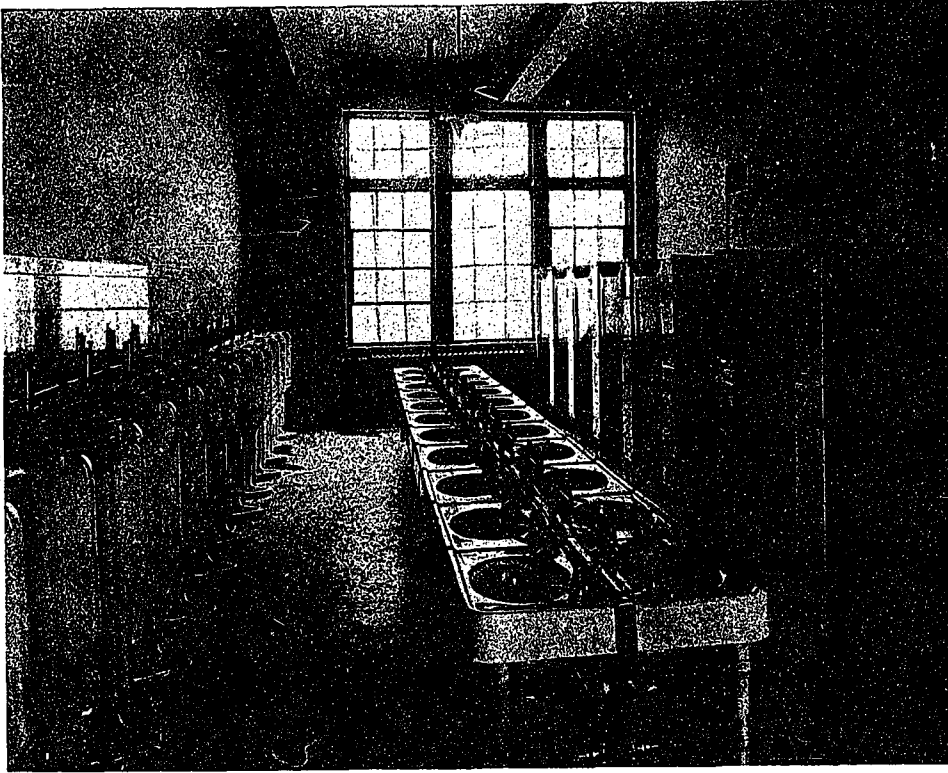


PUMP ROOM.

of fifty k.w. capacity. A motor generator set consists of one hundred and twenty-five horsepower, three-phase induction motor direct connected to a three-wire d.c. generator of seventy-five k.w. capacity. A single stage air compressor is direct connected to a steam engine and furnishes compressed air to all shops, laboratories, etc. A single-acting vertical ammonia compressor is direct connected to a horizontal engine and serves to operate a brine circulating system, which in turn is used to cool drinking water, make artificial ice, and operate cold stor-



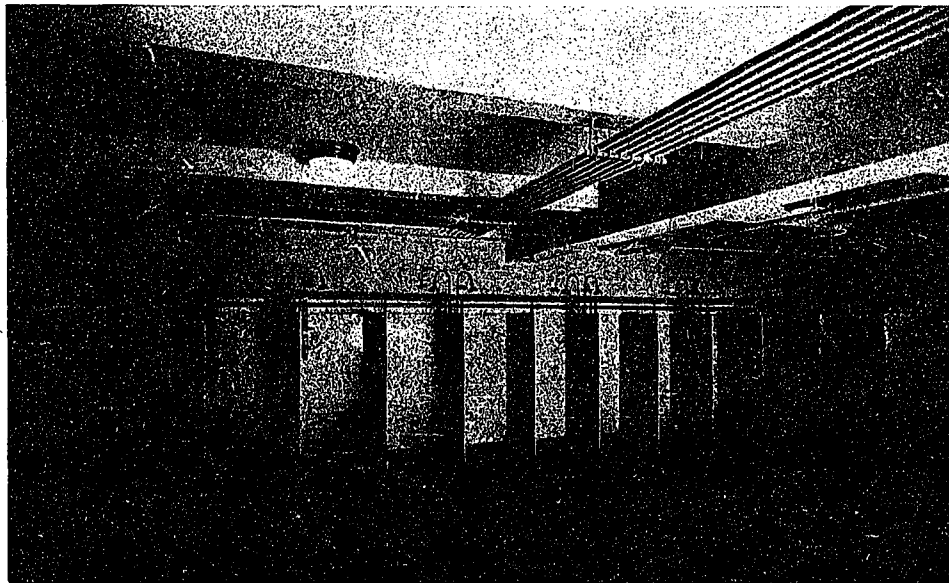
REFRIGERATING UNIT.



TYPICAL TOILET.

age boxes and refrigerators located in lunch room, domestic science halls and living apartments. The main switchboard is of white Italian marble, forty-two feet by eight feet, all instruments being of copper and with brass handrail around switchboard platform. There are seventeen panels, and the board is so arranged that every department and many individual rooms can be supplied with either direct current from the school or with alternating current from outside service wires.

The pump and heater room contains all the apparatus for pumping and heating water for boiler-feed, domestic service, heating and ventilating system, etc.; also the filtration plant for



SHOWER BATH.

purifying, aerating and heating water for the swimming pool. The heating and ventilating system is most simple and interesting; "hot water heating with forced circulation" has been adopted in which system the scheme is, briefly, this: The water for heating is first warmed in large heaters, then made to circulate rapidly through mains, radiators and fan coils by means of centrifugal pumps, afterwards being returned through the heaters with an incredible small loss of temperature. The particular advantages of this system are as follows:—(1) Exhaust steam from engines, pumps, etc., may be used in the heaters

and afterwards returned to boilers through proper oil-filters; this application of exhaust removes all back pressure from engine and pumps, increases their efficiency and renders unnecessary large size mains for conducting steam to the radiators, or the purchase of any special radiator valves, vacuum specialties, or other patented apparatus. (2) Live steam can be automatically used to supplement the exhaust steam as needed. (3) The temperature of the water circulated can be maintained either above or below the boiling point, can be controlled or regulated at the heaters, and there is thereby offered a simple and ready means of varying the temperature of the water to suit outside climatic variations. (4) Water can be

transmitted great distances with uniform velocity, small temperature loss, and through extremely small pipes which saves many thousand of dollars in cost of piping system; also there is less expansion trouble, and reduced repair bills owing to reduced number and size of fittings, valves, etc., and there is no air-binding and no knocking or "hammering" of pipes. (5) Buildings maintain a more uniform temperature, do not cool down at night, and less coal and attendance is required. The steam circulating

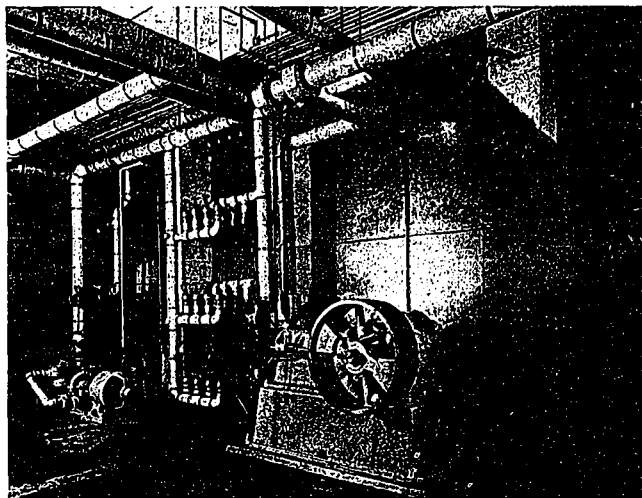
pumps, exhaust and live steam heaters constitute the only specialities in the heating system, and no patents were involved. Exhaust steam from pumps is used in the heaters. Heaters are fourteen feet long; exhaust heater sixty-four inches, and live steam heater forty-nine inches in diameter. They have a combined capacity to carry over two hundred and fifty thousand square feet of radiation, and have over three miles of one-inch brass tube heating surface.

The ventilating system is of the plenum type, the building being divided into two units, and each unit having its own fresh air fan, air washer, tempering and re-heating coils, automatic by-pass dampers for regulating temperature of air, etc. Approximately one hundred and eighty thousand cubic feet of air is supplied per minute, warmed to seventy degrees, washed, purified and humidified and passes through over five miles of galvanized iron duct work to and from three hundred odd rooms. Exhaust fans are also supplied for laboratories, toilets, forges etc. Fan coils are heated by hot water from forced circulation system. Both direct and indirect radiators are equipped with automatic temperature regulation. Cost of heating and ventilating system including boilers, pumps, heaters, sheet iron ducts, flues, etc., was approximately \$150,000.

The lighting of the building is varied to suit requirements. Glass rooms have direct-indirect lighting, the ceiling, side walls, and reading line thus having uniform illumination; drafting and art rooms have semi-indirect lighting, the greater part of the lighting being thus "reflected;" the auditorium and main corridors have special decorative semi-indirect fixtures; shops are lighted by direct illumination and in many instances individual drops are provided for the various machines.

The wiring of the building is so arranged as to facilitate repairs and alterations and to permit of changing departments, pulling new wires, installing conduits, etc., at a minimum expense. From main switchboard in engine room all main feeders are run in exposed conduit in main air-ducts under basement corridors to six large vertical brick shafts or "wire-ducts," extending to upper floors, whence they are carried to various distributing panels throughout the building. Lighting is by three wire feeders with two wire branches, having "cut-out" boxes on each floor. Over thirty miles of conduit and copper wiring is installed.

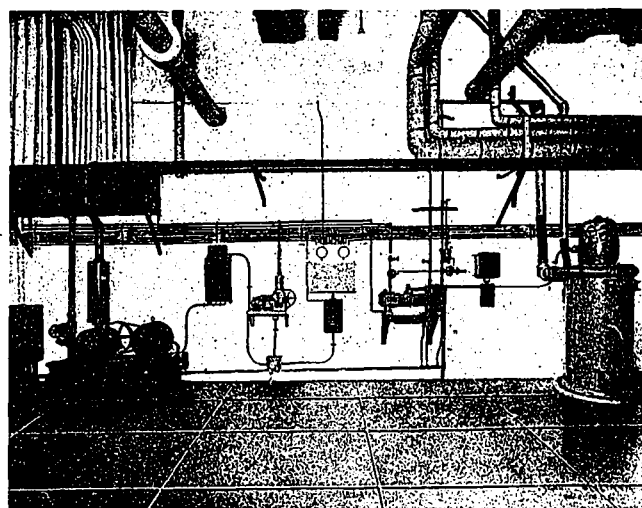
The plumbing system is of the very best; fixtures are well chosen and splendidly installed. There are large toilet rooms and lavatories at each end of the building on all floors except the first, together with numerous well-appointed smaller lavatories for teachers and employees. Individual urinal stalls are of solid porcelain;



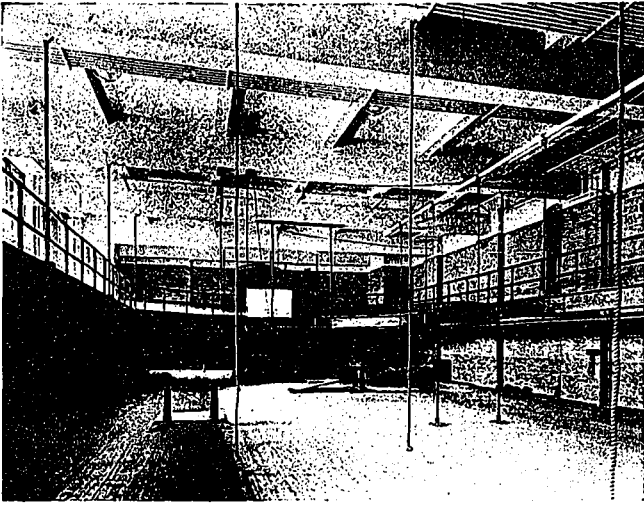
FAN ROOM.

w.c.'s are of porcelain with suitable vents; urinals and w.c.'s have individual oil-regulated flushometers. Batteries of twenty odd wash basins are installed in each large lavatory; drinking fountains are at diagonal corners of all floors; shower baths have anti-scalding valves, and filtering apparatus for swimming pool has a capacity of 4,000 gals. per hour. A most unusual feature of the plumbing installation was the erection of considerable portions of the piping, soil risers, etc., in advance of the general building construction, the same being for weeks tied to the steel work, this being necessary to accommodate the unusual type of floor construction.

Inter communicating phone systems, master clock systems, fire and call bells, vacuum cleaners, etc., offer no particular deviation from established customs; they are, however, quite elaborate and naturally more extensive than in an average sized school building; vacuum cleaning outlets are provided for all important rooms; phones can be used for either "outside" or "inside" service; the breaking of a fire glass sounds alarm in the principal's, engineer's and



VACUUM PLANT, DAMPER CONTROLS AND VACUUM CLEANER.

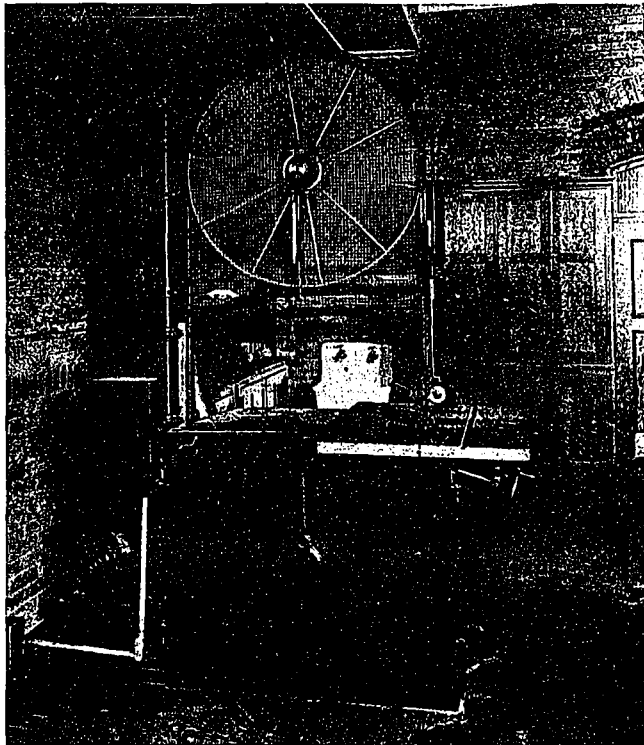


GYMNASIUM.

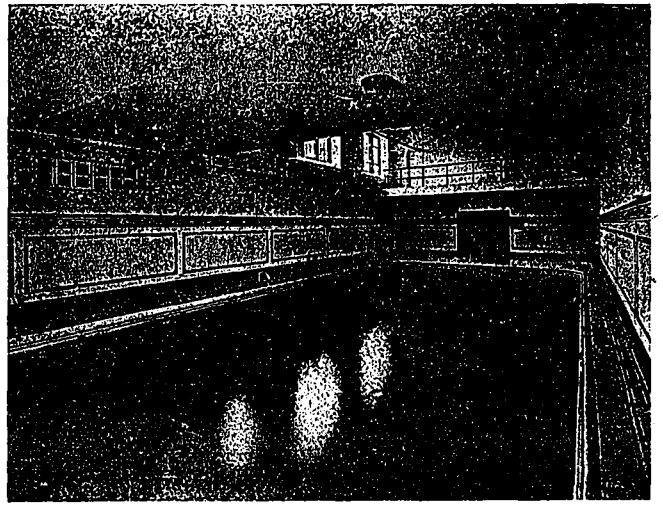
telephone offices, indicates exact location of the call and sounds all fire bells; clock system is of the program type.

Passenger elevator of the double worm gear, drum type electric driven, has a capacity of 30 pupils and a speed of two hundred and fifty feet per minute; freight elevator has a capacity of four thousand pounds and a speed of seventy-five feet per minute.

Laboratory and shop equipment is so extensive as to require a whole volume to describe. Some \$200,000 has been invested in class room chairs, tables, machinery, experimental apparatus, physical and chemical laboratory cabinets, etc., the major portion of the same being purchased by the Board of Faculty. All cabinets, etc., were built to careful detail drawings and the fitting up of the cabinets alone with gas,



WOODWORKING MACHINERY.



PLUNGE BATH.

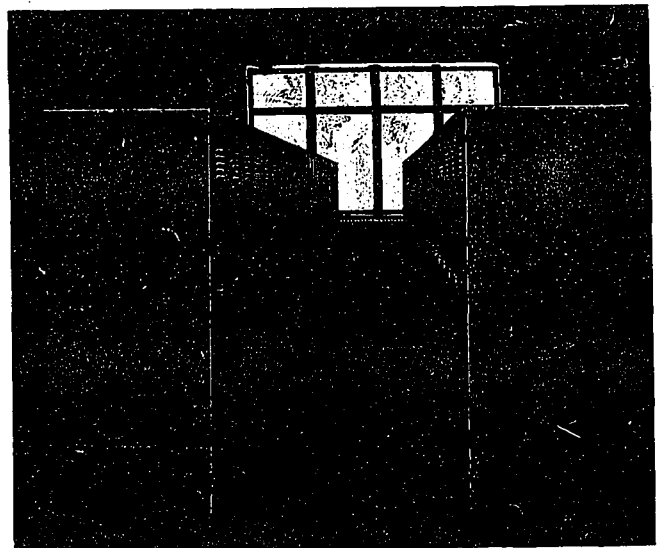
electricity, compressed air, etc., cost over \$35,000 and required over 150 individual drawings.

To public school boards and building committees generally it is another example of the ability to erect a magnificent structure—costing millions—without any extravagance, incompetency or political interference.

To the cause of technical education the school marks the passing of an important milestone—the completion of one of the largest schools in two hemispheres; also it will serve as a model for buildings of this kind for years to come.

To the student, whether embryo architect or mechanic, or a young woman pursuing a vocational training, it spells opportunity, and there will be found every requisite for securing a good educational ground-work amid most pleasant and sanitary surroundings.

To the teaching and operating staff it should prove a source of self congratulation, while without doubt it will be found that as regards ease, simplicity and economy of mechanical and domestic plant operation it will rank with the best the world affords.



LOCKER ROOM.

Some Future Developments in Heating and Ventilation

By A. H. BARKER, B. Sc. *

IT is somewhat surprising, in view of the immense importance to mankind of the twin sciences of heating and ventilation, that the amount of attention hitherto paid to the scientific aspects of these subjects, both on the part of the scientific man and of the engineer, should have been so small. The subject, indeed, is hardly seriously regarded as capable of scientific treatment by the average engineer, who probably looks on it as a branch of plumbing or building, calling for a certain knowledge of rule of thumb and a certain amount of practical experience, but at the same time hardly a fit subject for the scientific engineer. Although the science of this subject is yet in its infancy, the author is anxious to secure a more just recognition of its position as a serious branch of engineering, and takes this opportunity to explain to his brother engineers how and why this view is a totally erroneous one, and to discuss the general nature of some of the problems yet unsolved. It may safely be said that there are more unexplored problems of science and greater difficulties attending their solution in the case of heating and ventilating than in almost any other branch of the profession, and the author has had some experience of a good many. In Germany, that uninspired land of detail, where the minutiae of the subject have been thrashed out with a meticulous care which seems to us to be almost absurd, the real essence has been entirely missed.

This erroneous view of the science as a mere matter of rule of thumb has been fostered in the past by the extremely unscientific manner in which the subject has been treated by writers of technical books in America and England. Any educated engineer studying some of this literature must be driven to the conclusion that there is really no science whatever in the subject.

The reasons why it has failed hitherto to come up to the standard attained in other branches of engineering are not difficult to understand. They are the immense complexity of the factors which go to make up any given result, the difficulty of defining in terms of exact science what that result is or should be, the fact that the criterion of success up to the present has, of necessity, been the feelings of individuals rather than the readings of scientific instruments. Added to these is the immense power of adaptability of the human organism to varying conditions, which tends to make actual variations of conditions appear unimportant in practice. The circumstance which differentiates this branch of engineering from al-

most all others and at the same time introduces difficulties unknown in all other branches is that we have here to take account of the variable human factor, both as to its physiology and its psychology, as an essential part of the problem. In this sense we trench on the domain of the physiologist and hygienist to a degree unknown in any other branch.

It is easy to understand that this combination of difficulties tempts the busy practical man to be satisfied with any sort of result, and to leave to nature the task of adapting the organism of the sufferer to the conditions produced by the engineer—a task which she can often accomplish, but often not without injury to the individual. The present lack of exact knowledge makes it difficult or impossible to hold the practical man to any precise standard of accomplishment. In other words, the practical man can get along somehow, with a very small modicum of knowledge. It is the general attempt to do so which has led to the undoubted state of discredit in which this branch finds itself to-day.

All engineering is merely glorified common sense. The training of an engineer leads him to try to deal in a common-sense way with objective facts as he finds them. In this branch the first obstacle is the great difficulty of finding what are the facts.

Consider, for instance, the first problem which would meet a scientific engineer endeavoring, without previous experience, to arrange a satisfactory scheme of ventilation for a building. He would commence with the assumption that the artificial ventilation of a building consists in forcing in a calculated volume of air, a task which, if he were familiar with fans and the laws of the flow of air in ducts, he might think he could easily accomplish. After he had made one attempt to satisfy the occupants of the building by proceeding on the assumption that this is the only requirement, he would find out that one essential factor in the problem was to study the distribution of the air currents in the building itself.

Even in a small building, this is in itself a problem of very great difficulty. Although each one of these currents obeys laws of nature as rigidly accurate as any other laws of nature, yet the number of influences having an effect on the air currents is so enormous that the complexity of the result is almost immeasurable. In the attempt to lay down in terms of exact science the laws which govern this result, any person might well be baffled and unable to trace with any clearness the operations of any law at all. The reason is, of course, not that the law is not there, but that it is so complex that it

*Extracts from a paper read before the Society of Engineers.

would take almost a superhuman intellect to analyze it completely.

Further, who can say what system of air currents in a room—say a theatre—is to be aimed at? We all know that complaints of the ventilation of almost every public room are universal. Yet there is no general agreement, either what is wrong or what is needed to put it right. How is it possible to hold the ventilating engineer responsible for a poor result when no one can specify what the result ought to be?

I have made reference to the complexity of only one of the constituents of ventilation. Those of heating are no less complex. We have two totally distinct forms in which heat is delivered into the room—namely, convection currents of heated air and radiant energy. These are as distinct from one another as light is distinct from sound. Yet, up to the present, no formal recognition of their entire separation from one another has been recognized in current literature. The cause for this is easily seen to be that, different as these two forms of what for convenience we call heat are from one another, yet they can be instantaneously transformed from one to the other and back again. Their measurement, again, is not a problem to be easily solved. No sooner does one measure the amount of radiant energy than the mere act of measuring it turns it, or part of it, into convection heat.

The difficulty, however, which is the most baffling in the attempt to reduce this subject to an ordered science is the fact that the object of both heating and ventilation, though primarily physiological, is also to some extent psychological. The primary object is to keep the inhabited rooms healthy; of almost equal importance is the necessity to keep them comfortable. The effect of any given condition on the human body is, if possible, more complicated than the laws which govern air currents and heat flow. The physiologist cannot yet tell us in exact terms what are healthy conditions for inhabited rooms. He can give us generalities only, and the experiments on which even these generalities are based are far from convincing. He cannot even, for instance, tell us what is a healthy temperature for human beings to live in, nor does he seem to realize that when he speaks of "the temperature of a room" he means merely the temperature of a thermometer suspended in the room.

Some physiologists say (and the author agrees) it is desirable in the interests of health that the temperature maintained should be as low as a human being can endure without real discomfort. Yet others will say this is nonsense, that the room should be so warm that the man feels comfortable without any effort. Neither can anyone tell us within 300 per cent. how

much fresh air per head per hour is the minimum consistent with health. Indeed, as a fact, such a crude statement would have no meaning in the real science of the subject. It depends on the temperature, humidity, and a score of other things. Physiologists cannot agree as to the chemical nature of healthy and unhealthy air. Books on the subject of climate do not give any explanation of what physical conditions constitute a bracing or relaxing climate. Indeed, most of the hygienists do not seem to realize that such words need any further description.

The matter is yet more complicated when we consider that one object the heating engineer has in view is to make persons comfortable. We here come across the baffling fact that a man is comfortable when he thinks he is comfortable. If we can make him imagine he is comfortable without the alteration of any single condition, we can make him feel comfortable. Make a man imagine he is cold or feels a draught, and he will at once want to shut all the windows. Convince him, on the other hand, that to shut the windows is unhealthy and stuffy, and the same man will not be comfortable unless the windows are open. One can train oneself to feel comfortable in anything.

In further illustration the author will refer to a psychological experiment he made on a medical man who was a guest at his house some years ago. We were sitting in a room which had a thermometer suspended on the wall. The visitor made some remark about a "shoemaker's wife" and complained of the room being cold. It was freezing outside: the thermometer on the wall read 54 deg., and was a correct one. The author's view is that such a thermometer reading is quite consistent with health and comfort when it is freezing outside. We fell to a discussion of temperatures, and it was suggested, as an experiment, that the temperature of the room should be gradually raised until the guest felt comfortable, to ascertain whether he found a temperature of 60 deg., too high. The room was provided with a fairly powerful heating apparatus. The author went into the cellar, pretended to stoke up the boiler, and to turn the radiator full on. As a matter of fact, nothing was done either to the boiler or the radiator, though the doctor was allowed to hear the clattering of the fire-doors and fire-irons. After a short interval the thermometer was changed unobserved by the visitor for another precisely similar in appearance which read 6 deg. too high. When it had been placed on the hook without his seeing the change, it was shown to him, and he was asked whether that temperature made him more comfortable. He said the temperature was then just right for him, neither too hot nor too cold, although the real thermometer reading was precisely the same as it

had been in the earlier part of the evening. That little experiment is most illuminating as showing the extraordinary difficulties attending an attempt to treat this subject scientifically.

It is an undeniable fact that a room filled with air which, so far as chemical analysis can detect, is absolutely pure, may feel very stuffy. For instance, in the House of Commons, on the ventilation of which the author has experimented for many months for the Committee of the House, the air in the Debating Chamber is, chemically speaking, as pure as in any room in the world. Fresh air simply pours into it in extravagant volumes. In a moderately full house there are no less than 13,000 cubic feet of air supplied per head per hour. Yet it produces, without any possible doubt, the effects which we are accustomed to think of as associated with defective ventilation—lassitude, sleepiness, infection, and so forth. Complaints are loud and quite general.

A room may, on the contrary, feel fresh and sweet in which, judged by chemical standards, the air is very bad. The author has analyzed air containing 25 volumes per 10,000 of CO₂, which felt as fresh as a spring morning, although 10 volumes is regarded as the extreme allowable impurity in current science. There must be some combination of chemical or physical conditions which accounts for the effect so far as it is objective—when it is purely subjective, of course, it is impossible to analyze the effect. Nobody up to the present has ventured to specify what is that combination.

Now the future of the sciences of heating and ventilation depends, on the scientific side, on the further analysis of the conditions which produce the feeling of comfort and other effects. On the practical side they consist of the application of those discoveries so as to bring under control each of the conditions, and on the further developments of economy of construction and transmission and the better control of the forces we bring into play. Before we can get a step further we must be able to express, in exact terms, each of the chemical and physical conditions which go to make up the sum total of the room condition.

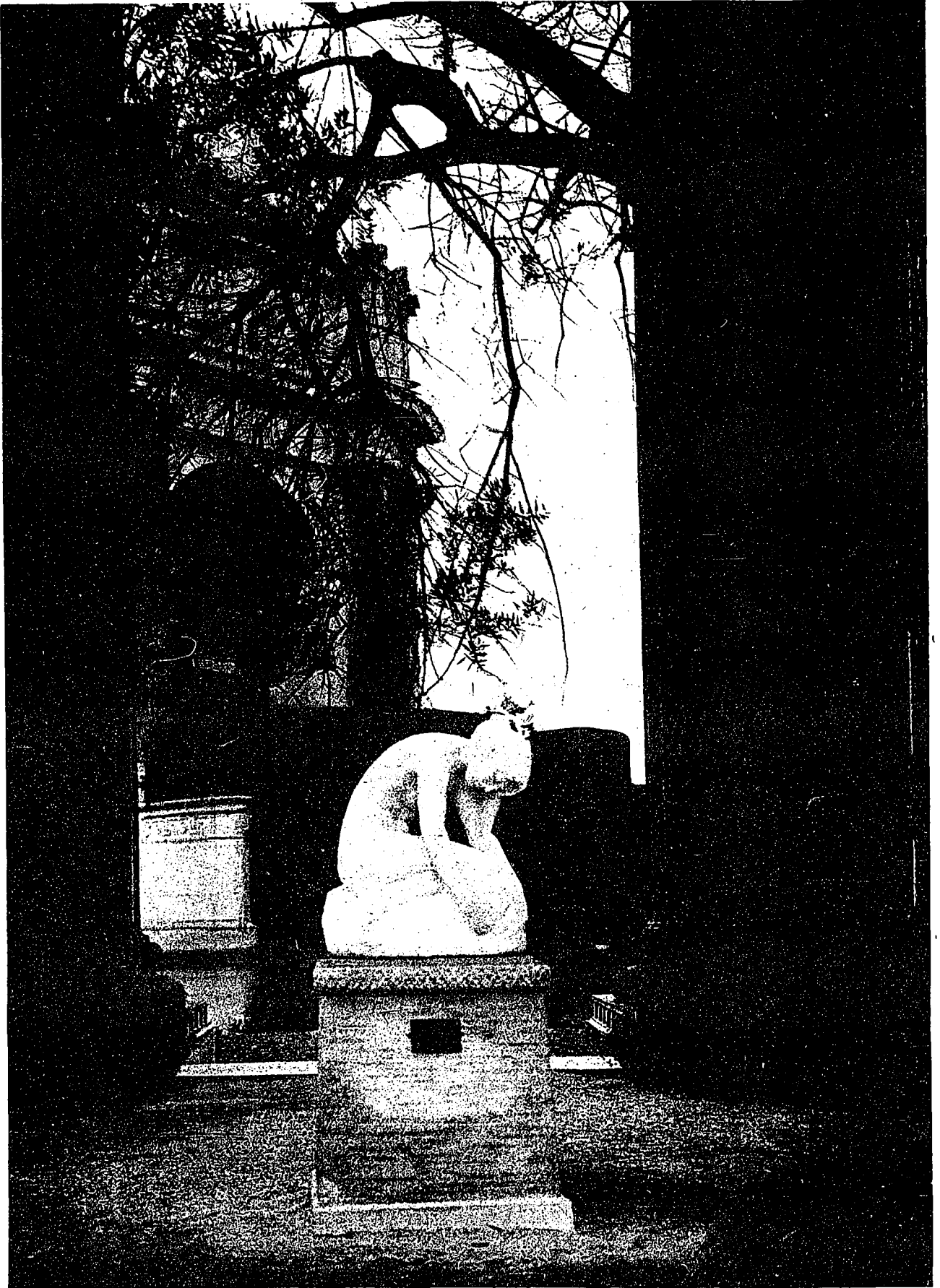
The criterion of our success, as I have said, is, and must be, the effect on the feelings of an individual. But we must, in order to give this subject a scientific basis, be able to translate the feelings of an individual into terms of measurable physical conditions, and this is our first difficulty. We may lay down certain physical conditions which we conceive to be necessary to the production of comfort and health, and we may direct all our attention towards producing those conditions. We may succeed completely in doing so, and find that when we have done it that some individuals will find that those con-

ditions are not such as are necessary for their personal comfort. We may then get other bases to work upon and still find that the new bases themselves are not any more suitable than the first.

It is clear that the only legitimate function of the engineer as such is to produce and control certain specified conditions. The criterion of his success must not be the self-contradictory feelings of the occupant of the building, but they must be the exact readings of well-defined measuring instruments, such as radiometers, hygrometers, air meters of various kinds, apparatus for the analysis of air, dust counters, thermometers, and other instruments.

The other half of the problem is for the physiologist and the hygienist—viz., to specify what are the conditions which will be regarded as healthy and comfortable. It involves essentially experiments on human beings which are in their very nature illusory and extremely difficult. In essence they are, in reality, so many attempts to calibrate human beings. The science of the subject is only in its infancy as yet. Future developments depend on the analysis of these problems to no small an extent.

It will be evident that the problems of heating and ventilation are closely associated. We cannot even consider problems of heating without simultaneously considering those of ventilation. We have, for instance, to consider the effect on the human organism of warm air and cold air. A further important point in connection with ventilation is to determine the effect on the human organism of different quantities of dust in the air. The investigation of such a matter naturally imposes on us the necessity of determining with some accuracy how many particles of dust do exist in a particular sample of air. As this number runs into millions per cubic inch, it will be evident that very special methods are required for counting them. The measurement of the dust particles is clearly only one side of the problem. We have also to measure the effect of different degrees of dustiness on the human organism. That is obviously a matter of great difficulty and concerns the physiologist, and is more appropriate to the physiological than to the engineering laboratory. In no respect has the science of heating and ventilation been more backward than in the knowledge of laws governing the movements of air. If we compare, for instance, what is known of the laws of electrical currents with the corresponding laws of pneumatic flow, we shall see that in the one case the knowledge is, for practical purposes, complete and definite, enabling calculations to be made with the utmost precision and, what is more important, enabling the results of the calculations to be carried out in practice.



MUSE FINDING THE HEAD OF ORPHEUS,
PANAMA-INTERNATIONAL EXPOSITION,
1915, SAN FRANCISCO, CALIFORNIA.

Panama-Pacific Exposition, San Francisco, California

THE SCULPTURE

WHAT dream was ever more prophetic than that of Jules Guerin, as he stood at the Golden Gate and silently gazed upon the men converting the mud flats into a realm of beauty. To repeat his words:

"And as I watched those busy, bare-armed laborers, I had a vision—a dream of the beauty for which they were slowly laying the foundation stone. . . . The brown marsh had vanished, the workmen were gone, and in their place arose what seemed a fairy city—a meeting place of the nations such as no country had ever known before—a thing of sunlight and color and joy. And as I looked upon it, I knew that it was the architecture of the New World, conceived by men of ideals and imagination, built by eager hands, adorned with the work of artists and sculptors, and filled with specimens of the finest craftsmanship of many lands.

"As I looked down, the city of my dreams grew clearer, and shaped itself into more definite form. I saw the red tile roofs of vast buildings, the climbing towers, the huge domes of green and gold that glittered in the strong California sunlight. I beheld the great triumphal arches, the long rows of majestic colonnades, and the gigantic groups of statuary intimate in color and texture to the buildings. I looked down upon the wide avenues and roadways with their dark green sentinels of shrubs and trees into the vivid, flower-filled gardens and high, open pavilions, and over the splashing fountains and broad pools of water that mirrored, with the deep blue of the sky, shifting colors of vine-clad column and wall and dome. Long, arch-framed vistas drew my eyes past hall and court and statue out toward the water and the hills, beyond the green lawns and terraces that sloped down to the bay.

"On every hand was the beauty of splendid color—the wonderful vibrating blue of sky and water, the terra cotta of the roofs, the living green of grass and trees, the orange and vermilion of the flower-beds, the shining gold of dome and statue, and the soft buff tones of roadway and arch and wall—a great architectural pageant in which builder and sculptor, painter and gardener, had each contributed his vital efforts toward the common goal."

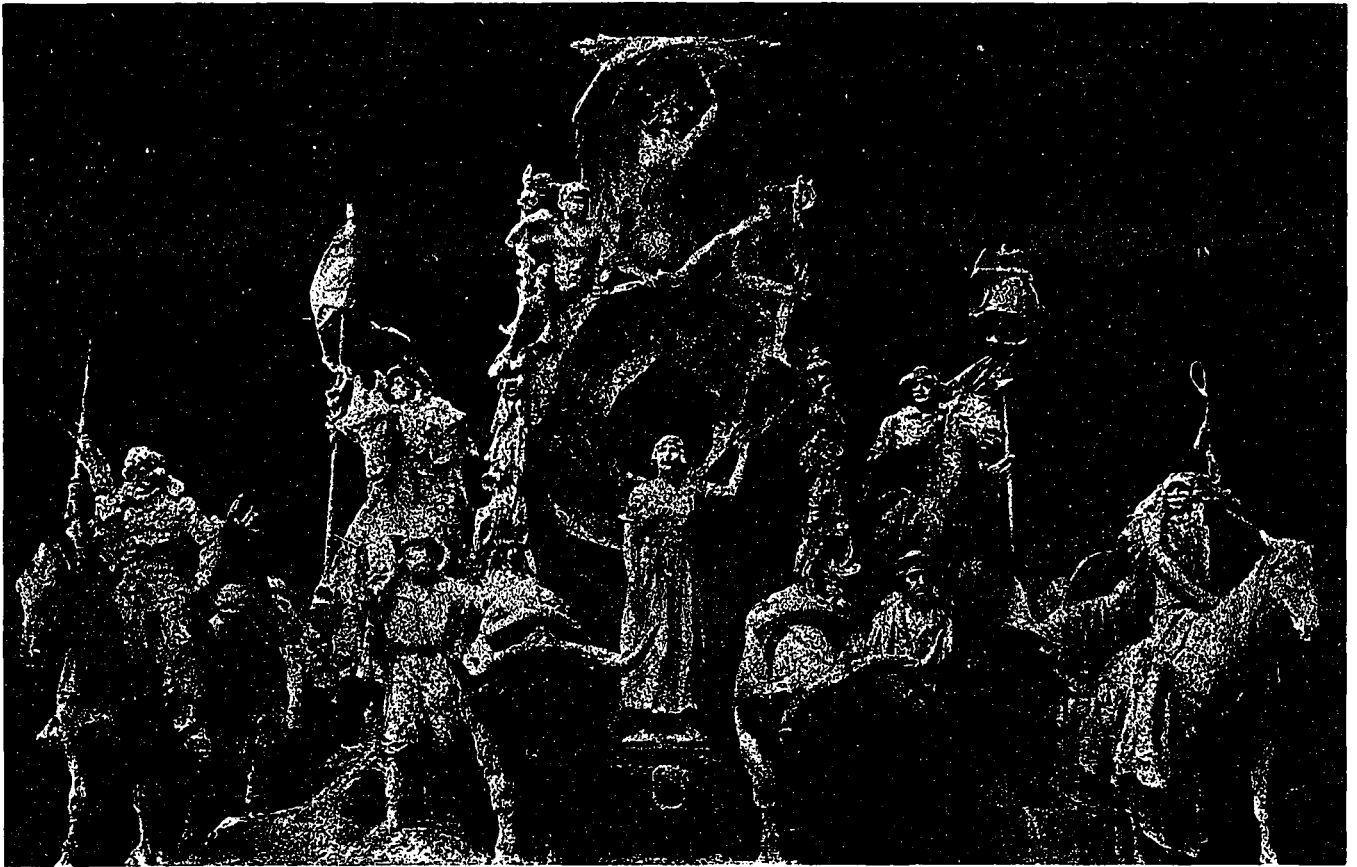
This dream has become a reality, quite evident to all who pass beneath the lofty archway of the tower gate into the Court of the Sun and Stars. Here is presented a vast oval courtyard, around which colonnades sweep to the right and to the left. On the central axis in these directions are triumphal arches 160 feet high, the crowning sculptures of which represent "The Nations of the East" and "The Nations of the West." The two main free standing monuments of the court are the Fountains of the Rising and of the Setting Sun, occupying positions relatively east and west. Flanking the main axis of circulation of the court north and south, at the level of descent into the sunken garden are titanic figures in horizontal composition, of the four elements, Fire, Water, Earth and Air. These are of a great scale and placed close to the ground, are capable of a symbolically imaginative rendering. On the upper ramps of the sunken garden of the Court of the Sun and



WOOD NYMPH, BY ISADORE KONTE.

Stars, in positions facing the arches are vertical groups of two figures each, representing "Order and Chaos" and "Eternity and Change."

Advancing down the forecourt there is a pool of placid water in which the great tower is reflected. The tower is decorated with much sculpture of a purely ornamental kind, as well



NATIONS OF THE WEST, BY ROTH, LENTELLI & CALDER.

From left to right: 1. The French-Canadian—the trapper on horseback. 2. The Alaskan with totem poles on her back. 3. The Latin-American on horseback. 4. The German. In the centre is the old Prairie Schooner drawn by oxen. Atop, pushing out, is Enterprise leading the group westward, a white boy and a colored boy on either side, the Heroes of To-morrow. Marching in front is the stalwart Mother of To-morrow. Then follow: The Italian. The Anglo-American, also astride a horse. The Squaw with her papoose basket. The American Indian on his horse.

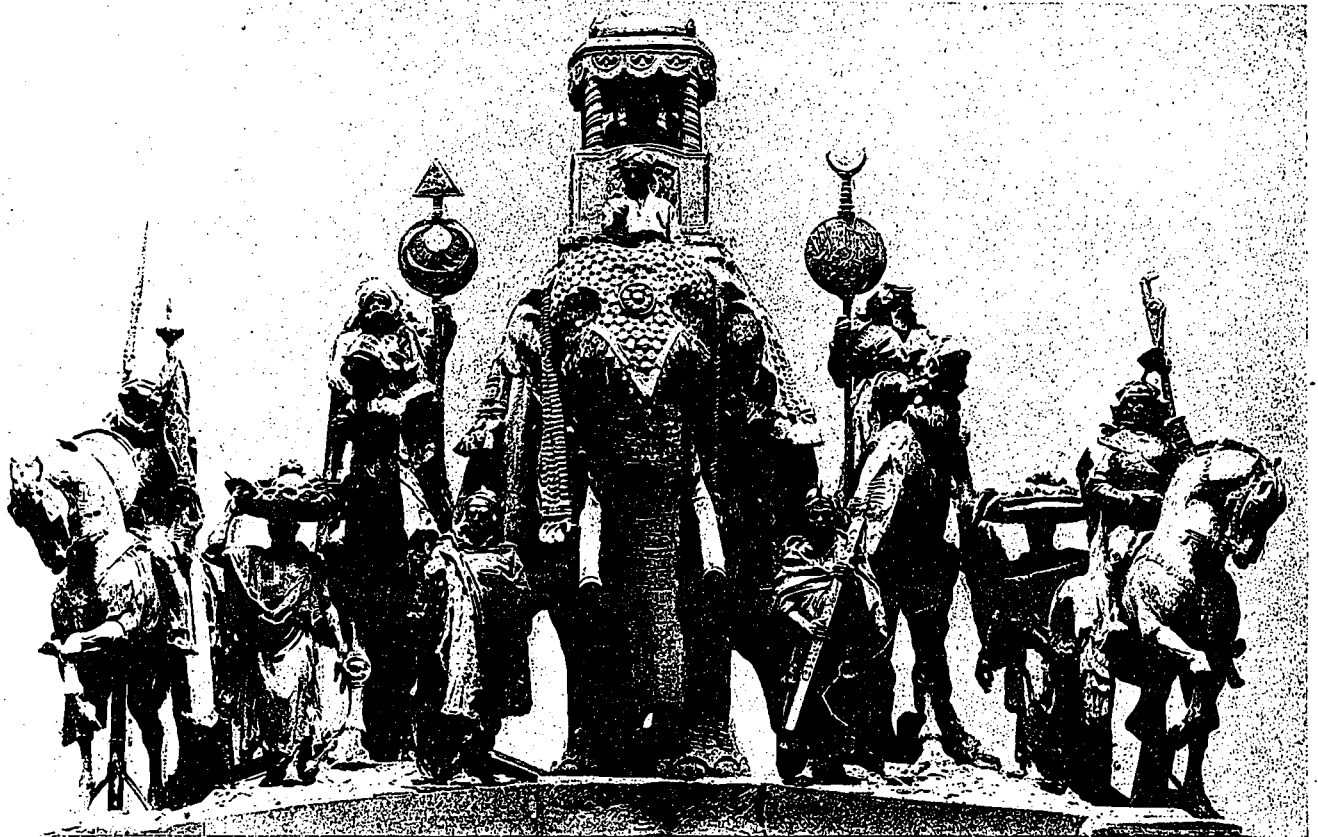
as a repeated typical equestrian figure of an armored horseman. At the level of the spring of the great arch are pedestals which support standing statues of types representing Philosopher, Adventurer, Priest and Soldier. Terminating the open colonnades on each side of the tower gate mural fountains have been created by Mrs. Harry Payne Whitney and Mrs. Edith Woodman Burroughs, portraying El Dorado and Youth.

In the Court of the Seasons, situated between the Agriculture and Educational buildings, the sculpture symbolizes the benign forces of nature. A great group representing Nature herself occupies the pedestal beneath the archway of the head of this court. Here the work is all founded on the tales of the Arabian Nights. These inspired the composition of the central fountain, while the minor decorations of the facades, finials, caryatides, etc., supplement this imaginative mass. The doorways are all flanked by strange visaged lions and the attic studded with figures of Oriental slaves.

For the Court of the Palms the western fairy tales have spurred the sculptor to new imagery, with Beauty and the Beast as the subject for the central fountain. At the entrance to the Courts of the Flowers and of the Palms on the southern esplanade and in front of the gateways of Columbus and of Balboa on the sea esplanade

are four equestrian statues, one in front of the Court of Flowers of the American Indian, another in front of the Court of Palms of the Pioneer; a third beneath the Gateway of Columbus representing Cortez, and, beneath the Gateway of Balboa, a fourth portraying Pizarro.

The Court of Abundance, called by the architect the Court of the Ages, which is the most eastern of the three great inner courts, is, in more senses than one, the most modern of the Exposition. Its style is intensely original and cannot be accredited to any mediæval or ancient period, although it suggests Spanish Gothic. The interest of the court centres in its great tower and in the Altar of Human Evolution in its southern facade, the groups for which were modelled by the sculptor Chester Beach. The altar is set upon the third level of the tower, about 100 feet above the pavement. The first and lower group, which stands upon the second level of the tower, just above the arch of the main entrance of the court, is of the Stone Age. Above this is the second group of the Middle Ages, flanked by single figures, one male and one female, symbolical of the violent struggle in evolutionary change. Above the altar is the third group, representing the ages to come, which might be called "The Divinity of the Future." This group is composed of a seated



NATIONS OF THE EAST, BY ROTH, LENTELLI & CALDER.

From left to right are: 1. The Arab Sheik on his Arabian steed. 2. The Negro Servitor with fruits on his head. 3. The Egyptian on his camel, bearing a Mohammedan standard. 4. The Arab falconer with bird on his wrist. 5. The splendid Indian Prince on the back of the elephant. 6. Inside the howdah the Spirit of the East. 7. The Lama from Thibet with his rod of authority. 8. The Mohammedan with his crescent standard. 9. Another Negro Servitor. 10. The Mongolian on his horse.

goddess, whose posture and crown of a rayed sunburst suggest something of the spirit of the East, and whose eyes gaze fixedly forward.

In a book recently published, under the title "The Art Exposition," the author, Eugen Neuhaus, devotes part of the work to sculpture. Mr. Neuhaus' criticism carries considerable weight, as he was a member of the International Jury of Awards in the Department of Fine Arts of the Exposition. He says the sculptural decorations of the Exposition are so much a part of the architectural scheme that their consideration must no longer be delayed. The employment of sculpture has been most judicious and has never lost sight of certain architectural requirements, so frequently overlooked. While there are a great many examples of sculptural decorations at the Exposition, there does not seem to be that over-abundance of ornamentation so often confused by the public with artistic effect.

The best compliment that can be paid to the Exposition sculpture is that it is not evident at first and that one becomes aware of it only in the course of studying the architecture. I do not think that, with the exception of the Column of Progress and the groups of the Nations of the East and of the West, the Exposition has produced, through its very unusual and novel opportunities, any great work, or presented any

new talent heretofore not recognized; but it will most certainly stand a critical examination and comparison with other exposition sculpture and not suffer thereby. As a matter of fact, a number of the sculptors of our Exposition were commissioned to do similar work at St. Louis.

In one respect our Exposition must immediately claim originality—that is, in the elimination of the glaring white, with its many ugly and distracting reflected lights, insisted upon for years, in practically all the great expositions of the past. This absence of white is surely a very novel and very helpful feature, from an artistic point of view. The Travertine staff material used, the highly successful work of Mr. Paul Denneville, with its innumerable fine accidental effects, so reminiscent of the tone and the weatherbeaten qualities of really old surfaces, is an asset that the sculptors among all the collaborating artists gratefully acknowledge.

The artistic value of the Travertine lies in its beautiful expression of architecture as well as of sculpture. A plain wall becomes a matter of interest and comfort. An ornamental feature or sculpture obtains a wonderful charm and delicacy in this material which is particularly unique in sculpture. The natural Travertine is a sedimentary deposit dating back, it is claimed, to the glacial ages. That imitated here forms the bed of the River Tiber near Rome and

was extensively used for ages in the early Roman and Greek era as a building stone for their temples and works of art. While a poor material in cold climates, because of its striation, it was always sought in Italy for its wonderful texture and tone. It was used in the Coliseum and in many other buildings erected during the Roman period.

It is evident that there has been a very happy and close co-operation between the architect and the sculptor—a desirable condition that,



FOUNTAIN OF ENERGY, BY STERLING CALDER.

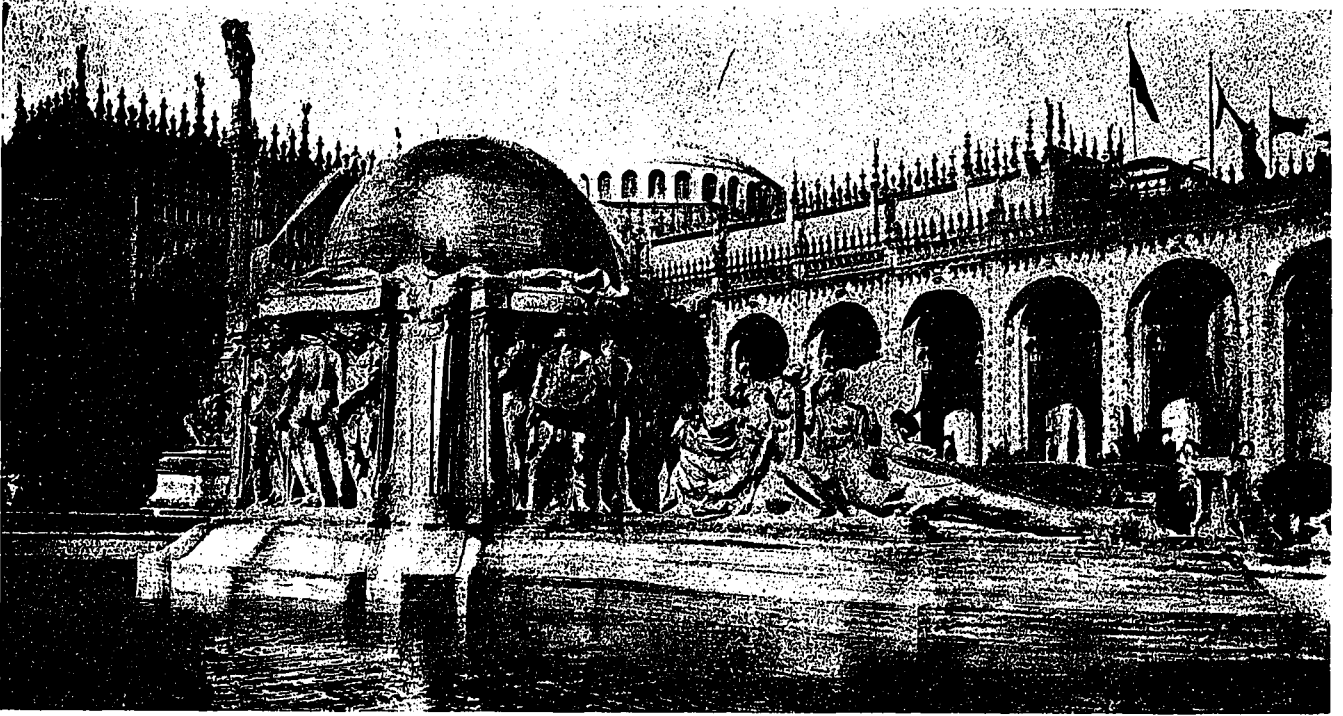
unfortunately, does not always exist. Architects will sometimes not allow the sculptor to give full expression to his ideas, will put unwarranted restrictions upon him, and the result is very one-sided.

I had the pleasure of seeing much of the sculpture grow from the sketch to the finished full-scale work, and the kindness and the vigorous personality of Mr. Stirling Calder added much charm and interest to this experi-

ence. Mr. Calder has been the director of the department of sculpture and the inspiration of his own work penetrates that of all his fellow-artists. Among them are many specialists, such as Frederick Roth, for instance, as a modeler of animals, who shows in the very fine figure of "The Alaskan" in the Nations of the West that he is not afraid nor unable to model human figures. Practically all of the animals in the grounds show the hand of Roth.

Like Roth, Leo Lentelli did a good share of the task. His work is characterized by much animation and spirit, but well balanced wherever necessary, by a feeling of wise restraint. I remember with much horror some of the sculptural atrocities of former expositions that seemed to jump off pedestals they were intended to inhabit for a much longer period than they were apparently willing. Repose and restraint, as a rule, are lacking in much of our older American sculpture, as some of our Market street statuary testifies. It seems that our unsettled conditions find an echo in our art. It is much to be hoped that a certain craving for temporary excitement will be replaced by a wholesome appreciation of those more enduring qualities of repose and balance.

Calder's work, no matter how animated, no matter how full of action, is always reposeful. His "Fountain of Energy" gives a good idea of what I mean. It is the first piece of detached sculpture that greets the Exposition visitor. Its position at the main gate, in the South Gardens, in front of the Tower of Jewels, is the most prominent place the Exposition offers. It is worthy of its maker's talent. Its main quality is a very fine, stimulating expression of joyousness that puts the visitor at once in a festive mood. The Fountain of Energy is a symbol of the vigor and daring of our mighty nation, which carried to a successful ending a gigantic task abandoned by another great republic. The whole composition is enjoyable for its many fine pieces of detail. Beginning at the base, one observes the huge bulks of fanciful sea-beasts, carrying on their backs figures representing the four principal oceans of the world: the North and South Arctic, the Atlantic, and the Pacific. Some are carrying shells and their attitudes express in unique fashion a spirit of life and energy which makes the whole fountain look dynamic, in contrast with the static Tower of Jewels. Everything else in



FOUNTAIN IN COURT OF ABUNDANCE. BY ROBERT AITKIN.

this fountain has a dynamic quality, from its other inhabitants of the lower bowls, those very jolly sea-nymphs, mermaids, or whatever one may want to call them. They are even more fantastically shaped than the larger figures. In their bizarre motives some of the marine mounts look like a cross between a submarine and a rockcod.

Rising from the very centre of the fountain basin, a huge sphere, supported by a writhing mass of aquatic beasts, continues the scheme upwards, culminating in the youth on horseback as the dominating figure of the whole scheme. The sphere is charmingly decorated with reclining figures of the two hemispheres and with a great number of minor interesting motives of marine origin. The youth on horseback is not exactly in harmony with the fountain; one feels that the aquatic feeling running through the rest of the fountain is not equally continued in this exceedingly well-modeled horse and youth and those two smaller-scaled figures on his shoulders—I feel that the very clever hand of a most talented artist has not been well supported by a logical idea. Their decorative effect is very marked, taken mainly as a silhouette from a distance. They are no doubt effective in carrying upwards a vertical movement which is to some extent interfered with by the outstretched arms of the youth. Mr. Calder has given us so very many excellent things, alone and in collaboration with others throughout the Exposition, that we must allow him this little bizarre note as an eccentricity of an otherwise well-balanced genius.

As long as we are in the South Gardens, we might take the time to investigate the two

fountains on either side of the centre, towards the Horticultural Palace on the left and Festival Hall on the right. There we find a very lithe mermaid, used alike on either side, from a model by Arthur Putnam. Many of us who for years looked forward to the great opportunity of the Exposition, which would give Arthur Putnam a worthy field for his great genius, will be disappointed to know that the mermaid is his only contribution, and scarcely representative of his original way in dealing with animal forms. The untimely breakdown, some two years ago, of his robust nature prevented his



DETAILS OF FOUNTAIN, BY ROBERT AITKIN.

giving himself more typically, for his real spirit is merely suggested in this graceful mermaid.

Sherry Fry's figural compositions on the west of Festival Hall might well be worthy of a little more attention than their somewhat remote location brings them. The two reclining figures on the smaller domes are reposeful and ornate. A stroll through the flower carpets of the South Gardens, amidst the many balustrade lighting Hermae, discloses a wealth of good architectural sculpture, which in its travertine execution is doubly appealing.



END OF THE TRAIL, BY JAMES EARLE FRASER.

There are four equestrian statues in different places on the north side of the Avenue of Palms. Two are in front of the Tower of Jewels, the "Cortez," by Charles Niehaus, and "Pizarro," by Charles Carey Rumsey. The third is in front of the Court of Flowers, and the last at the entrance to the Court of Palms. The two latter, Solon Borglum's "Pioneer," and James Earle Fraser's "The End of the Trail," belong as much together as the two relatively conventional Spanish conquerors guarding the entrance to the Court of the Universe.

The symbolism of the "Pioneer" and "The End of the Trail" is, first of all, a very fine expression of the destinies of two great races so important in our historical development. The erect, energetic, powerful man, head high, with a challenge in his face, looking out into early morning, is very typical of the white man and the victorious march of his civilization. His horse steps lightly, prancingly, and there is admirable expression of physical vigor and hopeful expectation. The gun and axe on his arm are suggestive of his preparedness for any task the day and the future may bring.

Contrast this picture of life with the overwhelming expression of physical fatigue, almost exhaustion, that Fraser gives to his Indian in "The End of the Trail." It is embodied in

rider and horse. Man and beast seem both to have reached the end of their resources and both are ready to give up the task they are not equal to meet.

The psychology of this great group is particularly fine. It is in things like these that our American sculpture will yet find its highest expression, rather than in the flamboyant type of technically skilful work so abundantly represented everywhere. "The End of the Trail" could have been placed more effectively in the midst of, or against, groups of shrubbery in a more natural surrounding, where so close a physical inspection as one is invited to in the present location would not be possible.

The Tower of Jewels, however, with its lofty arch and suggestion of hidden things behind it encourages the spirit of investigation. On entering this great arch, one is suddenly attracted by the pleasing sound of two fountains, sheltered in the secluded abutting walls of the great tower. Minor arches, piercing the base of the tower west and east, open up a view toward these sheltered niches, harboring on the right the Fountain of Youth, by Mrs. Edith Woodman Burroughs, and the Fountain of El Dorado at the left, by Mrs. Harry Payne Whitney. These two fountains are totally different in character, and they could well afford to be so, since they are not visible as a whole at the same time, although physically not far apart.

Mrs. Burroughs' fountain is very naive in feeling, very charming in the graceful modeling of the little girl. The decorative scheme of this poetic unit is very simple and well-sustained



FOUNTAIN, BY BERNARD MAYBECK.

throughout its architectural parts.

Mrs. Harry Payne Whitney's fountain is of the intellectual, dramatic kind. The treatment of this almost theatrical subject is well balanced. While it does not possess any too much repose, it is very effective. In general there are three parts to this fountain; the central doorway of Eldorado, just ajar, disclosing faintly this land of happiness; while on either side are two long panels showing great masses of humanity in all manner of positions and attitudes, all striving toward the common goal. Some are shown almost at the end of their journey, overtaken with exhaustion; others more vigorous are lending a willing arm to the support of their less successful brothers and sisters about to fall by the wayside. The whole composition of those two friezes shows Mrs. Whitney as a very skilful and imaginative artist. It is a gratifying spectacle to see a woman such as Mrs. Whitney, so much heralded, possibly against her own inclinations, in the society columns of New York, find the time to devote herself to so serious and professional a piece of work as the Fountain of Eldorado.

Passing through the Tower of Jewels into the Court of the Universe, one's attention will be attracted to a number of pieces of detached statuary. The most important among them is "The Four Elements," by Robert Aitken. We all remember Aitken as the very promising young man who left us before the fire to make a career in the East, after having exhausted all local possibilities, the Bohemian Club included.



FIGHTING BOYS, BY JANET SCUDDER.



THE SCOUT, BY CYRUS DALLIN.

His figures of the Four Elements are typical of his temperament, and he acknowledges in them his indebtedness to Michael Angelo without being in the least imitative. These four figures are allegorically full of meaning, and taken simply as sculpture, they are excellently modeled. His "Fire," showing a Greek warrior defending himself from the fiery breath of a vicious reptile, is novel in its motive, while "Water" discloses Father Neptune bellowing out into the briny air, accompanied by dolphins in rhythmic motions. "Air," on the south, discloses Aitken as the skilful modeler of less muscular forms of a winged female figure, which in itself, without the birds, is suggestive of its meaning. It was very daring to introduce the story of "Icarus" in this group, by the small-scaled figure of this first mythological aviator on the outside of the wings of the larger figure. It helps to add a note of interest to an otherwise not so interesting part of the group.

The Fountains of the Rising and the Setting Sun are most impressive by their architectonic quality, and Wienman's clear style of modeling is seen at its best in the Tritons in the fountain bowl. The figure of the Setting Sun is one of the finest figures of the entire Exposition. The suggestion of the termination of day, indicated in the folding of the wings and in the suggestion

of physical fatigue, is very well conveyed. A fine relaxation runs through the whole figure.

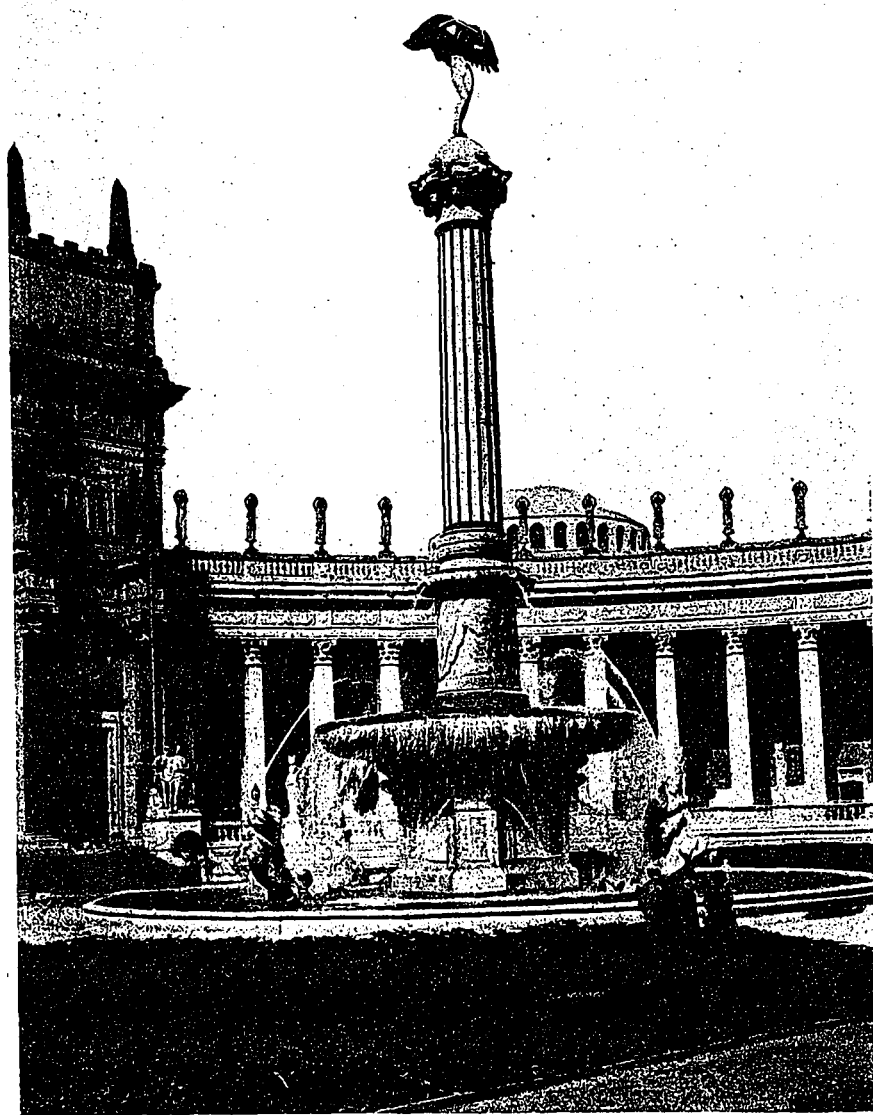
The Rising Sun, on the other side, has all the buoyancy of an energetic youth ready for his daily task. With widespread wings, looking squarely out into the world, he seems ready to

It is rather a flight from those Manship figures to the colossal groups of the Nations of the East and of the West, but one is irresistibly drawn to these wonderfully effective compositions. Their location makes them the most prominent groups in the Exposition ensemble.

The harmonious co-operation of Calder, Roth, and Lentelli has resulted in the creation of a modern substitute for the old Roman quadriga, which so generally crowns triumphal arches. Both groups are so skilfully composed as to have a similar silhouette against the blue sky, but individually considered they are full of a great variety of detail. It was an accomplishment to balance the huge bulk of an elephant by a prairie schooner on the opposite side of the court. Considering the almost painful simplicity of the costumes and general detail of the western nations as contrasted with the elaborately decorative accessories, trappings, and tinsel of the Orient, it was no small task to produce a feeling of balance between these two foreign motives. But what it lacked in that regard was made up by allegorical figures, like those on top of the prairie schooner, used not so much to express an idea as to fill out the space occupied by the howdah on the other side. There is a great deal of fine modeling in the individual figures on horse and camel back and on foot.

In either one of the two groups much has been lost in the great height of the arches. Figures like "The Alaskan," "The Trapper," and "The Indian," for instance, are particularly fine and they would be very effective by themselves. "The Mother of To-morrow" in the Nations of the West is a beautifully simple piece of sculpture.

The Nations of the East, like the West, in its entirety, is the conception of A. Stirling Calder, who modeled the pedestrian figures. With Mr. Calder, Messrs. Frederick G. R. Roth and Leo Lentelli collaborated. The huge elephant in the centre of the group was modeled by Mr. Roth, also the camels. The mounted horsemen were modeled by Leo Lentelli. From left to right the figures are—an Arab warrior, a Negro servitor bearing baskets of fruit, a camel and rider (the Egyptian), a falconer, an elephant with a howdah containing a figure em-



FOUNTAIN OF EVENING, BY ADOLPH A. WEINMAN.

soar into the firmament. The contrast is admirable in these two figures, and Wienman deserves all the popular applause bestowed upon his work.

Paul Manship has contributed two groups at the head of the east and west steps leading to the sunken gardens, each group consisting of two figures, one representing Festivity, the other, Art and Music. These groups are used alike on either side. Manship deserves to be better represented in the Exposition than by these two groups alone. His position as one of the very successful of our younger men would have warranted a more extensive employment of his very strong talent.

bodying the spirit of the East, attended by Oriental mystics representing India, a Buddhist Lama bearing his emblem of authority, a camel and rider (Mahometan), a Negro servitor, and a Mongolian warrior. The size of the group, crowning a triumphal arch one hundred and sixty feet in height, may be inferred from the fact that the figure of the Negro servitor is thirteen feet six inches in height.

On the arch beneath this group are inscribed these lines by Kalidasa: "The moon sinks yonder in the west, while in the east the glorious sun behind the herald dawn appears. Thus rise and set in constant change those shining orbs and regulate the very life of this our world."

The Nations of the West, crowning the arch of the Setting Sun, is also the conception of A. Stirling Calder, who modeled the imaginative figures of "the Mother of To-morrow," "Enterprise," and "Hopes of the Future." Messrs. Leo Lentelli and Frederick G. R. Roth collaborated in their happiest style, the former producing the four horsemen and one pedestrian, the Squaw, and the latter the oxen, the wagon, and the three pedestrians. From left to right the figures are, the French Trapper, the Alaskan, the Latin-American, the German, the Hopes of the Future (a white boy and a Negro, riding on a wagon), Enterprise, the Mother of To-morrow, the Italian, the Anglo-American, the Squaw, the American Indian. The group is conceived in the same large monumental style as the Nations of the East. The types of those colonizing nations that at one time or place or another have left their stamp on our country have been selected to form the composition.

The following lines by Walt Whitman are inscribed on the arch beneath the group of the Nations of the West: "Facing west from California's shores, inquiring, tireless, seeking what is yet unfound, I a child, very old, over waves towards the house of maternity, the land of migrations, look afar: look off the shores of my western sea, the circle almost circled."

It is popularly conceded that these two groups are magnificently daring conceptions, richly worked out. They are probably the largest groups of the kind ever made, the dimensions of the base being fifty-two by thirty-eight feet, and the height forty-two feet.

Looking seaward from the Court of the Universe the Column of Progress commands attention, crowned by the "Adventurous Bowman" and decorated at the base with a frieze symbolizing achievement, or progress. The very fine symbolism in this column deserves to be studied. The position of the column itself is most artistic in its relation to the surroundings. It is too bad, however, to see the view from the main court toward the column spoiled by a music pavilion of dubious architectural

merit. The effect of the column as seen from any point is inspiring in its monumental grandeur. The group on top, the Bowman, represents man's supreme effort in life. He is supported on the left by his fellow-man, adding strength and steadiness to his aim, while on the right the crouching figure of a woman watches anxiously the sureness of his aim. She holds ready in her hand the laurel wreath which she confidently feels will be his just reward.

The great Column of Progress is the first column in the world, so far as I know, whose design was inspired by a purely imaginative motive, and the first sculpture column at any exposition. It must be considered the most splendid expression of sculpture and architectural art in the Exposition. Mr. Calder may justly feel proud of this great idea, and Mr. Hermon MacNeil has added new laurels to his many accomplishments in the free modeling of the very daring group on top.

The column itself is decorated with the spiral ascending motive of the Ship of Life, while at the base Isadore Conti expresses the striving



DETAIL OF STATUE, FOUNTAIN OF EVENING.

for achievement in four well modeled panels of huge scale, representing human life in its progressive stages, showing men and women in attitudes of hope and despair, of strength and weakness, in the never ending task of trying to realize human destiny.

The Court of the Four Seasons harbors four groups by Piccirilli, representing the seasons in the conventional way, dividing the year into

four distinct parts—spring, summer, autumn, and winter. These four groups of Piccirilli are not equally successful. By far the most effective is the one representing winter. The severe rigidity of the lovely central standing figure expresses well that feeling of suspended activity which we associate with the conventional conceptions of the season of dormant life. The kneeling side figures are in full harmony of expression with the central figure. They support very well the general scheme.

The next best, to my mind, seems "Spring," on account of the very fine psychological quality of the standing figure in giving expression in a very graceful fashion to that invigorating and



BOWMAN, BY HERMON A. MACNEIL.

reviving quality of our loveliest season. The two side figures seem to be gradually awakening to the full development of their powers.

Next to "Spring," "Fall," by the fullness of the decorative scheme, suggests Peace and Plenty in the preparation for the Harvest Festival and in the touch of family life of the mother and child on the right.

Mr. Piccirilli's naturalistic modeling does not express itself so well in "Summer." There is so little strictly architectural feeling in that group. I think that Albert Jaegers, with his two single figures on top of the two columns flanking the Orchestral Niche, actually represents our own two seasons much more successfully than does Piccirilli. Jaegers' "Rain and Sunshine" should be used to name the court properly—"The Court of the Two Seasons," as we know them in California—the dry season, the season of harvest; and the wet season, the one of recuperation. I regret that here an opportunity was lost to add distinction to the many different features of a great undertaking.

Jaegers has contributed also the figure of "Nature" on top of the music niche and the capital bulls on the pylons toward the north of the court. These terra cotta bulls are surely worthy of the adjective derived from them. Their relative size is very good, and to see them in the richness of their color against the upper regions of a dark blue sky is very effective.

Directly north of the Court of the Four Seasons stands Miss Beatrice Evelyn Longman's Fountain of Ceres, originally planned for the centre of the court, but so very effective all by itself between the dignified colonnades of the avenue. The fountain is most impressive by its fine architectural feeling, so uncommon in the work of many women sculptors. The general feeling of it is refinement, combined with great strength. It is fully deserving of monopolizing a fine setting of dignified architecture, so richly emphasized by some of the finest old yew trees in the grounds.

In the Court of Abundance a riot of interesting architectural sculptural details invites the attention of the visitor. Beginning with the lower animal forms, such as crabs and crayfish, etc., the entire evolution of Nature has been symbolized, reaching its climax in the tower, where the scheme is continued in several groups in Chester Beach's best style. The lowest of these groups shows the Primitive Age, followed above by the Middle Ages and Modernity. The great charm of this finest of all the towers in the Exposition is its wonderful rhythmic feeling. The graceful flow of line from the base toward the top is never interrupted, in spite of the many sculptural adornments used on all sides. In front of the tower are two very ornate illuminating shafts, showing Leo Lentelli's

diabolical cleverness in making ornament out of human figures. Leo Lentelli's style is particularly well adapted to Mullgardt's Court of Abundance. Its care-free, subtle quality, full of animation, presenting new motives at every turn, is most helpful in the general spirit of festivity which characterizes this most interesting of all the courts.

Aitken's Fountain of Life in the centre of the court is totally different. Full of intellectual suggestion, it is almost bewildering in the story-telling quality of its many details. Aitken's fountain, which is situated in the centre of a basin a hundred and fifty feet long by sixty-five feet wide, rises directly from the water. The main structure consists of a series of four groups of heroic-sized figures, carved in pierced relief, each flanked by colossal bronze Hermes, their arms reaching around the structure and held together by animal forms of reptilian or fishy origin. All these forms and figures surround a globe of enormous size, typifying the Earth, over the surface of which streams of water are thrown from the reptilian chain motive.

Leading up to the main structure is a group of ten crouching figures, symbolizing Destiny in the shape of two enormous arms and hands, giving life with one and taking it with the other. Here, on the left side, are arranged figures suggesting the Dawn of Life, while on the right are men and women depicting the fulness and the end of existence.

In the first, Prenatal Sleep, is the crouched form of a woman, while successively come the Awakening, the Ecstatic Joy of Being—or it may be the Realization of Living; the Kiss of Life, with the human pair offering up their children, representative of the beginnings of fecundity; a female, strong of limb and superb of physique, enfolds in her arms two infants, while her mate, of no less powerful build and rude force, kneeling beside her, gives her an embrace typical of the overpowering parental instinct. Here is the suggestion of the elemental feelings, the beginnings of things.

Between the first group and the central one comes a gap, a space typical of that unknown time in history when conjecture alone permits speculation, and the story is taken up again with the first of the central groups, wherein stands a figure of Vanity, glass in hand, symbolizing the compelling motive of so much in human endeavor. To her left, in enormous contrast, are primitive man and woman, treated with great realism, these two carrying their burdens of life, in the form of their progeny, into the unknown future, their expression that of rude but questioning courage, the man splendid in his virility, superb in the attitude of his awkward strength, ready to meet what-



THE GENIUS OF CREATION, BY DANIEL CHESTER FRENCH.

ever be the call of earth. His mate meanwhile suggests the overwhelming and eternal instincts of motherhood.

An archaic Hermes, dividing these figures from the next group, allows for a space of time to elapse, and we come to their children, now grown to manhood and womanhood, in their rude strength finding themselves, with the result of Natural Selection. This is a group of five personages, the centre figure a man of splendid youth and vigor, suggesting the high state both of physical and intellectual perfection, unconsciously attracting the female, two of whom regard him with favor, while two males on either side, deserted for this finer type, give vent to deep regret, despair and anger. One attempts by brute force to hold the woman; the other reluctantly gives up his choice, in the obvious futility of his unequal intellectual endowment to comprehend.

From this to the Survival of the Fittest we have a militant group, in which physical strength begins to play its part, and perhaps discloses the first awakening of the war spirit, the woman in this case being the exciting cause. The powerful chieftains struggle for supremacy of their time and tribe, their women making futile efforts to separate them. Here the sense

of conquest receives its first impression and is finely indicated, with admirable action, while there is the symbolism of the conflict of the nations that has ever gone on, for one cause or another, and that struggle for the female which has ever been the actuating motive in war, conquest, and, for that matter, peace.

The next group—always separated by the solemn and dignified *Hermæ*—discloses "The Lesson of Life," wherein the elders, with the experience of the years, offer to hot-headed youth and to the lovelorn the benefit of their own trials and struggles. A beautiful woman is the central figure. She draws to her side splendid manhood, the Warrior, willing to fight for his love and his faith. To his left his mother offers him her affectionate advice, while to the right a father restrains a wayward offspring who, rejected by the female, is in a state of frenzied jealousy. Finally two figures represent Lust, a man struggling to caress the unwilling woman who shrinks from his embraces, and we are led down from this pair out of the composition to the crouching group at the approach of the structure, referred to at the beginning of this description, who here are departing from the central composition.

First is a figure of Greed looking back on the Earth. He holds in his hands a mass suggestive of his futile and unsavory worldly possessions, the unworthy bauble toward which his efforts have been directed. Back of him we have the group of Faith, wherein kneels a Patriarch, who offers consolation to a woman to whom he presents the hope of immortality, holding in his hands a scarab, ancient symbol of renewed life. Next come two recumbent figures, a man and a woman, the first, Sorrow, the other typifying Final Slumber. These are about to be drawn into oblivion by the relentless hand of Destiny.

In the centre of a formal parapet at the end of the basin of water, sixty feet from the fountain, is a colossal figure symbolic of the setting sun, *Helios*, the great orb having thrown off the nebulous mass that subsequently resolved itself into the earth.

In the immediate neighborhood of this Court of Abundance is found Sherry Fry's figure of Neptune's Daughter, in the open court north of the tower. The figure is not in keeping with the scheme of Mullgardt's court, extending in this direction. The effect of this figure, no matter how graceful it may be, is unquestionably too physical, in a certain measure owing to the opportunity for close inspection.

On the south of the Court of Abundance, in the Court of Flowers, Edgar Walter's fountain has been placed. "Beauty and the Beast" have been combined in contrasting fashion, with much effect, by associating the youthful charms of a graceful maid with the angular

ugliness of a dragon, who seems to feel honored by having been selected as the resting-place of a creature from outside his realm. He seems to be almost hypnotized into a state of abject lifelessness. The effect of this juxtaposition of the round forms of the human body and the almost geometrical angularity of the fabulous beast is very interesting and adds a new note to the many other ideas presented. The architectural scheme of the fountain is made doubly interesting by a rich use of animal forms of humorous character.

The immediate vicinity of the Laguna remains still to be investigated in regard to sculptural adornments. The dozen or so niches in the west front of the main building present a repetition of two individual groups by Charles Harley, of New York, of decidedly archaeological character—"The Triumph of the Field" and "Abundance." They are most serious pieces of work, possibly too serious, and they are in great danger of remaining caviar to the masses on account of the complexity of their symbolism and the intellectual character of their motives. Their setting is most attractive, amongst groups of trees and shrubs.

Maybeck's Palace of Fine Arts is so overwhelming in its architectural effects that one seldom feels like doing justice to the fine sculptural detail everywhere in this building. Ralph Stackpole's interesting Shrine of Inspiration is the most charming bit of sculpture, more detached in its effect than most of the other motives. Bruno Zimm's eight fine friezes, showing the development and influences of the arts in a very severe, almost archaic style of modeling, add a fine note to the dome, and Ulric Ellerhausen's equally architectonic friezes are in good style and are in thorough harmony with the classic quality of this great palace.

It is, of course, not possible to name all of the many pieces of architectural sculpture used at the Exposition. The general effect one receives is that it represents the best that is possible in exposition sculpture to-day. It gives evidence of the increasing development of the qualities of design, as contrasted with the so much looser work of former expositions. Seldom before have sculptors anywhere, since sculpture and architecture first worked hand in hand, so played their most important roles together in the ensemble setting that constitutes our Exposition visually. On arch or column, in niches, in fountains, and in free-standing groups, they sing of many themes, and always in harmony, but with no loss of character or individuality. There is no doubt of it, that, for an Exposition, sculpture is the most important of all the arts, because it is the most human. Without it, architecture would be cold and without appeal. I foresee a great future for sculpture in America.

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THE BEAUTY OF THE AGE

A. C. Benson

I AM going to attempt to say a few words about the beauty of ancient buildings, what it consists in, how we are to recognize it, and why we must try to recognize and preserve it.

An old and beautiful thing has two quite distinct kinds of beauty, though it is not always easy to say where one begins and the other ends. It has original design and conception, which Ruskin rightly says ought to be called expression, and which is, technically speaking, the classical quality in beauty; it has also the beauty of association, a varied and slowly acquired thing, which gradually draws into itself all sorts of interests and delights, deposited, as Pater says, cell upon cell; and this beauty of association is definitely a romantic beauty, not a question of form and proportion, but a power of evolving a sort of spiritual music, in which

themes and motifs outline themselves for an instant and disappear again.

What I propose to speak of to-day is the power of association; and though in one sense it cannot be called beauty pure and simple, yet it is a very real and true sort of beauty, though a complicated one, in the sense that it appeals to the spirit with a subtle and delicate sort of charm, and awakens all sorts of remote and musical echoes in the soul, like the music which lingers round vaulted roofs, when the organ utters the last huge chords of the high-piled symphony, and sinks into an awe-struck silence.

But the main difference is this, that the beauty of expression of which Ruskin speaks is a thing in itself, as distinct as Higher Mathematics; an absolute quality, depending upon some hidden psychological law, which tells even the untrained mind what is in due proportion and what is not—while the beauty of association is a subjective thing, contributed to a great degree by the spirit of the individual man who perceives it. The more highly stored that the mind behind the eye is, the more rich its memories, the more deftly and swiftly that it summons up and applies its garnered impressions, the more that it knows and feels, the more fertile and accessible its sympathies are, by so much the more appealing does the romantic force of association become.

What is so deplorable about modern restoration is that it is all a submissive harking back to an arbitrary period of Church art. It is not a departure, it is a tame virtuosity, desiring, if possible, to reconstruct a vanished atmosphere, without any real knowledge of what that atmosphere actually was. The essence of the old building and decoration was to have a few fine dignified things on which the eye might rest with unsated pleasure, for ever discovering fresh beauties. But the new theory is to cover up everything with tawdry and flashy decoration, which gives perhaps a scenic sort of pleasure at first sight, and which breeds an ever-increasing disgust at the continued contemplation of its shallow trickeries.

I believe with all my heart in a beauty of strict form. . . . But I believe also in the immense interest and charm of development and accretion—what Ruskin calls Association. I like to see and to preserve the best that people could do, whether it is a gaudy Jacobean tomb crowded with obelisks and emblems and a stiff-ruffed figure in veined alabaster, or even a wigged divine clasping a marble book, among lachrymose cherubs and cinerary urns. Those who ordered and those who designed such things thought them beautiful; and nothing which has ever engaged the affections and devotions of human hearts can ever wholly lose its charm.

Anyone who has ever broken up a home and

parted with familiar furniture must surely have had the feeling that the old chairs and tables are being unjustly used, and that they will not really ever feel happy with their new owners; and the love of a home is a complex thing, because a house has all the charm of a picture or a book, in that it is an expression of human personality, a symbol of human desires and designs; and then it acquires too the secondary charm of having been the scene and witness of human adventures and events, so that the beam of the roof and the stone of the wall have become inseparably connected with human emotions and hopes and fears, and have a sanctity of which they cannot be divested, which even the prosaic Romans felt and rendered in the untranslatable phrase *admonitus locorum*—the spirit and influence of a place—the way in which a scene, which is associated with the horror of a calamity, or which has been the haunt of a genius, can tacitly warn a human heart to forbear, to beware, to make a choice, or to follow a high example. That is the spiritual-side of what I have called the beauty of age—its real and potent effect upon the emotions of men. . . .

And then, too, in a less ethical and a more artistic region, there is the beauty which falls upon a building from the accommodation of all its mutual parts, through the touch of rain and sun, the pressure of wind, the strains and stresses of the earth, the movements of the soil, the slow passage of hidden streams, the thrust of burrowing tree-roots, the settling-down and distributing of the weights of wall and roof. When a building is first set up it has a mathematical rigidity and precision, as of a box of stone half embedded in a field. Then the slow process begins; here a softer passage of soil causes a settlement, a corner begins to shift away, and the rest of the house inclines a little to retain the fabric in its place; the roof timber warps and bends, and the tiles dip and waver in outline; all this is a pure gain, because the beauty of the underlying form is there, under the tiny deviations which relieve the eye from a too mathematical precision. The house leans and gathers itself together, and at last comes to look, not as if it were set upon the soil, but had grown up out of it, like a rock or a tree. It is no longer an intruded thing, but a part of the scene. Meanwhile every surface is feeling the influence of the chemistry in the air; the sharp edges are softened, the lichen spreads its delicate patches, the sun bleaches the southern surfaces, the moss creeps along the sheltered ledge; the whole fades and glows into a soft harmony of color and outline.

So my first and last plea is that we should dare to let things alone, even if we do not understand them or think them beautiful, for the sake of the tender care which set them in their

place, just so and not otherwise, and in the name of memory and reverence and love. For taste is a very changeable and inconstant thing, but reverence is eternal. The old house, the old church, ought to mean something to us, and we must not lightly change and deface them. Of course we must not let such emotions hamper our lives, and still less unfit us for harder and baser conditions. We ought not to grow more and more fastidious by experience, and if we find ourselves growing more and more disgusted and impatient if we cannot have things to our mind, then we are setting art before life, and not simply using it to enrich and strengthen life. If we are dealing with old and venerable things, we ought to do as little as we can to them; mending and repairing, but not what is called restoring. For a restored church is not a new church and it is not an old church—it is a new church without its originality, and an old church without its dignity.

And, if additions must be made for use and life, let them be frank additions, and not an attempt to fake what is old. The beauty of age is very easily marred, and it cannot be imitated; and I am sure that whatever art is, it must be sincere. It is the emotion which art can give which makes it worth while; but it must be a real emotion, and not a bit of clever self-deception. A love of story-telling and character-moulding is typical of the decline of real emotion. As Milton said of the staircase of heaven, "Each stair mysteriously was meant." There is a mystery and a meaning in it all. We do not know exactly what it represents, but we must do our best to interpret its meaning, and then we must be serious about art, if we are to get any help from it, but never solemn. It is being solemn about art when we try to make it produce fictitious effects just for the luxury of the emotion, but it shows a lack of all seriousness about it if we can misuse and deface a beautiful thing and destroy the rich beauty which only time and use and reverence can create.

* * *

AT the last meeting of the Council of the Architectural Institute of British Columbia, Inc., the following action was passed: "Resolved, "A record shall be kept by the honorary secretary of all members of the Institute in active service during the war. Such members are requested to advise the honorary secretary from time to time as opportunity offers, of movements, transfers, promotions, rank, and condition, together with such details of actions in which they participate as will enable the record to be made complete. Any member wounded or taken prisoner especially requested to so advise the honorary secretary as promptly as possible, in order that the Institute may render assistance in any way possible."

ANNOUNCEMENT has been received of the death of Joseph S. Henderson, president of Brandram-Henderson Limited. Mr. Henderson died at Halifax, July 31st after having brought this company up to its present state of efficiency and high standard. The organization will feel the loss keenly although the work will suffer in no way on account of the systematic foundation supporting the institution, mainly laid through the efforts of Mr. Henderson.

* * *

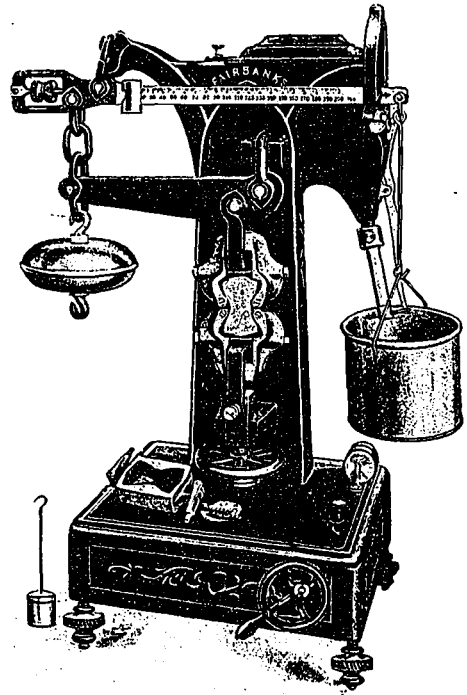
THE mechanical, electrical and domestic engineering equipment installed in the new Central Technical School, Toronto, was under the supervision of the Canadian Domestic Engineering Company, Limited, of Montreal. The author of the article treating of the mechanical work, Almond D. Woodman, is president of the above company, and has kindly co-operated in presenting this phase of the institution in a comprehensive manner. CONSTRUCTION is also indebted to J. B. Carswell, associated with the firm of Ross & Macdonald, for his treatise of the architectural features.

* * *

STEEL LOCKERS are rapidly becoming recognized as a necessity in modern well-organized establishments and institutions. They provide safety and security for each individual's clothes and personal effects. Also they conform to sanitary and insurance requirements and make for order, tidiness and system wherever used. An important installation of these lockers has been made in connection with the new Technical School, Toronto, for the use of teachers and students. There are nine locker rooms in the school containing in all one thousand lockers. Each locker has a different lock and the entire installation can be inspected by the use of a master-key. Each locker bears a number plate showing the number of the locker and also the room number. With this as a basis, a system has been worked out whereby those in charge may at all times know which student is responsible for the key of any locker. A tag is attached to each key and this tag bears the same locker number and room number as the locker itself. These lockers were supplied and installed by the Dennis Wire & Iron Works Co., Limited, London and Toronto, Canada, and are a splendid example of material and workmanship. Lockers manufactured by this firm, bearing their trade mark "Dennisteel," have been installed in practically every type of building, from one end of Canada to the other. They are used in offices, banks, factories, gymnasiums, schools, colleges, lodges, fire stations, hospitals, hotels, etc. The Y.M.C.A.'s of Canada have been large purchasers, while in Toronto "Dennisteel" lockers are installed in a large number of high schools.

For locker purposes, it seems that steel is highly preferable to wood. Steel lockers are theft-proof and almost unbreakable. They are non-inflammable and economize on floor space. They will not absorb moisture and vermin will not breed on steel. The appearance of steel lockers is excellent and with ordinary usage this class of material will last indefinitely.

* * *



A CEMENT TESTING Machine similar to one shown above was installed in the Toronto Technical School by the Canadian Fairbanks-Morse Co., Limited. The machine was supplied with tension attachment and had a capacity of 2,000 lbs. They also supplied percentage scale, briquette moulds, sieves, Vicat apparatus and Gilmore needles for use in connection with same.

* * *

MASTER BUILDERS' METHOD, it is claimed, eliminates the porosity of concrete floors by the use of Master Builders' Concrete Hardner, a finely-divided, chemically-treated and extremely hard material that is mixed with the sand and cement for the topping of the floor. When properly incorporated in a concrete floor topping, this hardner gives a high tensile and compressive strength, and enables the floor to withstand abrasion to an exceptional degree. Added to ordinary concrete in accordance with Master Builders' Method Standard Specification, it creates a concrete floor that is extremely dense, wear-resisting, dustproof and waterproof.

It not only treats the surface but is mixed right into the topping of the floor, binding, hardening and strengthening it, and making it exceptionally durable. It is further claimed that a concrete floor properly laid by this method, will

under ordinary conditions, resist wear almost indefinitely. There will be no dusting, no hollows or ruts to be gradually ground and crushed into trouble-giving holes. Other considerations which recommend its use are the elimination of painting, patching and replacement, thus insuring a concrete floor of a permanent character from the first. A splendid example of the application of the Master Builders' Method is seen in the floors of the new Technical School illustrated in this issue, which represents one of the more important recent contracts for which this material is specified.

* * *

IT IS SAFE to say that the book making the greatest impression on all visitors to the Panama-Pacific International Exposition, and also on those who cannot visit, but who are interested in it, is "The Art of the Exposition," by Eugen Neuhaus. Mr. Neuhaus, himself a painter, assistant professor in the Art department of the University of California, and chairman of the Western Advisory Board of the Department of Fine Arts in the exposition, is well fitted to write of the architecture, sculpture, color scheme, landscape gardening, mural decorations and illumination of the exposition, all of which he has discussed in this volume. The work is illustrated by thirty-two handsome duo-tone prints, showing the best of the exposition art. It is far more than a guide, it is a splendid interpretation of the form and color that make this exposition the most wonderful ever achieved. As a piece of book making, "The Art of the Exposition" is beautiful, printed on toned antique paper, bound in full fawn sunburst boards richly stamped, with uniform end papers and jacket. The price is \$1.50 net, published by Paul Elder & Company, San Francisco. A companion book, on the art galleries of the exposition, by Professor Neuhaus, is now in preparation and will be published in the very near future.

* * *

THE James Smart Manufacturing Co. has issued a circular relative to the silent sanitary school desk, which represents the latest improvements in connection with this phase of school work. It presents in a lucid manner the various features which commend it for general use.

* * *

IN COMMENTING on the resignation of the head of the sales department and the combining of this work with the Advertising under one head, the president of Berry Brothers, says: "It occurs to us that this change, coming at a time when some of our competitors have been reducing their forces of salesmen, may give rise to a feeling of apprehension lest we may con-

template such a course ourselves. We take occasion, therefore, to reassure each and every one of you, and to state that we contemplate no change of such a character. It is our desire and intention to continue the arrangements now existing between us and all of those salesmen who have been instrumental in building up and maintaining this business. The general policy of this company toward its employees will continue unchanged. Rewards for meritorious work will be as large as they have ever been and the appreciation will be as sincere. A continuation of the loyal support you have given us in the past will be met with the same spirit on our part." Such sentiment is worthy of emulation and will go a long way towards bettering the unnatural conditions of depression.

* * *

"ACHIEVEMENTS in Modern Heating and Ventilating" is the title of an instructive booklet issued by the James Smart Manufacturing Co. In this work the Kelsey warm-air generator system is thoroughly described and illustrated with many examples of buildings wherein it has been installed.

* * *

THE contract for building the superstructure of the railway bridge over Smoky River, Alberta, for the Dominion, Dunvegan & British Columbia Railway has been awarded to the Dominion Bridge Co., Ltd., and the material will be fabricated in this company's Winnipeg establishment, which is one of the largest and best equipped west of the Great Lakes. The bridge will consist of two 86-foot deck plate girder approach spans, six 120-foot deck spans, and one 125-foot through truss span which will span the main channel of the river, the steel in the superstructure weighing nearly 1,200 tons. This is one of the most desirable bridge contracts ever given out in the west. The concern has only recently completed the erection of a similar bridge for this railway over the Athabasca River.

* * *

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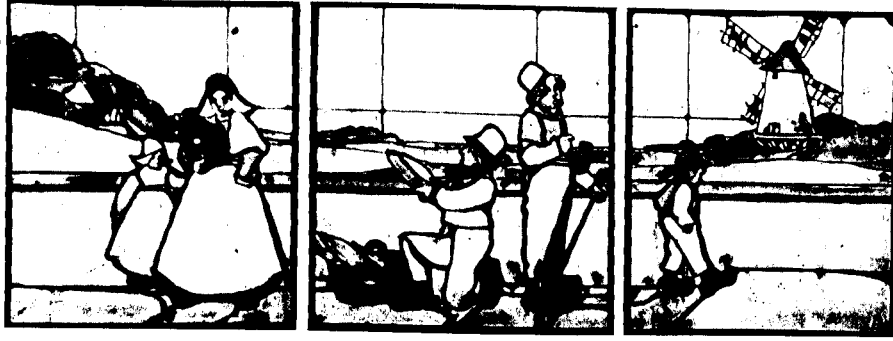
We should like to send every architect, engineer and building owner a copy of the Underwriters' Laboratories report on Barrett Specification Roofs. Address our nearest office.

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Gen. Contractor C. E. Deakin, Montreal.
Roofers Sibley & Hunt, Montreal.

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We advise incorporating in plans the full wording of The Barrett Specification in order to avoid any misunderstanding. If any abbreviated form is desired, however, the following is suggested: ROOFING—Shall be a Barrett Specification Roof laid as directed in printed Specification, revised August 15, 1911, using the materials specified and subject to the inspection requirement.

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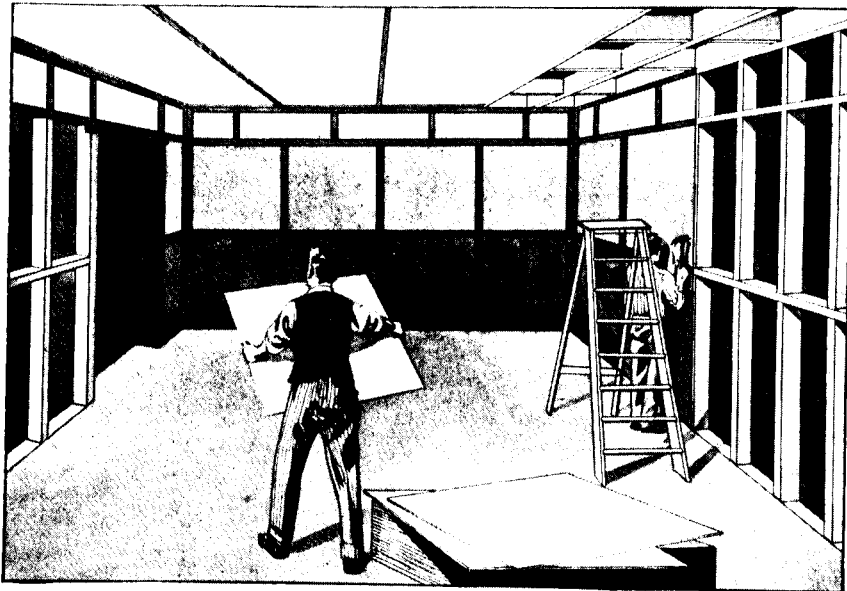
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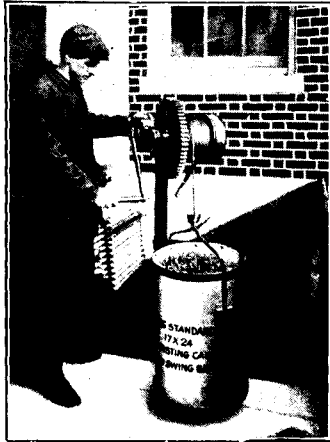
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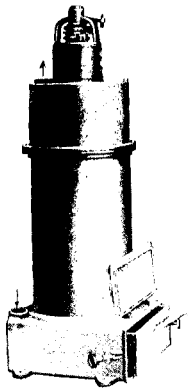
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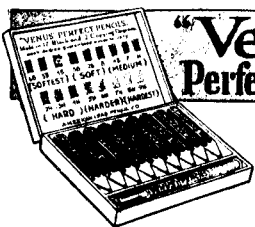
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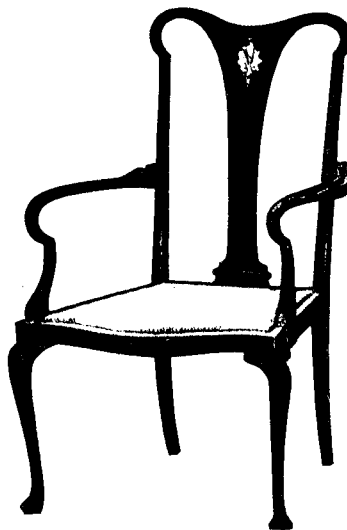


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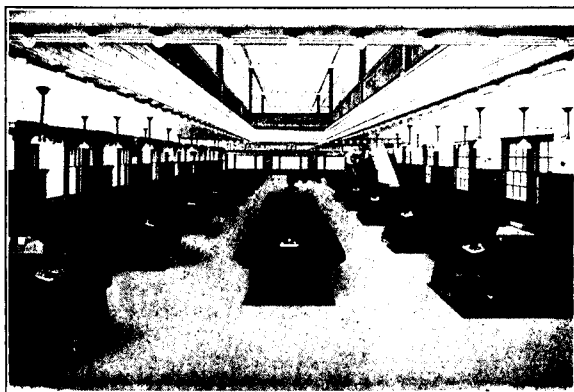
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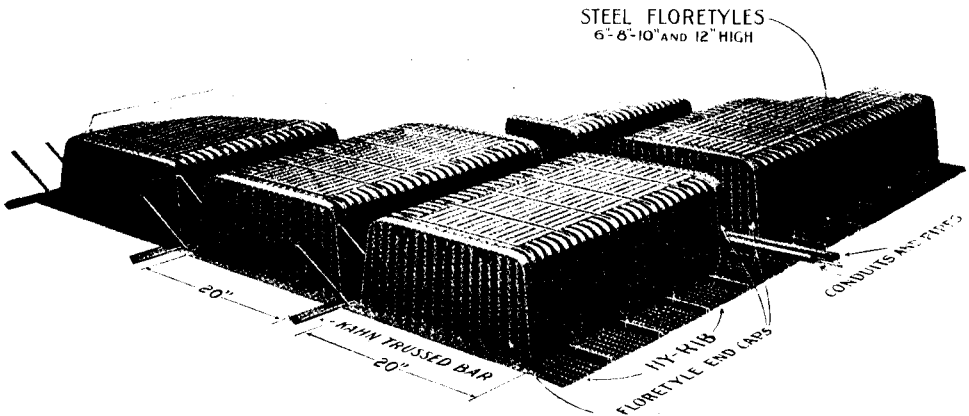
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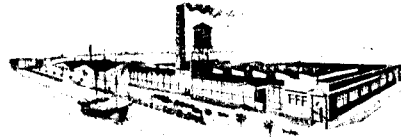
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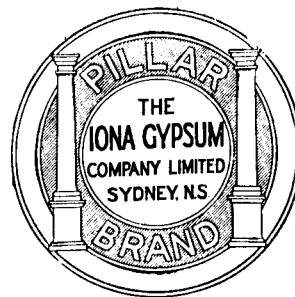
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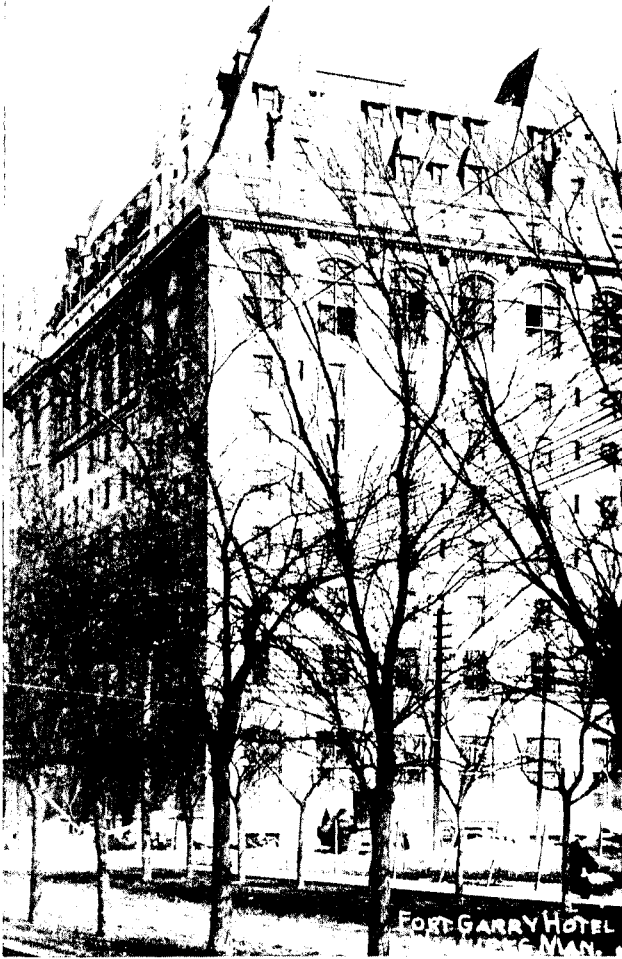
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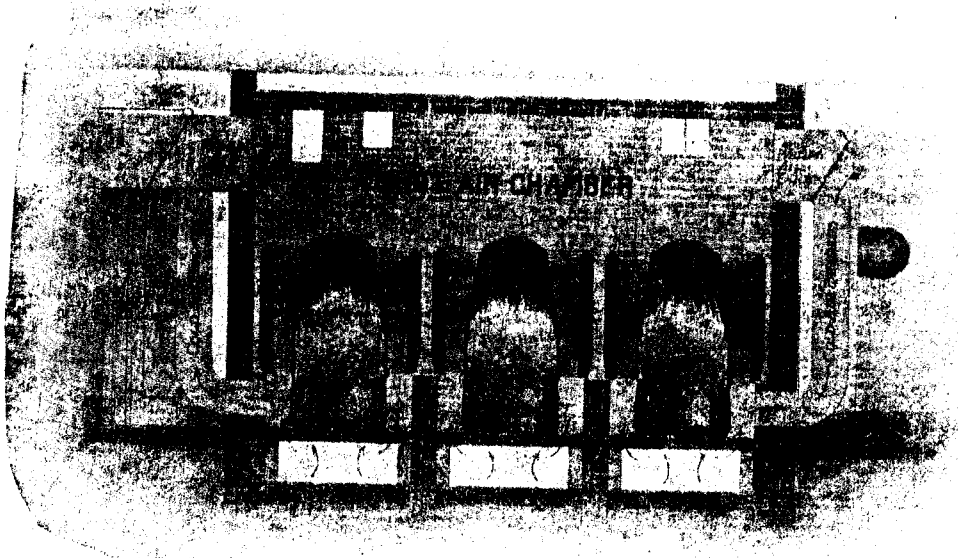
The circulation of air by the Gravity System is maintained by the natural laws and the movement of the air is usually accelerated—in the case of schools or other public buildings—by the use of stack heaters in the base of ventilating stacks or flues.

With the Kelsey Gravity System installed in schools, and with a properly operating ventilating flue, all foul air will be exhausted at the floor line and replaced with fresh warm air.

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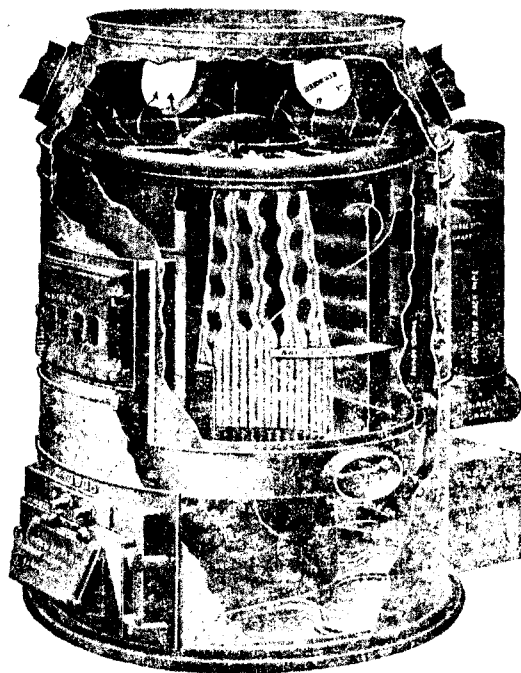


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