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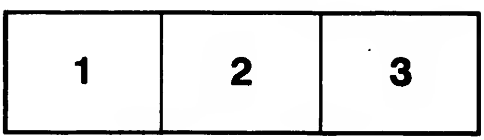
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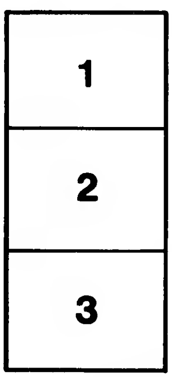
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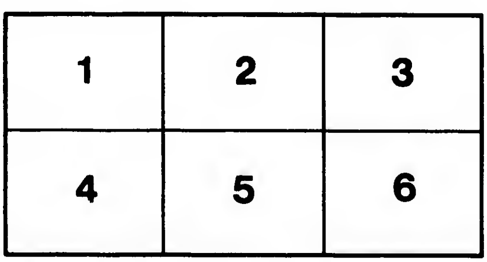
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The Expanded Metal and Fireproofing Co., Limited

CONTRACTORS FOR

General Fireproof and other Building Construction
Expanded Metal and Concrete Flooring
Fireproof Expanded Metal Partitions

Fireproofing Beams and Columns
Metal Furrings and Lathing
For all kinds of Ornamental Plastering

Vaulted Ceilings, False Beams
Cornices, etc., etc., etc.

Expanded Metal for Strengthening Concrete in Bridges
Sewers, Culverts, Retaining Walls, Pavements
And all classes of Engineering Work, etc., etc.

Modern Methods for

FACTORIES and MILLS
OFFICE BUILDINGS
WAREHOUSES
STORES
HOTELS
THEATRES
ASYLUMS
GAOLS
BREWERIES
RAILWAY DEPOTS
LIBRARIES
SCHOOLS
RESIDENCES
Etc, etc.

OFFICES: Nos. 98-100 KING STREET WEST, TORONTO

FACTORY: Nos. 23-25-27 PEARL STREET, TORONTO

MONTREAL AGENCY: 1833 NOTRE DAME STREET

INTERIOR VIEW OF FACTORY.

THE EXPANDED METAL AND FIREPROOFING CO., LIMITED, TORONTO.

On the right is the lath machine; to the left the machine for heavy material.

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EXPANDED METAL.

NOTICE.—Prices of the Metal, Estimates for Construction Work, Drawings, and full particulars of any phase of Expanded Metal will be supplied upon application, free of charge.

IT IS a far cry from webbed steel fencing, as originally invented by Mr. John F. Golding, to Expanded Metal, his final product, and it is readily comprehensible that the various and successive steps onward till now—when its utility avails for widely different purposes, and its manufacture is rendered an easy process by reason of a ponderous and ingeniously contrived machine—are too many here to enumerate.

The material, its special process of manufacture, the special machinery, and many forms of its uses have been patented in all the civilized countries of the world. It is extensively employed on every continent. There are companies operating in England, France, Austria, Russia, Belgium, Germany, as well as in the United States, Australia, and also lately launched amid most favorable auspices in the Dominion of Canada.

THE SPHERE OF EXPANDED METAL.

Broadly defined, Expanded Metal (see "Engineering," Eng., Nov. 13th, 1896) is a material made from soft low carbon (0.008 C.) Bessemer sheet steel which, by a mechanical process, is cut through—except at what become the junction points—and simultaneously is expanded into diamond shaped meshes, with the flat strands at 45° to the plane of the sheet. A distributed and extensive bearing surface is thus obtained, so that when embedded in any plastic material the strength of the combination is enormously enhanced. Each mesh is independent of all others, and numerous strands may be cut without materially weakening the sheet. Expanded Metal as a binding material in concrete multiplies its power of resistance to lateral strains from 8 to 10 times (see, among many others, the report of the late Sir John Fowler and Sir Benjamin Baker, Past Presidents of the Institution of Civil Engineers). House-building, by its invention and general use, has been revolutionized. Architects are enabled to construct light concrete floors occupying little space but of enormous sustaining power, whilst 1½ inch solid partitions equal in stability to a brick wall are just as feasible—both points having a marked bearing upon the cost, and upon the return from the outlay.

The amount of Expanded Metal used in strengthening floors, laid down in the States alone, in 1899, aggregated 1,000,000 square feet, exclusive of hundreds of buildings employing Expanded Metal lath. The Paris Exposition buildings, necessarily as fire-proof as possible, involved orders for 600,000 square yards of Expanded Metal, which lends itself pre-eminently to the artistic plastic decoration in which the French excel. The standing which Expanded Metal has obtained in England, for example, is evidenced by the use (after crucial tests by the Chief Engineer) of 675,000 square feet of flooring for the Manchester Ship Canal Warehouses; while an aggregate of 86,000 square yards of lathing was, or is now, under contract for the Horton, Hanwell, and Chadwell Heath Asylums, and the Collingwood Main Hospital. Her Majesty's Government has used the material extensively in Kensington Palace and some thirty offices, asylums, barracks, prisons, post offices and naval works. Eighteen different railway companies, 70 theatres, 60 hospitals, asylums or infirmaries, and 110 banks, hotels, schools, fire halls, baths, libraries, etc., are among the important users of Expanded Metal exclusive of warehouses, factories, etc. mentioned in the latest review of work done by the English Expanded Metal Company.

Expanded Metal is made from Nos. 24 to 10 guage steel and ¼ inch plate, and in various meshes ranging from ⅜ inch (suitable for lathing, see Fig. 2) all the way to 3 or 4 inches (as adapted to flooring, see Fig. 1), and in heavy railway work.

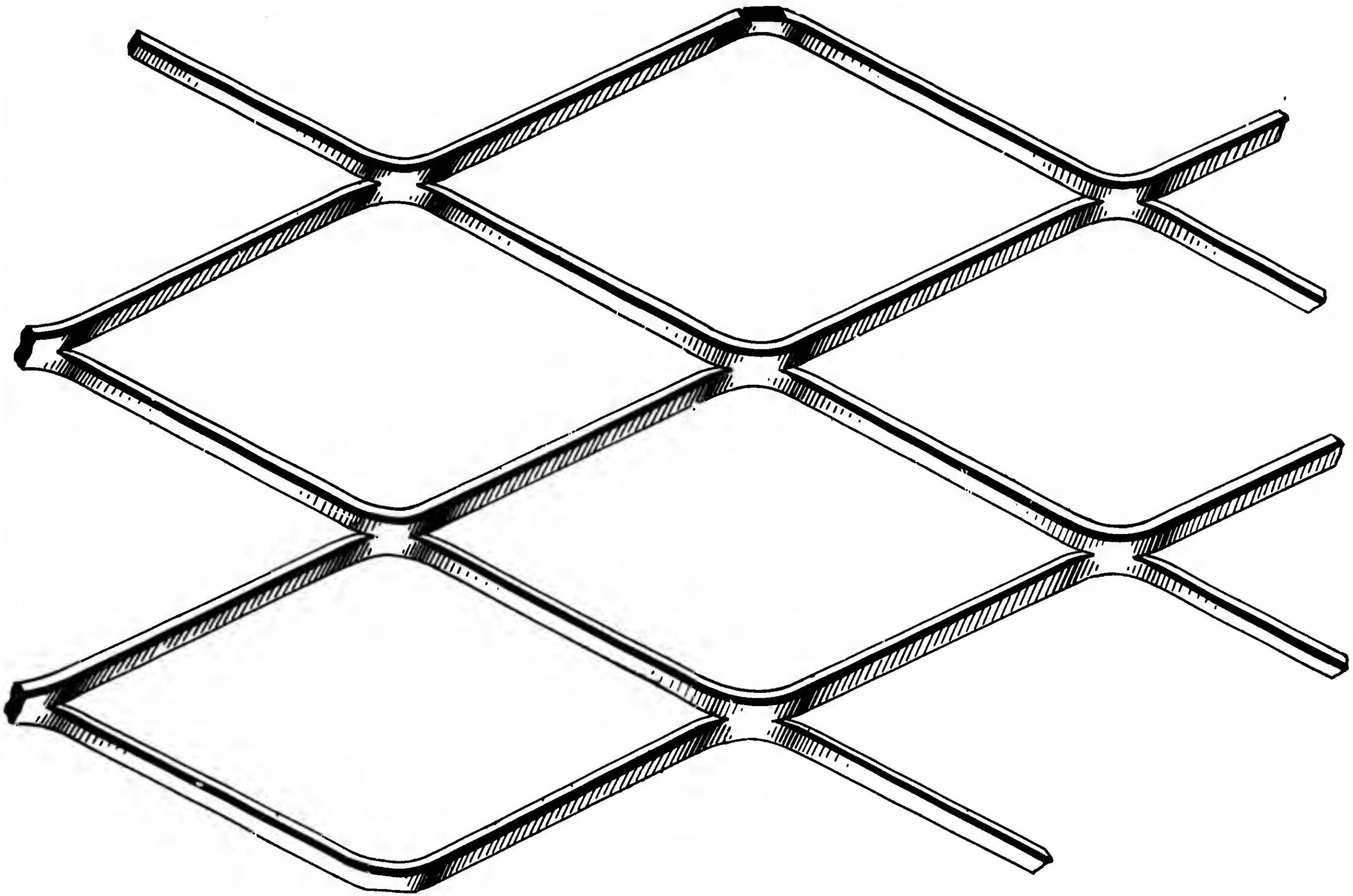


Fig. 1.—EXPANDED METAL FOR FLOORING. Full Size.

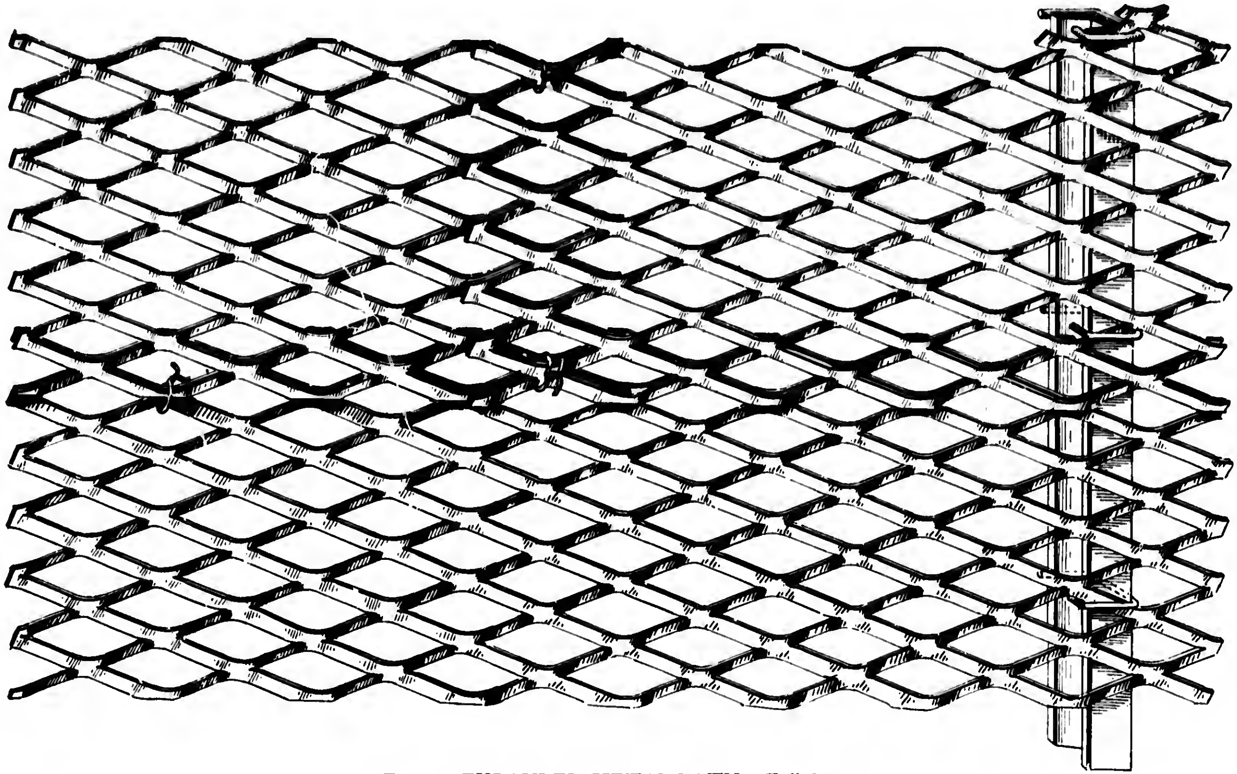


Fig. 2.—EXPANDED METAL LATH. Full Size.

COMPOSITE STEEL AND CONCRETE.

A reference to the enduring qualities of Portland Cement seems gratuitous, as it is a matter of common knowledge that this material continues to increase in strength for a long period and is probably the most enduring article made by the hand of man. The Pozzuolana of the Romans, greatly inferior to the modern article, is in well-preserved evidence to-day in many works of antiquity; while, with these as object lessons, the European nations have been extensive workers in concrete for many years, some of their bridges and other structures being of a striking and monumental character. Long prior to the resort to embedded metal for combined additional strength and decrease of weight, concrete was favored in the Motherland (as witness the factories of Manchester), for building purposes, and to-day no other country is so lavish of general concrete construction, professional men having set the seal of their approval thereon, confident in the tests of time.

Expanded Metal methods involve the combination of concrete and steel, the former enveloping the latter; and the second point, at the outset, upon which assurance becomes requisite is the resultant fate of the steel.

It is widely known that concrete's adhesion to steel outruns the tensile strength of concrete and, therefore, a steel bar which has once been embedded in the other will retain a thin coating of cement, though the concrete be broken away. This explains why engineers, though seeking long, have found nothing better for preventing steel corrosion than Portland cement. Best practice dictates that the I-beam grillage foundations of "skyscrapers" be embedded in concrete; the inner surface of the bottoms of steel men-of-war are proofed against rust by a coating of Portland cement mortar. In 1898, the Expanded Metal in some five or six cinder concrete floors, laid five years before, in different United States cities were examined and found perfectly preserved in every instance. Other confirmatory cases, covering a wider span of time are quoted in "Stahl und Eisen," Oct. 1st, 1892, and elsewhere while the same lesson, surely conclusive, is taught by iron cramps laid in cement joints which held together the lintels in the Parthenon, as well as by the anchors embedded in the concrete of the Coliseum walls, untarnished when brought to view. The *sine qua non* is the complete encasement of the iron or steel in the concrete.

EXPANDED METAL FLOORING.

THE THEORY OF OUR SYSTEM.

The modern theory of beams assumes that a loaded beam or plate, supported at the ends, has a horizontal plane, usually near the centre, where the particles are in neither tension nor compression. All particles above are in compression, below in tension, the intensity of the stresses varying with the distance from the neutral plane. Concrete, though excellent in compression, possesses little tensile strength, while steel is exactly the reverse. The combination of the two materials, in the method deduced from the beam theory, presents an ideal form of construction, as remarkable in results as in application wide. It is merely necessary to supply sufficient steel at all points of the structure liable to tension, as demonstrated by European experience for the past 25 years. The most economical position is as near as possible to the lower surface of the concrete floor plate whilst remaining totally embedded, and where its moment of resistance is at a maximum.

The Expanded Metal Floor Construction is a logical outcome, as will be seen, of the modern steel frame method of building. It were better to emphasize the little appreciated facts that the coefficient of lineal expansion, under heat action, of steel is almost identically the same as for concrete; while the adhesion of concrete to steel is greater than the tensile strength of the concrete. The two substances, therefore, expand together under heat, and contract together with cold such being true not only of concrete and the embedded Expanded Metal, but of the concrete floors and steel beams, etc., producing no ill effects in either case.

There need be no guesswork about our construction, because thorough and elaborate tests, the proofs and particulars of which are at the disposal of every Canadian architect, have been gone through at great expense, with the result that our engineers can assert with the confidence of the bridge or structural designer that any given grade of Expanded Metal, embedded in the manner heretofore stated, and acting as the tensile member in a concrete plate of given thickness and composition, will produce *certain and definite results*.

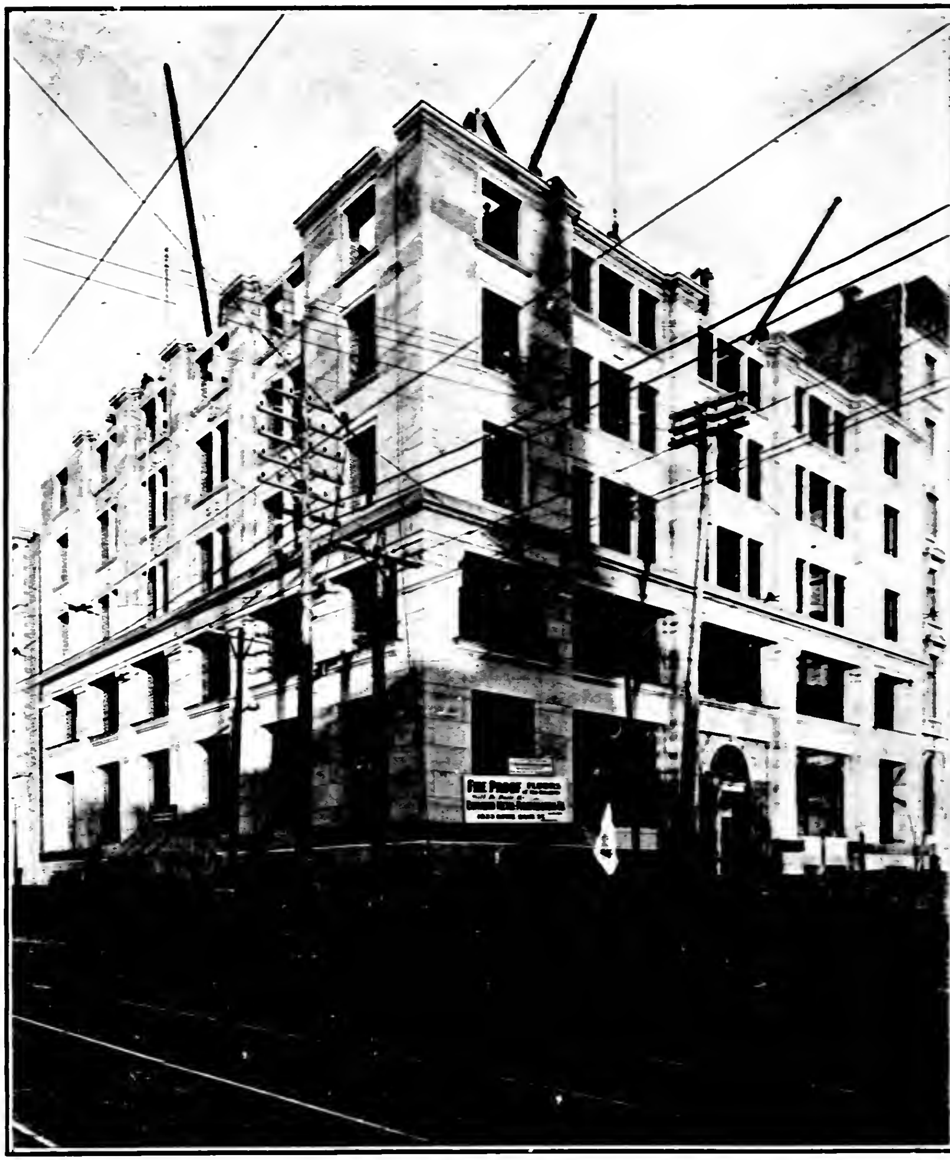
To state the case succinctly, the distinctive feature of our floor construction is great saving in dead load attained, combined with maximum fire-resisting qualities, as will be seen hereafter. Further, the Expanded Metal system stands alone as being designed and constructed to suit each particular case of load and span. Between a roof at Rockford, Ill., with 50 feet span to take near-at-hand examples and the floors of the New York Sugar Refinery, Long Island City, (in which two thicknesses of Expanded Metal were used, and which were tested with a load of 40,000 lbs. on a single square foot without crack or serious deflection) there would seem to be sufficient range to cover any probable conditions.

No other system can be constructed at an hour's notice, on the upper or lower flanges of I-beams as preferred, of different depths, set at varying levels, and with different spacing.

CONCRETE IN EXPANDED METAL FLOORS.

For many purposes, such as foundations, etc., broken stone forms the "aggregate" of Portland cement concrete, but in our flooring clean furnace cinders are more desirable, being lighter and less liable to inimical action from fire, yet producing great strength. For fire-resisting quality, the substitution of cinders a material already gone through the process of firing for stone upon which heat has most destructive action is a very important factor. The usual proportion is one part Portland cement, two parts sand, and five parts cinders, giving a weight when well rammed of about 80 pounds per cubic foot. The thickness of the floor plate varies with the area between beams and load to be carried, but 3 inches is entirely ample for all ordinary floors. All concrete in our systems is laid on temporary centering or false floors, and can, therefore, be *thoroughly tamped by iron rammers*, giving uniformity throughout and the hardness of a piece of stone. All the authorities on concrete agree that *this tamping is absolutely necessary*, and it can only be done when centering is used. The concrete once hardened, upon the removal of the centering, the ceiling below comes to view ready for the plasterer.

The skeleton steel frame, with its thin curtain walls, had birth in the effort to reduce the weight, width and, consequently cost of exterior walls. Along with it and to gain rentable space as well came the veneer wall with its thin facing of stone, terra cotta or brick. The immense superiority, on many scores, of the steel frame construction over the old-fashioned one of wood goes for naught, considering the risk from fire, if the web-work, however adequate to stresses imposed, be not as perfectly protected as possible. The failure of a single member may cause the wreck of the entire building, therefore the frame must be covered with a layer of incombustible and non-conducting material of sufficient thickness to prevent the transmission of enough heat to cause the failure of the steel. The critical moment arrives when water is applied to check the fire, and many materials that resist fire fairly well fail entirely under cold water action.



THE McINTYRE BUILDING, MONTREAL.

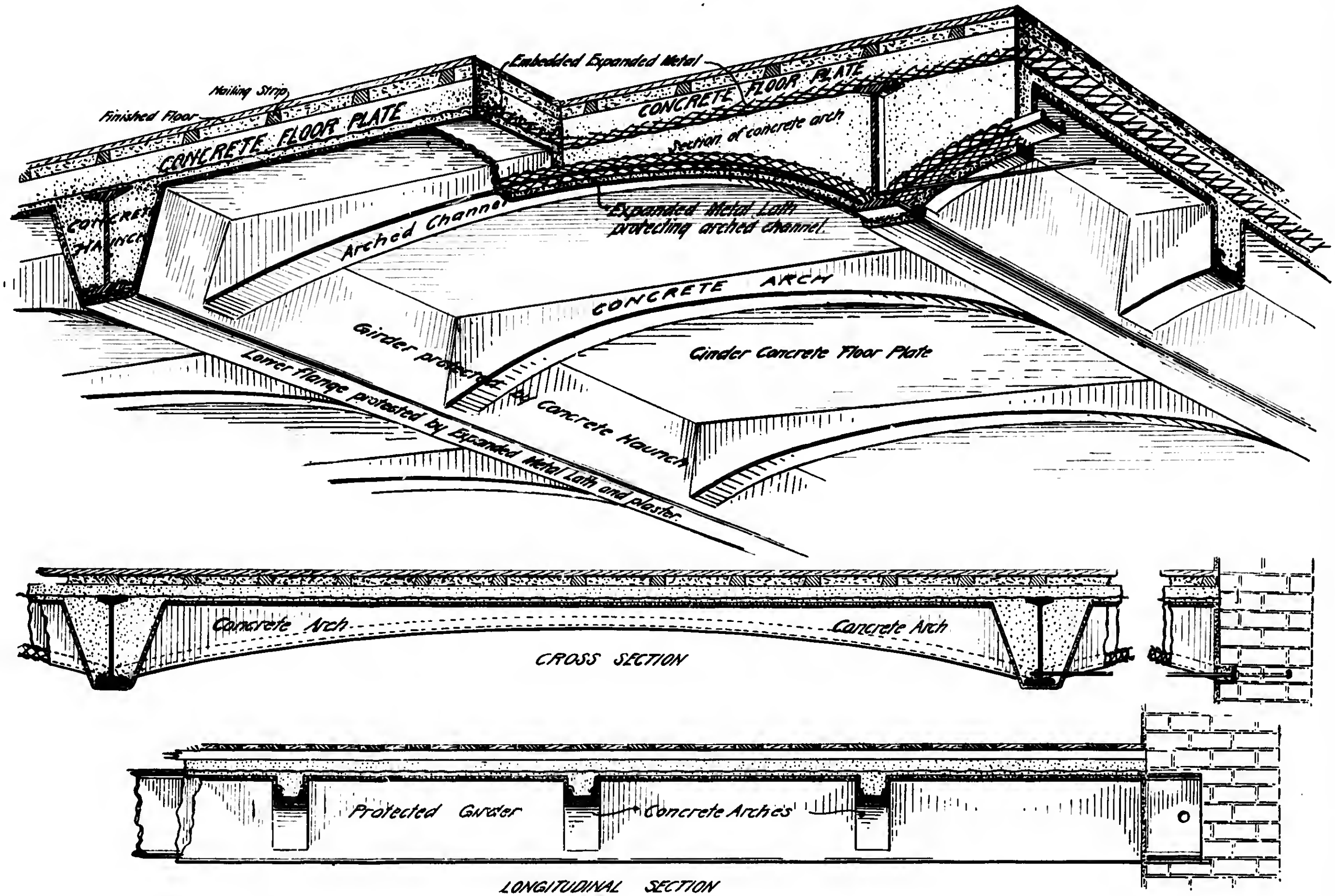
Architects: Messrs. Hutchison & Wood, Montreal. The Expanded Metal Fireproofing System throughout.

No. 1 SYSTEM.

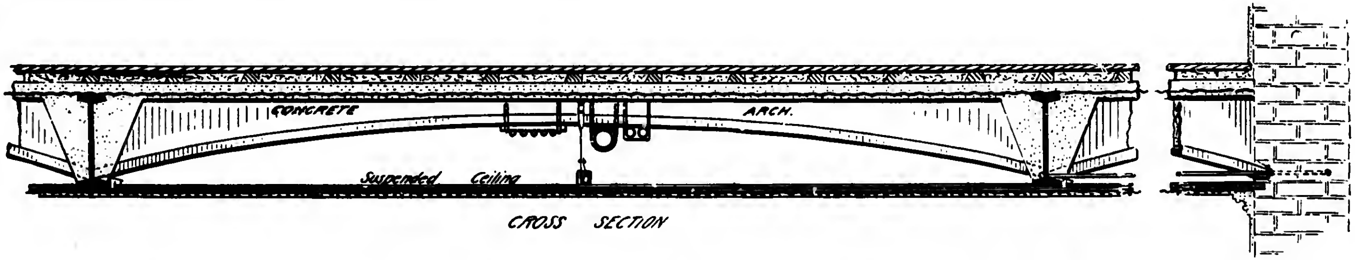
Designed for use in all classes of buildings. It may be employed in a wide variety of iron framing by virtue of introduction of arch channels. This system has been successfully adopted on spans 10 ft. to 22 ft., with the arch channels at such centres as the superimposed load demands. The arches indicated are formed by placing in position steel channels, curved with the flanges uppermost, 5 in. to 8 in., weighing six to eleven pounds per foot, according to requirements. Upon these the concrete —forming a composite beam of great strength—is built up to floor level, flush with the floor plates of Expanded Metal and concrete, which they support, and which are built on centering between and left ready for the carpenter. The floors can be made to sustain any desired load by simply increasing or diminishing the number, or weight, of the steel and concrete arches, and their rise.

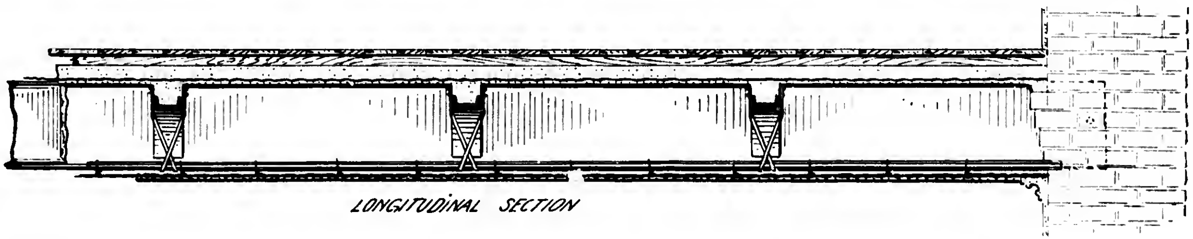
No. 1 SYSTEM.

The cross-section shows the girders with the curved channels in dotted lines, and together with the longitudinal section fully describes the system. The arched channels forming the soffits of the concrete arches, where there are to be open ceilings, are wrapped with Expanded Metal lath, ready for plaster like the lower flange of the girders so that no steel work remains exposed. Cinder concrete haunches bear on the lower flanges of the girders, protect them and add to their strength much beyond the additional imposed load. The system affords the greatest head room of any known type of floor


Embedded Expanded Metal
Nailing Strip
Finished Floor
CONCRETE FLOOR PLATE
CONCRETE FLOOR PLATE
Section of concrete arch
Arched Channel
Expanded Metal Lath protecting arched channel
CONCRETE ARCH
Girder protected
Cinder Concrete Floor Plate
Lower flange protected by Expanded Metal Lath and plaster
Concrete Haunch
Concrete Arch
Concrete Arch
CROSS SECTION
Protected Girder
Concrete Arches
LONGITUDINAL SECTION

No. 1 SYSTEM.



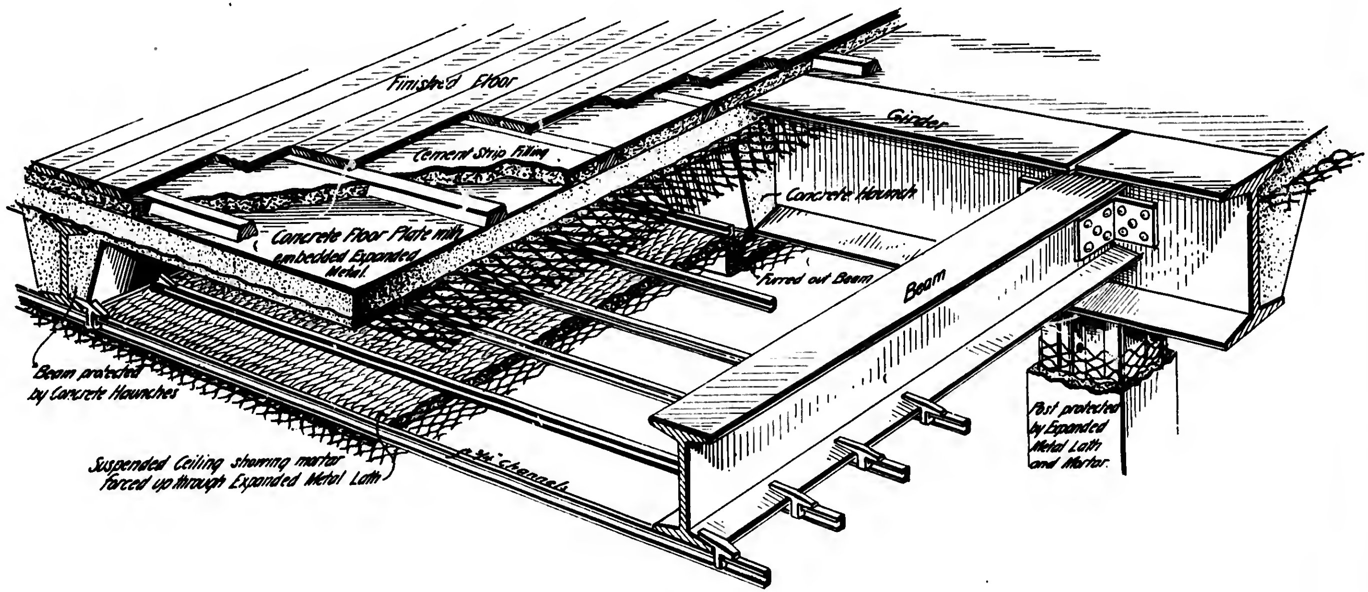


No. 2 SYSTEM.

Shewn in sections. Same as No. 1, except that it has 'evel suspended ceilings, affording generous space for wires, pipes, :onduits, etc. Absolute sound-proof qualities render this

No. 2 SYSTEM.

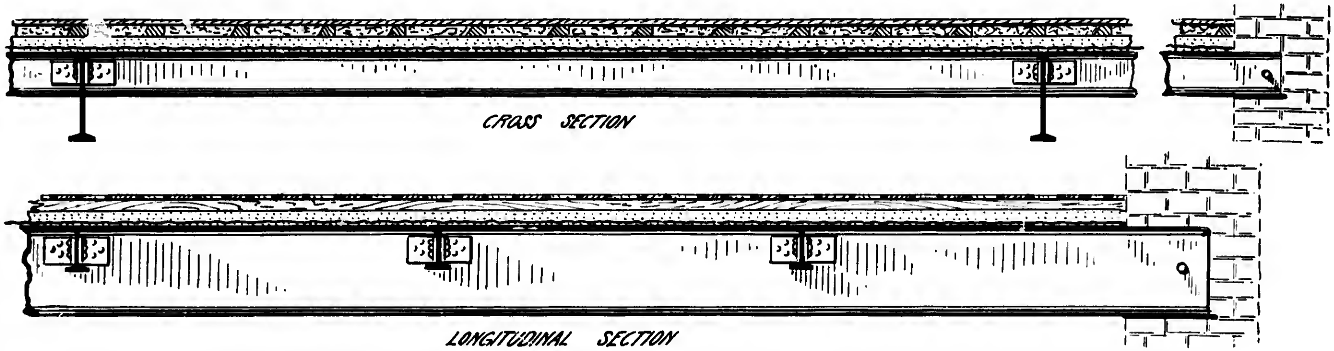
system desirable in certain cases. The ceilings are made of small inch channel irons hung from the bottom of the girders and to which is wired Expanded Metal lath ready for the plasterer. (See under "Expanded Metal Lath.")



No. 3 SYSTEM.

No. 3 SYSTEM.

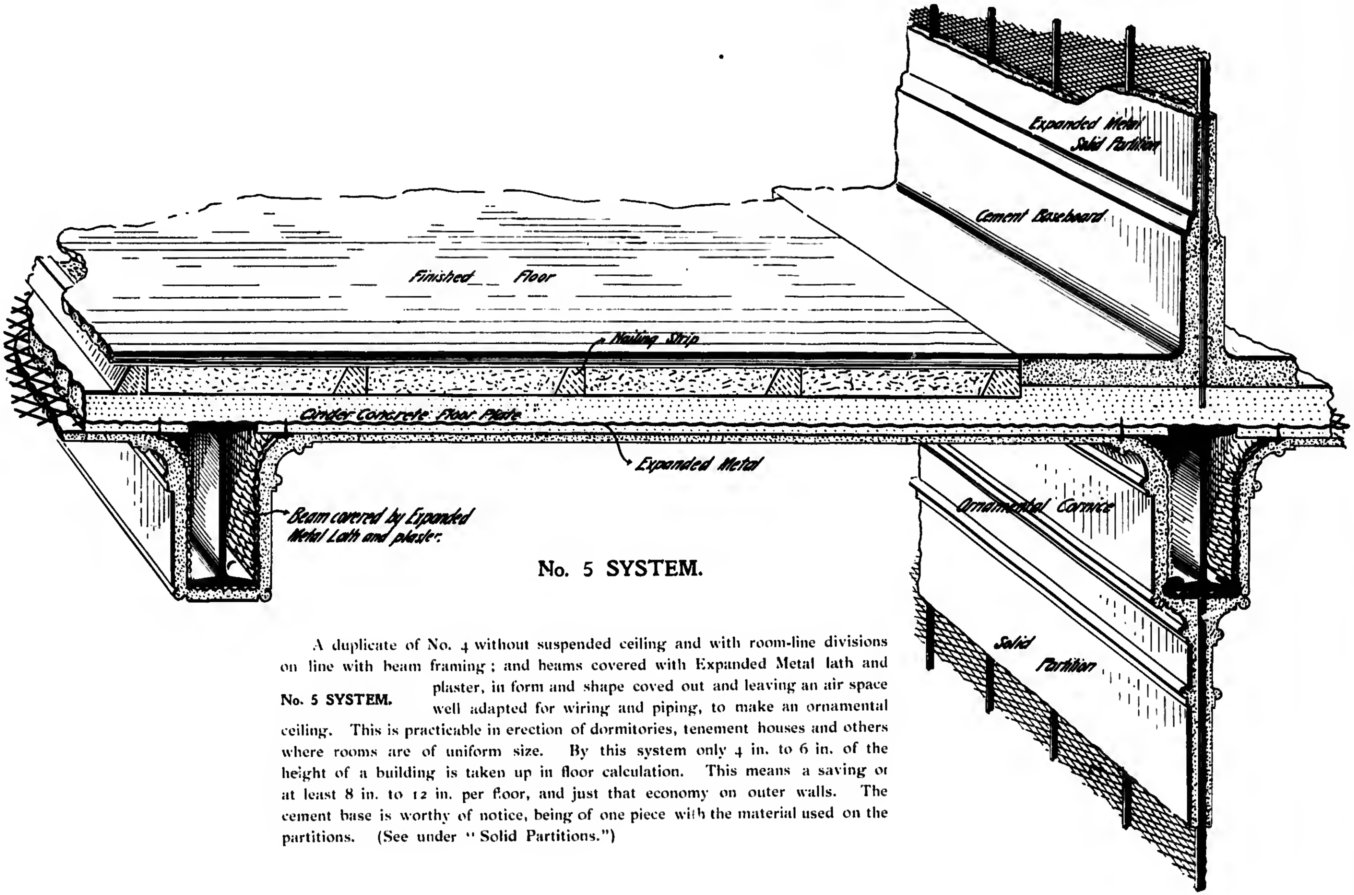
This may be described as the flat system, having the floor plate carried from beam to beam. As shewn on sketch, it affords a level ceiling and can be safely employed in spans of 8 ft. for office buildings, schools, hospitals, hotels or private houses. A excellent feature is the thorough fireproof protection afforded the iron beams. The method of suspending the small channels to the girders, preparatory to wiring the Expanded Metal lath, is well indicated.



No. 4 SYSTEM.

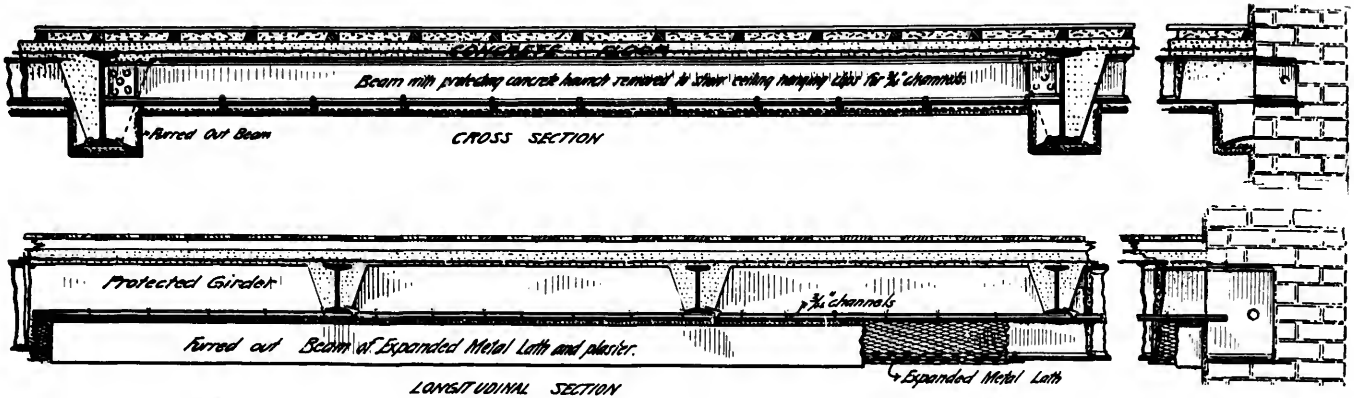
No. 4. SYSTEM.

Same as No. 3, lacking only the concrete haunches on beam lines and the level ceilings. In buildings, not occupied with large quantities of combustible material to endanger the iron framing, this system commends itsell for perfect safety and low cost. It has been used without suspended ceilings under conditions where ornamental effects are not desired, the iron work being neatly painted.



No. 5 SYSTEM.

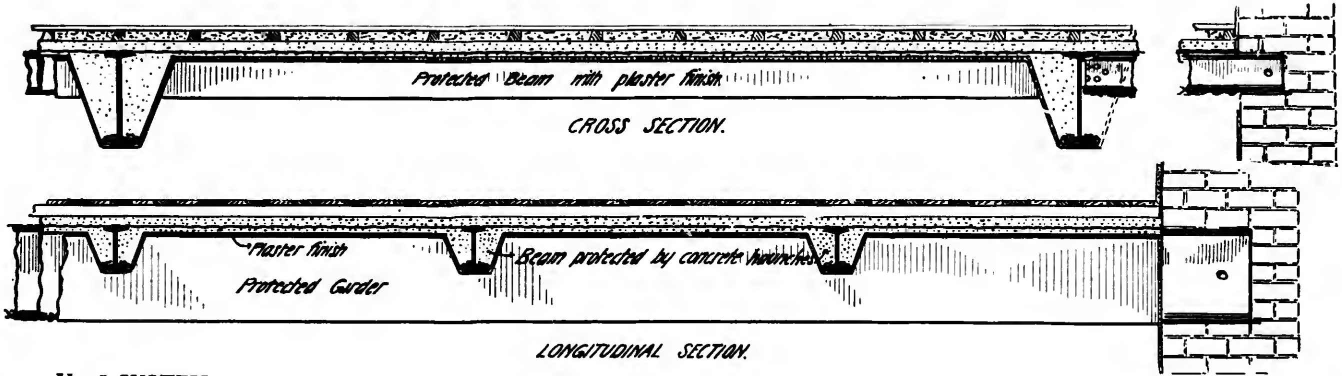
No. 5 SYSTEM. A duplicate of No. 4 without suspended ceiling and with room-line divisions on line with beam framing; and beams covered with Expanded Metal lath and plaster, in form and shape coved out and leaving an air space well adapted for wiring and piping, to make an ornamental ceiling. This is practicable in erection of dormitories, tenement houses and others where rooms are of uniform size. By this system only 4 in. to 6 in. of the height of a building is taken up in floor calculation. This means a saving of at least 8 in. to 12 in. per floor, and just that economy on outer walls. The cement base is worthy of notice, being of one piece with the material used on the partitions. (See under "Solid Partitions.")



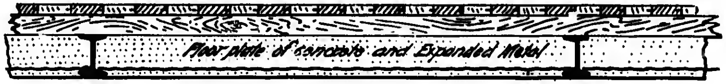
No. 6 SYSTEM.

No. 6 SYSTEM. Same as No. 3, except that the concrete and Expanded Metal floor plates go over the beams, forming a heavy monolith floor. The beams below are furred out with Expanded Metal lath to any form or shape desired. The sections indicate the level ceiling on the under side of beams.

No. 7 SYSTEM. The sections show this system to be virtually the same as No. 6, but with open ceiling.



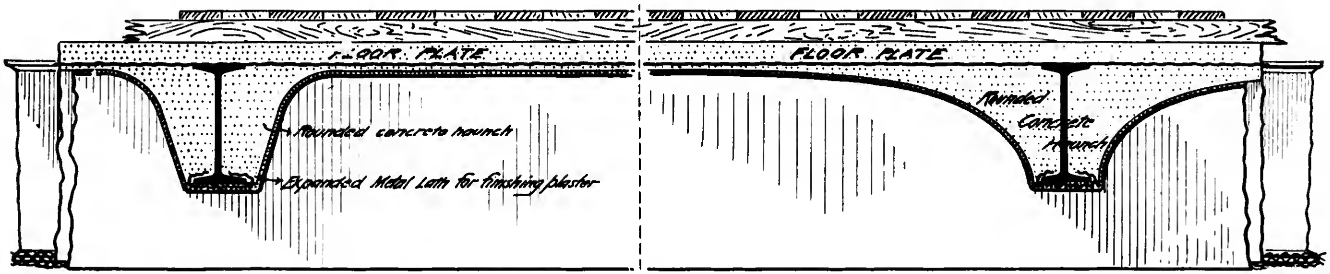
No. 7 SYSTEM.



No. 8 SYSTEM.

No. 8 SYSTEM. This system is applicable where light beams of from 4 in. to 5 in. are used. The depth of the beam is filled with Expanded Metal and concrete. Suitable to light construction as in house work, mezzanine floors, stair landings, projecting balconies, etc.

Nos. 9 and 10 SYSTEMS. Practically same as No. 6. Designed for open ceiling and very wide spacings. The concrete haunch is curved out onto the floor plate, increasing its strength the full width of the span, and relieving the sharp angles in the ceiling. Gives a very desirable effect in ceilings for better-class warehouses, store buildings, etc.



Nos. 9 AND 10 SYSTEMS.

All the systems illustrated herein may be modified to suit special requirements, and we particularly invite correspondence regarding difficult or unusual problems in construction.

SUPERIORITY OF EXPANDED METAL FLOOR SYSTEMS.

The chief points for consideration as regards floors are fire-resisting quality, strength, lightness, rapidity of construction, durability, and low cost.

FIRE-RESISTING QUALITY. Cinder concrete, tied together with a network of Expanded Metal, has proven itself the best material known under combined, or successive, fire and water action. This was conclusively shown by the tests of the Birmingham (Eng.) Corporation in 1898, under Building Surveyor Price and Supt. Teviotdale of the Fire Brigade. Burning fuel was piled under a heavily laden floor until a temperature of 3,000 deg. Fhr. resulted, and in spite of the water applied it remained intact. The Hamburg (Germany) Commission which superintended the most elaborate investigations ever made into the fire-resisting properties of concrete mixtures, affirmed the pointed truth that *cinder concrete* does not lose its coherence by exposure to fire, as may be the case with neat cement or with cement mortar in the joints of tile or brick work. Their tests (See Report, 1895, also abstracted in Johnson's "Materials of Construction") were upon actual concrete and consisted in exposing it to a fire of 2,000° Fhr. for several hours and cooling suddenly in water. Under like conditions "some bricks cracked" and the mortar became "very tender and lost its binding power." Many subsequent experiments in various places attest the fact that the action of fire and water on the coherence or tensile strength of cinder concrete is less than on any other material used in the erection of buildings. As referred to in "Engineering News" of April 22nd and July 1st, 1897, the Building Department of New York City conducted a series of tests under Mr. Gus C. Henning, whose dictum is as follows "The sum "and substance of results of all these official tests is this: concrete floors resist all "temperatures obtainable in ordinary conflagrations and are not materially "weakened by such fires; tile floors, of whatever construction or make, fail and "are destroyed by temperatures slightly above those at which the clay, of which "the tile is made, was baked or burned (or 2,000° Fhr. and above)." Additional evidence of the great resisting qualities of cinder concrete floor construction is to be found in the "Insurance World" Supplement of July 1st, 1897, containing the report of the Committee of Insurance Adjusters upon the disastrous fire at Pittsburgh, May 3rd, 1897, involving a property loss of nearly two million dollars. The board of Engineers engaged by the Committee consisted of Gustave Kaufman, C.E., Consulting Engineer, Chairman; Emil Swensson, C.E., Genl. Supt. Keystone Bridge Works, Carnegie Steel Co., Ltd.; and F. L. Garlinghouse, C.E., Chief Structural Engineer, Jones & Laughlins, Ltd.

From their report:

"The most important lesson taught by this fire was the lack of strength "developed by the fire-clay fire-proofing. The building was permitted to move in "any direction without any material restriction by the fire-proofing. The floor "arches showed, by the scaling off of the lower webs, that they were unable to "offer any sufficient force to counteract the tendency to lateral motion. The "column protection, although composed of the very best obtainable kind of fire-"clay tile, was also not of sufficient strength."

"In view of these important developments, it is our opinion that important "structures of this class should have a radically different method of fire-proofing. "The fire-proofing should be in itself strong and able to resist severe shocks, and "should, if possible be able to prevent the expansion of the steel work. There "seems to be but one material that is now known that could be utilized to accom-"plish these results, and that is first-class concrete."

In this connection it may be stated that, in England, tile construction has been abandoned for all important Government buildings.

FIRE TEST IN LONDON, ENG.

The tests of the British Fire Prevention Committee—whose summary of report is here quoted in full, and which is avowedly independent and exact—are arranged on scientific lines to secure information of the broadest kind, not to meet any special circumstance. The Committee counts a membership of some 500 architects, surveyors, engineers and others interested in fire prevention, who give their services gratuitously. The sub-committee of the Executive which conducted the test consisted of Mr. Charles E. Goad, C.E., Member of Canadian Society of Civil Engineers; Mr. Max Clarke, A.R.I.B.A.; and Mr. Ellis Marsland, District Surveyor, Camberwell. Among others present were H. Muthesius (Technical Attaché to the German Embassy) and Capt. B. Baden-Powell (Scots Guards); and on behalf of the Executive, Sir Arthur W. Blomfield, M.A., A.R.A., F.S.A.; Mr. Edwin O. Sachs, Architect (Chairman); and Mr. Frederic R. Farrow, F.R.I.B.A.

"*Test of Expanded Metal Floor, Feb. 15th, 1899; floor 3½ in. thick, with suspended ceiling ½ in. thick:*"

"Object of Test"

"To record the effect of a smouldering fire of 15 min. duration, of a "temperature not exceeding 600° Fhr., followed by a fierce fire of one "hour, gradually increasing to a temperature of 2,000° Fhr., followed suddenly by the application of 3 min. of a stream of water and the conse-"quent rapid cooling. Note: The area of the floor under investigation "was to be 100 ft. superficial in the clear (10 ft. x 10 ft.) The floor was "to be loaded with 140 lbs. per square ft. The time allowed for the con-"struction and drying of floor was to be three months (winter)."

"Summary of Effect"

"*The plaster ceiling below the floor remained intact* until the applica-"tion of water.

"There was a slight deflection of floor and ceiling.

"The concrete of floor was slightly and superficially cracked.

"*The fire did not pass through the floor.*"

Disregarding the lack of moral right in any individual to construct and maintain a "fire trap," whether so wholly or in part, it should be realized that as a general thing the saving in insurance premiums upon a building and its contents will pay a handsome rate of interest on the extra cost of fireproofing. This extra cost over the ordinary combustible construction varies, according to the design and location of the building, from 10 to 50 per cent. To give precise comparative figures is impossible without examination of the plans, but the broad statement holds true that the advantages will fully compensate for the added cost.

In days gone, timber was abundant and cheap; buildings were quickly and inexpensively erected; hence the custom of using wood joists and studs as the framework, and the highly inflammable wood lath as a plastering base. The daily reports of factory losses, to instance only one class of building, surely point a moral. The percentage of fire resisting buildings, however, is increasing with commendable rapidity. With a proper fireproofing system, a fire might occur in any one room in a building and destroy everything in that room without extending beyond it.

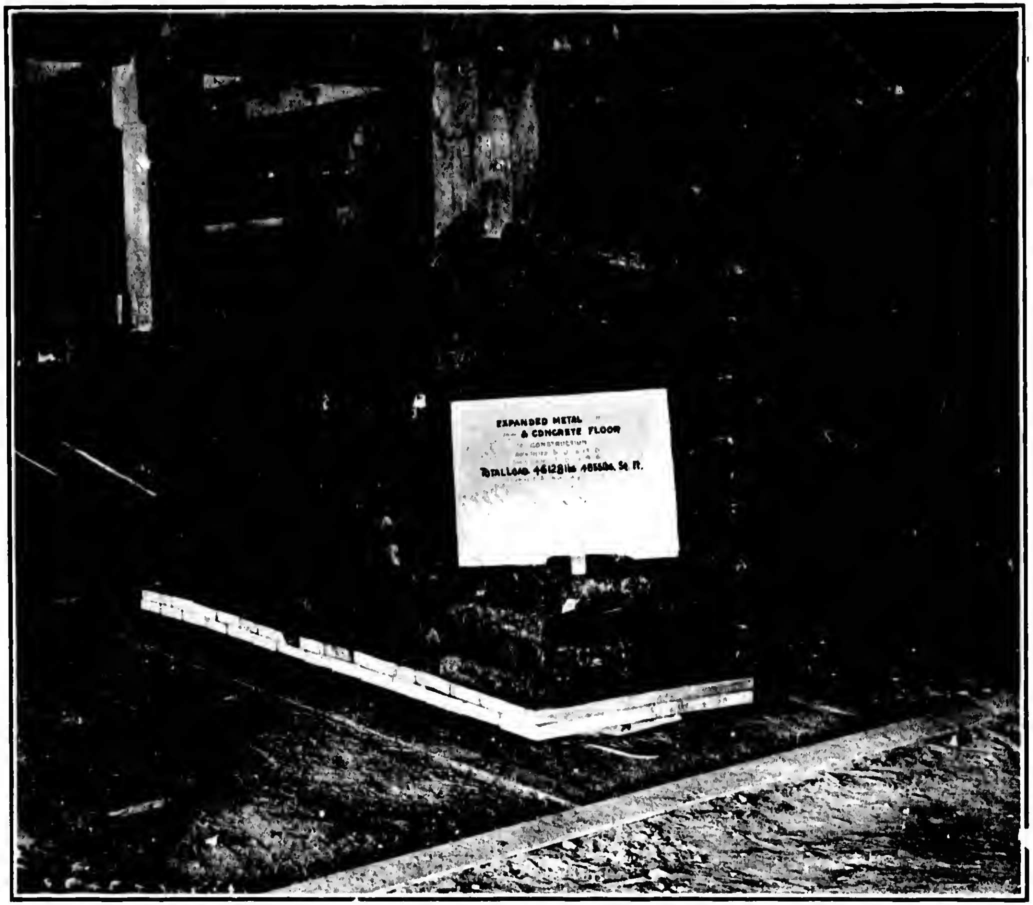
STRENGTH.

As already elucidated, Expanded Metal and concrete flooring can be constructed to carry any required load in addition actually strengthening the steel framework it being only necessary to use the proper amount of the materials named. No very elaborate means of joining Expanded Metal sheets is necessary, for the very form of the steel mesh causes it to be held, when embedded in concrete, so firmly that the steel will fracture before pulling out. In other words, any given number of Expanded Metal sheets become a single one, simply by overlapping the material by one row of meshes. Any reasonable number of holes for pipes, etc., may be cut neatly, quickly and cheaply and without detracting from the floor strength; or wooden plugs of proper section may be placed upon the bare centering and afterwards knocked out from the concrete.

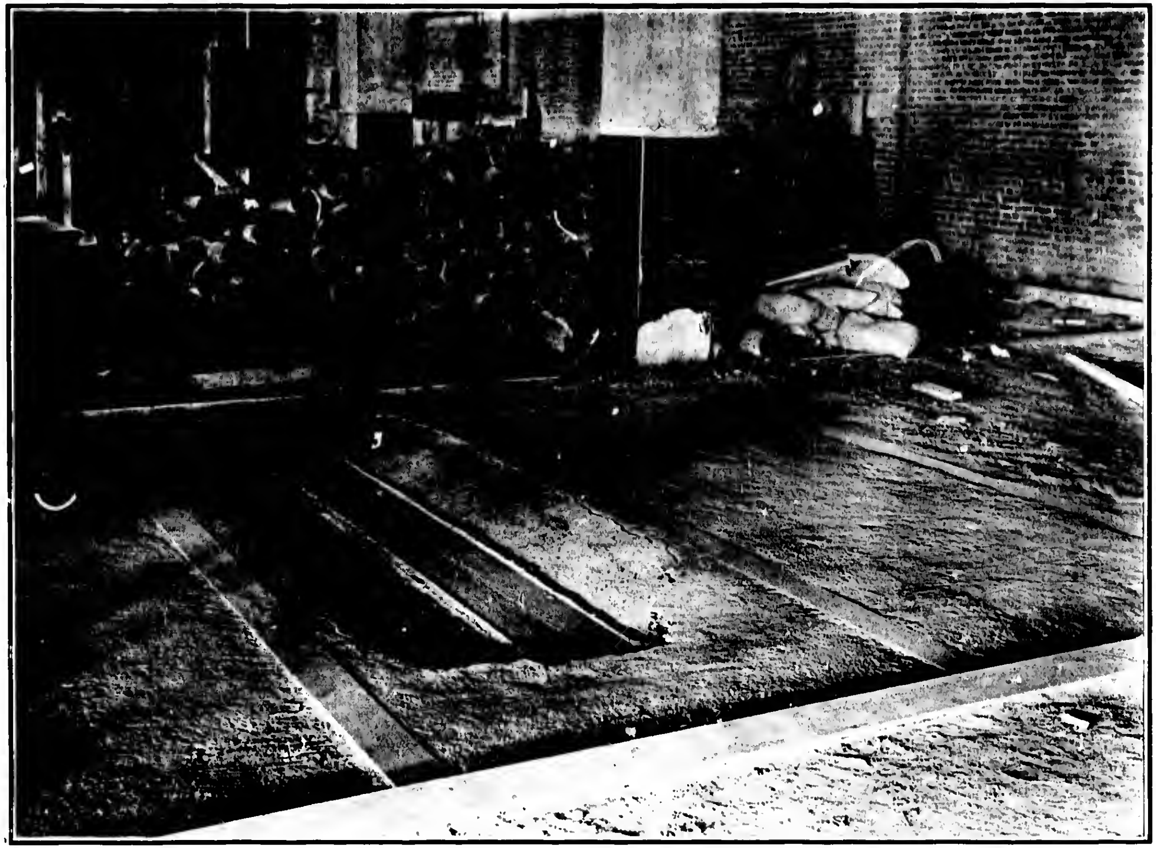
SANITATION.

All vents may be hermetically sealed with cement around the pipes with ease, and any final doubt concerning the sanitary advantages of our floors a solid monolith from outer to outer wall disappears. Germ distribution or ravages of vermin are an impossibility. In many classes of building a finishing wooden floor is unnecessary, a top layer of cement and sand, one-half inch to one inch thick, or an asphalt finish, better suiting all purposes. Our illustrations show how wood floors are best laid, nailing strips being partially embedded in the concrete before hard set If desired, the flooring may be nailed directly upon the concrete, a coat of tar or asphaltum being applied hot to the top of the concrete.

WEIGHT TEST OF EXPANDED METAL FLOOR.—
Distributed load, 2,422 pounds per square foot. Resting upon a platform 12 x 4 feet.
The Floor in question was according to our No. 3 System.



WEIGHT TEST OF EXPANDED METAL FLOOR. - Concentrated load as subsequently placed on same Floor Plate, resting upon a 12-inch oak plank 9½ feet long. Concentrated load of 4,855 pounds resulted in a break.



WEIGHT TEST OF EXPANDED METAL FLOOR.—Appearance of Floor Plate after the break.

WEIGHT TEST OF EXPANDED METAL FLOOR.—Appearance of Floor Plate after break, from below. A still further test was the dropping of a ram, 1½ x 1½ x 3 feet, from a height of 11 feet; no further injury to Floor Plate was apparent, although the blow was equivalent to 1,800 pounds.

Our systems invoke economy in the weight of beams, girders, columns and foundations—the last being a considerable item in high buildings. For example, even in a five story structure, covering an area 50 x 150 ft., a saving of 22 lbs. per sq. ft. in floor weight represents a provision for 412½ tons less of dead weight in foundations and structural steel, meaning a corresponding saving in the cost of carrying the load. In order to attain the best results the steel work should be laid out to suit Expanded Metal construction, and architects and engineers are urged to avail themselves of our engineers' services. We are always ready to design structural steel work in connection with Expanded Metal construction, and to submit prices in competition.

LIGHTNESS.

Cement, sand and cinders are available anywhere in bulk and, as a large stock of Expanded Metal is always kept on hand, to be delivered at the building in sheets of convenient size ready for use, it is easy of comprehension why, in many instances demanding speed of erection, the determining factor in favor of the Expanded Metal System has been its facility of construction. Rotary concrete mixers, improved steam hoists, and other time-saving devices are minor but useful aids along this line.

RAPIDITY OF CONSTRUCTION.

To durability much space has already been devoted, and attention is directed to pages 5 and 6 for conclusive arguments as to the permanence of our system.

DURABILITY.

The prudent owner balances carefully the contract price of a given material against the extent to which its use will affect the cost of the complete structure. Expanded Metal and concrete floors stand for a combined saving in weight and space. Being only from one-third to one-half as heavy as any other form of fireproofing, and permitting greater spans, the cost of structural steel is reduced from 15 to 20 per cent. The absence of side thrust on the beams obviates the use of tie-rods; the Expanded Metal in the floor furnishes the lateral support, and precludes failure of the beams by buckling. It is often economical to use beams of different depths in the same floor; with our system it is immaterial whether the beams are set flush at top or bottom, or with centres level.

LOW COST.

From a purely technical point of view, it is quite as poor engineering practice to design a structure with an unreasonable excess of material, thereby causing useless expense to the client, as it is to employ insufficient factors of safety or poor materials, although destruction of life or property may not follow in the first case as in the second.

If, from finished ceiling to finished floor in a seven-story building the distance be 16 in., we must add 6 x 16 in., or 8 ft., to the walls between the first floor and the roof. With open ceiling Expanded Metal Systems, and proper spacing of beams, 4 ft. of this could be saved.

To reduce the height of a building 7½ ft., without robbing the clear height of the ceilings—such as was done in one hotel that was originally designed with a view to clay tile floors—is to show great economy. The owner was relieved from the expense of the brick, stone and iron work, the plastering in shafts, all water, gas and soil pipes, stairways and everything else involved in a lateral section through the building of the height stated; together with the necessary annual repairs needed by the released materials. In addition he avoided, for the life of the structure, the power and time necessary to hoist and lower the elevators in the distance gained; he lessened the foundation and wall estimates to the extent of the load removed; and the architect eventually discovered by actual tests that the thinner concrete floors were very much stronger than if built as originally contemplated.

Finally, the merit of our flooring as *a foundation for carefully laid and expensive granolithic or mosaic* finishes should be underlined. No shrinkage, expansion, or settlement can ensue, and, consequently, no breaks are possible over the beams, such as often cause costly annoyance, where floors are laid which involve arches formed of several or many pieces. Arches of this description, both segmental and flat, will open up, carefully built or not. Among the hundreds of Expanded Metal floors with ornamental tile or mosaic finish *we do not know of a single one that exhibits a crack to-day.*

To enter, now, into more detailed description of ceilings, partitions, cornices, etc.—heretofore only alluded to as comprised in our broad system—it should be stated that Expanded Metal was used by architects as the best possible material for carrying plaster long before the floor systems were developed. Invariably, a suspended Expanded Metal lath ceiling was specified by many leading architects for use below the hollow tile arches, and this in order to avoid the staining through the plaster which invariably occurs, sooner or later, with tile or wood. The most costly and elaborate decoration can be employed on our suspended ceilings, or the plastering can be done directly on the concrete, without risk of stain or crack.

EXPANDED METAL LATH.

In England, wood lath is adopted only for cheaper grade dwellings; in Canada, where it costs less, its use is all but universal in structures of whatever nature.

A PERFECT KEY. The fire underwriters know the rest of the tale. The first step towards improved building construction is taken by the substitution of a suitable metallic base for holding the mortar, the latter being one of the best non-combustible and non-conducting substances. That architect, builder, plasterer or owner— the wide world over— who, each in his several capacity, wants a bond or key to hold his *plastic material in positive and lasting position*, will never fail to [illegible] for Expanded Metal. Expanded Metal lath is of the open net-work order, of high quality steel, and becomes entirely embedded both in front and rear, as the shape of the meshes render it an impossibility for the mortar to act otherwise than pass freely through the openings and knit together, to form a complete shield on the other side. The defects of wire cloth and its substitutes are thus totally overcome, as enough plastic material is applied to form this desirable fire-resisting shield—no more; all woodwork is then so completely enveloped by the incombustible and FIRMLY KEYED plaster that the flames are effectually cut off and prevented from spreading until the ordinary methods of extinguishment can be applied. The second step to ideal construction lies in adoption of the Expanded Metal solid partition, in which the use of wood is entirely discarded. Additional benefits earned by the use of our lathing material will become apparent from subsequent remarks under "False Work, Cornices, etc.," and "Solid Partitions."

Our Suspended Ceilings go a long way as a fire resistant in wood frame construction, and are necessary under some of the floor systems (as drawings show)

SUSPENDED CEILINGS. where flat ceiling effects are demanded. The method of suspension is simple. Furring bars at suitable centres, of small channel or bar iron, are secured by malleable clips to the beams, and to these the Expanded Metal lath is laced with No. 18 copper wire, or fastened by patent clips. The ceilings—furring, lath and plaster, complete—have a weight of not over ten pounds per square foot. Their fire-resisting qualities are most thorough; they may be hung at any level, giving any required space for heating pipes, etc.

The extension of these ceilings to the sidewalls, with various artistic cove effects, has developed into the erection of false work in domes, arched halls,

FALSE WORK, CORNICES, Etc. alcoves, etc., etc., very generally in non-fireproof structures. This false work consists of Expanded Metal lath laced on a skeleton frame preferably of iron—which receives the plastic application and painted decoration, and all very economical of execution.

The diagonal direction of the strands of our lath, when used in large cornices and ornamental ceilings, braces the furring to a marked degree. This truss construction and the great strength of each sheet of material, without joint or seam; the ease with which it may be bent to any retained form; the extraordinary hold its flat strands maintain in the plastic coat; the entire freedom from expansion, contraction or warping; the complete envelopment of the metal in the mortar (which mainly is the fire-resisting material); the necessarily high grade of steel from which it is made—these are some of the reasons why architects elsewhere came to realize the full measure of the possibilities of Expanded Metal as a material to create new effects, and to utilize in forms commonly known but too expensive for general adoption. Among the hundreds of thousands of square yards in place to-day, in public and other buildings, in the States alone, *not a single complaint* has ever been made on the score of cracking or otherwise. The material has been largely used in many of the English theatres, musical halls, hotels, banks, libraries, mansions, etc., for such or like purposes. The domed plaster ceiling of the magnificent new Royal United Service Institution, Whitehall, is formed and moulded on Expanded Metal lath. The concussion due to discharge of artillery at Chatham, Gosport and Sandown, in the Old Country, and at Gibraltar, has proved unable to damage Expanded Metal ceilings one whit.

Its utility as a background to mosaic dadoes and ceilings, elaborate stucco work, etc., is unquestioned. Architects imitate the massiveness of heavy beams and panelled ceilings, they secure the ornamental features of groined arches, coves, fluted pilasters and other interior effects—having the appearance and durability of the most expensive construction—at a cost relatively merely nominal.

The proper covering of structural steel ready for plaster is usually a very simple matter (see cuts on pages 11 and 13) but frequently quite difficult problems

BEAM AND COLUMN COVERING. are presented, and methods vary with almost every instance. For each, the peculiar nature of Expanded Metal permits results in the way of special forms and shapes not so readily obtainable with any other material. Fig. 3 describes various means pursued in columns. In fireproof construction iron furring only is accepted, though wood furring is often used.

Why do men pay high prices for ground which is carefully computed as available space and then, at great expense, construct walls to enclose it, but after-

SOLID PARTITIONS. wards (seemingly in contradiction of the purpose thus far) deliberately build thick brick or wood partitions all through to destroy that space? The introduction in 1800 of the Expanded Metal solid partition was hailed by progressive architects as an event big with possibilities; time has more than borne out their most sanguine hopes.

Our lathing is fastened with No. 18 or 20 soft copper wire to upright steel channel studs, 3/4 or 5/8 inch x 3/8 inch, set at 12 to 16 inch centres and carefully placed on line. Upon it the plaster is applied (see Fig. 4 and cut on page 13). By virtue of the shape of the mesh *a greater bond or key* is furnished by Expanded Metal lath than by any other form known, of whatever make or material; and, although the completed partition is as little as 1 1/2 or 2 inches thick, it is rigid and strong—proof against fire, water, sound and vermin.

The ordinary wall of wood studding and lath (the latter left by the saw with shreddy edges that invite ignition as much as the kiln-dried studs) has had its day.

But, disregarding the superior fire-proof quality of the Expanded Metal plan, compare the result with 6-in. to 10-in. tile partitions, or with the old-fashioned wood

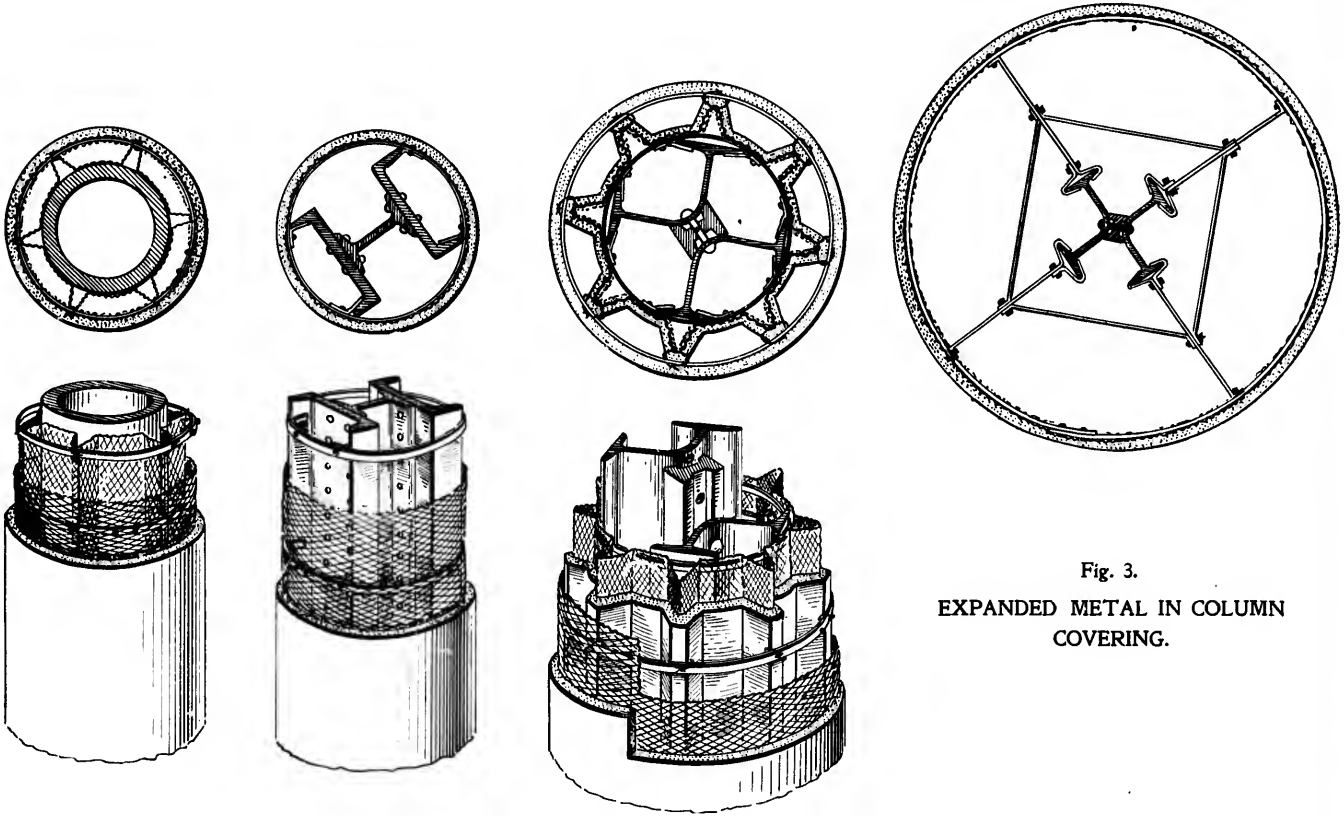


Fig. 3.

EXPANDED METAL IN COLUMN COVERING.

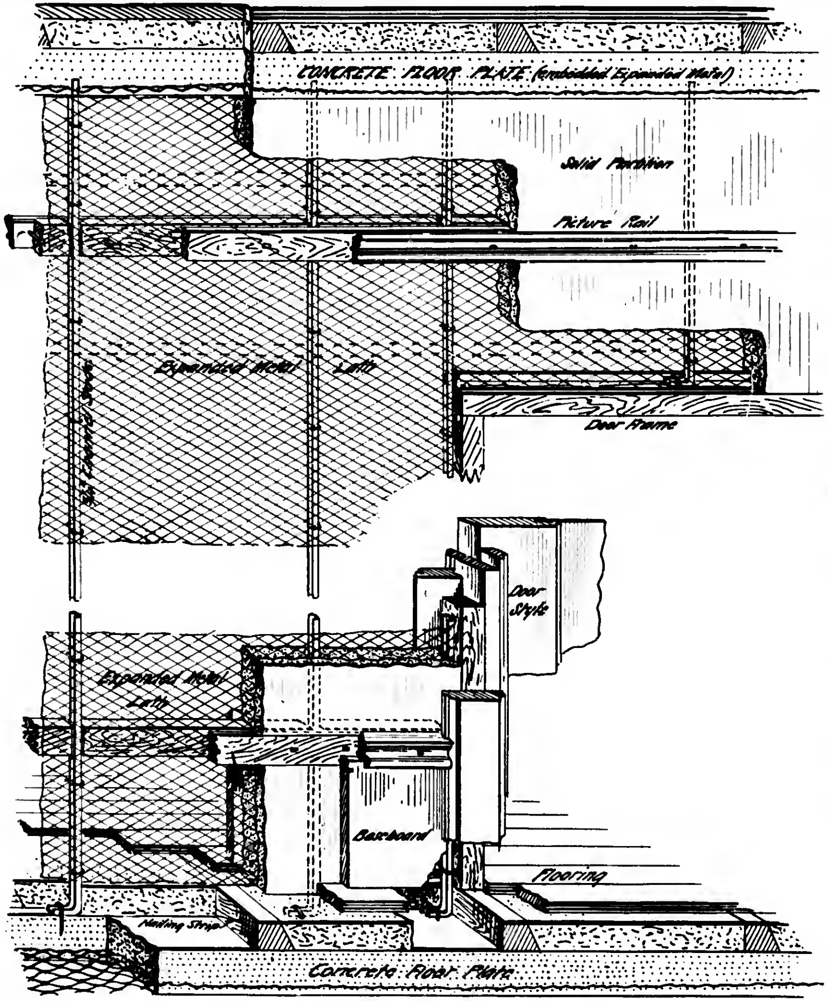


Fig. 4.—EXPANDED METAL SOLID PARTITIONS.
Showing Framing Methods, Etc.

affair of equal thickness. The monolithic character of our system, with its staunch and continuous network of steel, protected by plaster from corrosion absolutely, commends itself at once over any block or fragmentary construction. There is no possibility of shrinkage, or the falling off or *cracking* of plaster. The weight is less than 15 lbs. per sq. ft., complete. The 12 ft. high partitions, of 2 in. thickness, adopted in New College, Oxford, are in the published opinion of the architect, as sound-proof as a 9-in. brick wall. As to rigidity and stability, witness those in the London (Eng.) Hospital Medical College, which range between 16 and 19 ft. in height.

Ordinary gas pipes and electric wires can be run in solid partitions without difficulty. In kitchens, laundries, conservatories, bath rooms, closets, basements, etc., architects have found the substitution of a cement baseboard (see cut on page 13) neatly moulded into position by the plasterer when finishing up his work, a perfect cure for the dampness and vermin lodgment of the ordinary wood baseboard. The method is simple and all housekeepers comprehend the boon conferred by this space, which can be thoroughly scrubbed and washed, yet never is damp.

The sanitary benefits from our system in the construction of hospitals, asylums and others of like class, are apparent at a glance; absolute cleanliness of every nook and corner is ensured by the monolithic quality of our solid partitions.

For solid partition advantages as a base for expensive decorative plastic effects, see under "False Work" and elsewhere.

DOOR AND WINDOW FRAMING.

Figs. 4 and 5 indicate plainly different methods of framing in connection with Expanded Metal walls, and show no difficulties to arise from their thinness, even when, for instance, circumstances demand sliding windows in corridors. Other details, of course, may be devised to meet the judgment or taste of the architect.

HOLLOW PARTITIONS.

Where large pipes or air ducts are necessary, double or *hollow* partitions can be used, consisting of light steel studding with Expanded Metal lath on each side. The entire thickness through, by suitably arranging the channel studs, need not exceed 2 in. Such a partition possesses the advantage of greater warmth, and is applicable to the entrance vestibules of offices, stores or residences.

CEMENTINE CONSTRUCTION.

Half-timber construction was common in the Middle Ages, and even in the time of Elizabeth and the Stuarts. In Chester and York linger many examples of exterior oak and plaster, which have survived the ravages of wind and weather for 400 years. The new-fashioned half-timbered house will be popular, because cheaply built and of unlimited variety of detail.

Expanded Metal lath is susceptible to a wide range of architectural treatment for the exterior of buildings, from factories to residences. In old structures the lath is applied to steel or wood studding to form the base for fireproof cement or pebble dash work, inviting finish treatment of any imitative character desired and at a much reduced cost. Recently, the Pennsylvania Railroad Station at New Brunswick, New Jersey, an unsightly affair, half brick, half frame –was renovated by this method in tinted plaster. A uniform and attractive appearance was thus inexpensively imparted to a rambling series of buildings upon which a sentence of demolition had been seriously debated.

The Cementine system on wood frame structures consists in furring the diagonal sheeting outside the studs with ¼ in. round iron rods, 8 in. to 12 in. centres, over which Expanded Metal lath is stapled securely. Buildings accorded this monolithic treatment are *warm in winter and cool in summer*, are tight and dry, and need no painting. A *perfect key* is afforded the mortar, as elsewhere explained, and the shape of the meshes is such that all expansion or contraction is taken up in each mesh instead of at the end of the sheet. The Ordnance Offices at Chatham, the Children's Home Hospital at Barnet, the Dublin Gas Co. Works, and St. Andrew's Hall at Cardiff are some of the examples of cementine work in England. The exterior walls are of cement mortar alone, plastered upon Expanded Metal lath. That temperature or climate oppose no hindrance to this modern construction, and that emphasis may be given to its wide range of utility, we would instance the extensive soap works of the W. and H. Walker Co., Pittsburgh, or the Providence Gas Works—and the building of the Anglo-African Trading Co., Bulawayo, Rhodesia. The first named, by the way, included five buildings; in roofs, walls, floors and partitions there were needed 103,000 square feet of flooring material and 297,000 square feet of lathing. It may be said in truth that there is no existing method other than this whereby so much of substantial value can be presented for an outlay so small. Considering the resultant economy in decreased weight of foundations, the cost of cementine factory construction is about one-half that of brick. Space forbids anything further than a simple reference to the eminent suitability of fire-resisting cementine construction for summer hotels and residences, hospitals, theatres, hotels, school houses, insane asylums and other homes for helpless people; in addition to the palpable benefit, as regards sanitation and safety from fire, which would accrue from the adoption of Expanded Metal construction throughout.

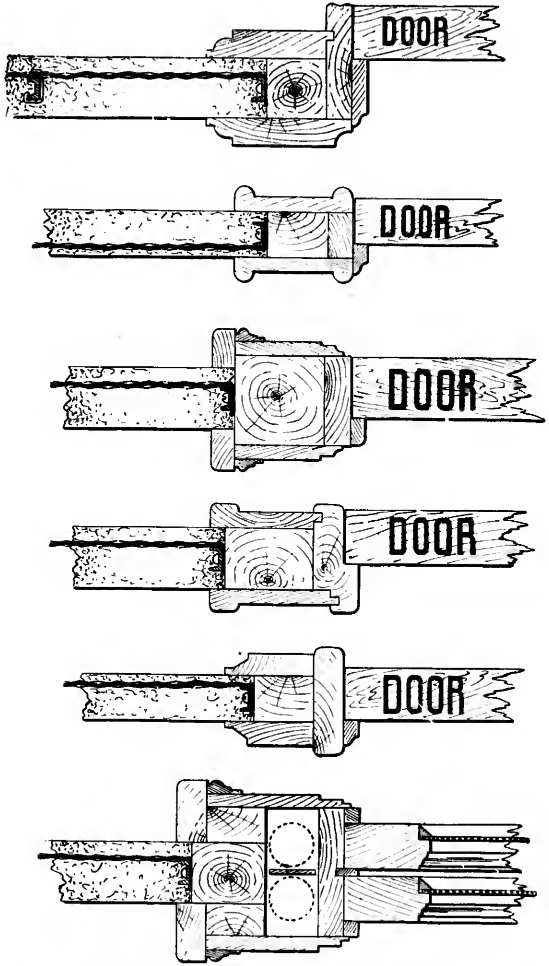


Fig. 5, Quarter Scale.—EXPANDED METAL SOLID PARTITIONS.
Showing Door Framing.

MODERN FACTORY CONSTRUCTION.

(See also under "Cementine Construction.")

This term implies the use of steel frame for floor, roof and walls, and Expanded Metal and concrete systems in connection therewith—a combination notable for simplicity, ease of erection (irrespective of difficulties due to site), incombustibility as to materials used, great strength and permanent result. In no other line of Expanded Metal operations has success been more signal, or popularity more readily won.

Economy and durability alone suffice to assert, and re-assert, its merit in factories for wet processes; in print works, bleacheries, dye works, paper mills and others; or for concerns in which buildings constructed of wood, etc., are subject to rapid deterioration. These buildings can be put up on brick, stone, or concrete piers, covered in and roofed with suitable outer covering, with floors of cinder concrete (guaranteed to carry any required load) and treated in granolithic or other finish. We claim that our estimates will show *a handsome reduction on the cost* of the usual construction.

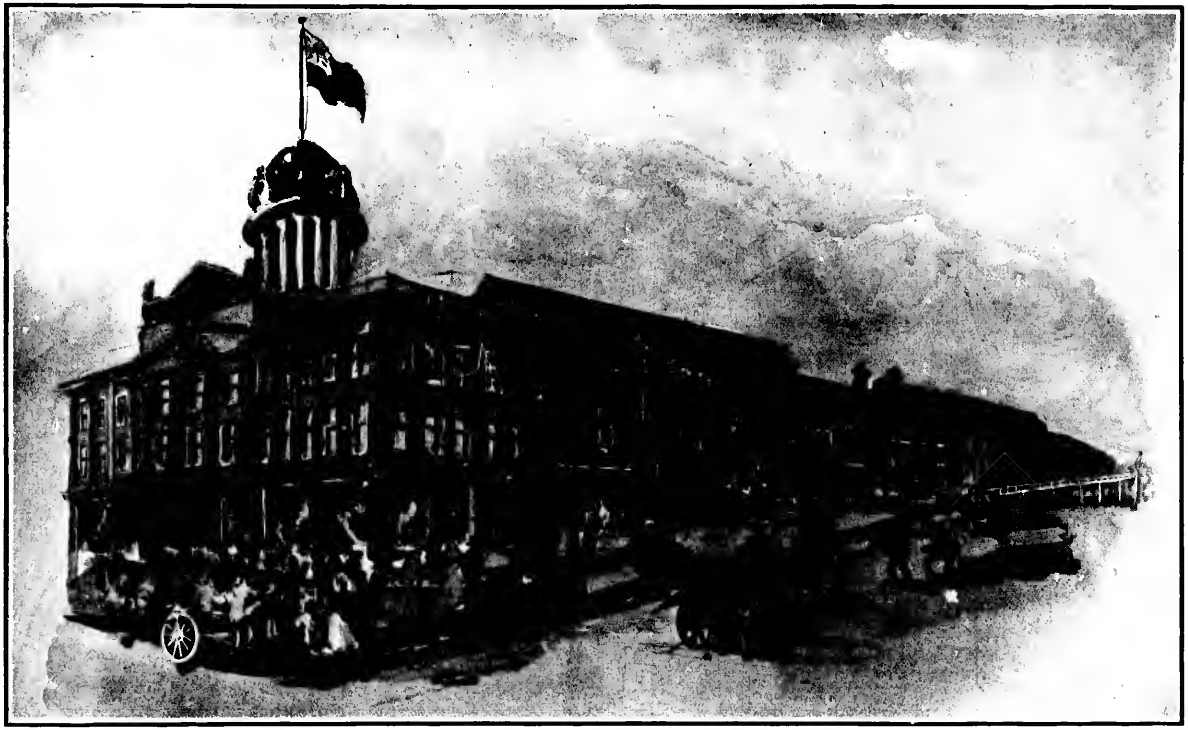
ROOFS.

Expanded Metal and concrete present the ideal roof. Any form of covering—slate, tile, asbestic, etc.,—is readily adaptable, from the fact that nails may be driven without difficulty in cinder concrete, while it is but a few weeks old. Skylights, ventilators, gutters of any form, offer no difficulty of treatment, being modelled in simultaneously with the roof itself. The average roof is 2½ in. or 3 in. thick, bearing on purlins 8 ft. between centres. For roofing reservoirs, tanks, etc, spans up to 100 feet can be treated advantageously by our light system. Old Country examples of this use being in connection with the Accrington, East London, Dyce, New River, Worthing and Wrexham Water Companies, and the Nottingham sewage tanks.

SPECIAL LINES OF UTILITY.

The resourcefulness of architects, etc., evolves new and legitimate uses for concrete and embedded Expanded Metal daily. We lack space except for bare enumeration of a few of these.

- Covering Hot Air Ducts,
- Fireproof Smoke Stacks,
- Boiler Covering,
- Coke Ovens,
- Brick-burning Kilns,
- Wall Coping,
- Fire Walls,
- Stairs and Steps,
- Public Bathrooms,
- Lavatory Partitions,
- School Blackboards,
- Theatre Prosceniums,
- Storage Rooms and Vaults in Non-Fireproof Structures,
- Heavy Warehouse Floors Without Use of Beams,
- Round Houses,
- Elevators,
- Tanks, Vats,
- Retort Houses,
- Theatre Seats and Risers,
- Exterior Cornices, Etc.,
- Balconies,
- Gables and Towers,
- Bays,
- Piazzas and Columns,
- Statuary,
- Fountains,
- Etc., Etc., Etc.



THE NEW ST. LAWRENCE MARKET, TORONTO.

Architect: Mr. J. W. Siddall, Toronto. Furnished with Expanded Metal Flooring.

EXPANDED METAL IN CIVIL ENGINEERING.

After the experience in France and other European countries over a long term of years, nothing prefatory can be needed in directing the attention of municipal, railway and other engineers to the advantages of the heavier grades of Expanded Metal as a tensile adjunct to general cement construction. The monolithic idea, as represented by masses of concrete strengthened and tied together by steel in its most desirable form, is fast asserting itself in many directions. As a precaution against irregularities in the quality of the concrete, and as a bond where concrete is liable to concussions or vibrations, the supplementary value of Expanded Metal can not be overrated. The *cheapening of concrete work* must win favor.

SEWERS, CONDUITS, ETC.

Quite commonly in the case of flat arch sewers, or where the topographical features of the district, or other local causes, make it impossible to secure sufficient room for filling over the sewer without going above grade the arch has been reinforced by the use of concrete, in which Expanded Metal is embedded. The metal is easily handled in the trench and is comparatively inexpensive, adding little to the cost of stiffening and strengthening the arch. The city engineers of Boston, to cite one instance, have utilized our product in this way. Sewers of concrete and Expanded Metal, throughout, possess European endorsation.

BRIDGES.

The facility of adopting the main features of the Expanded Metal Floor System to bridge construction is apparent, and is extensively in vogue outside of Canada. The attainable strength is unlimited. As regards the ordinary work of the city or county engineer, we would state that our methods will show the necessity of using no more steel than is at present calculated to carry the wooden planking and furnish the additional opportunity for cheaply laying a permanent roadway. This feature is noteworthy when the question of bridge repairing is considered.

SIDEWALKS AND PAVEMENTS.

Expanded Metal as a binder to the concrete sub-pavement has been successfully tested in Chicago. The coefficient for expansion and contraction being identical in steel and concrete, and the tensile reinforcement given when the former is bedded in the latter, secures for the combination immunity from cracks. The Canadian experience is that wherever asphalt or other roadway finish shows a crack, a corresponding and significant fracture in the concrete below is inevitably found. Sidewalk pavements with granolithic or other finish come under the same category as regards the legitimate use of Expanded Metal. In both cases the minimum of concrete can be figured on. Fig. 6 indicates the uses of the material as well as that in curb work. Special attention is drawn to the advantages in covering excavated areas under sidewalks (see Fig. 7) by an adaptation of our No. 1 System, as already installed by various architects in Toronto and Montreal. Our pavement consists of 3 in. cinder concrete, 2 in. of stone concrete and finishing surface of 1 in. The cinder concrete, essentially a non-conductor, prevents sweating underneath and makes assurance doubly sure of no surface cracking. A Luxfer Prism sidewalk frame for lighting both the area and basement is shown.

AN EXTENSIVE ENGINEERING FIELD.

A few other instances of the engineering adoption of Expanded Metal with concrete, among many, are subjoined :

Foundations,	Engine Beds,
Piers,	Subways,
Culverts,	Retaining Walls,
Fortification Work,	Wing Walls,
Filter Tanks,	Wharves,
Dams,	Lighthouses,
Roofing and Supports in Mines,	Breakwaters, etc., etc.

FENCING, RAILINGS, ELEVATOR SCREENS, WINDOW GUARDS, ETC.

Expanded Metal Fencing needs only to be seen to be appreciated, being the *cheapest*, strongest and most handsome on the market. Expanded Metal was employed exclusively for Gallery and Stair Railings in all World's Fair buildings at Chicago. For Elevator Cages, Screens, Balustrading, Window Guards, Tree Guards, etc., its all-round suitability and *low cost* will soon become proverbial.

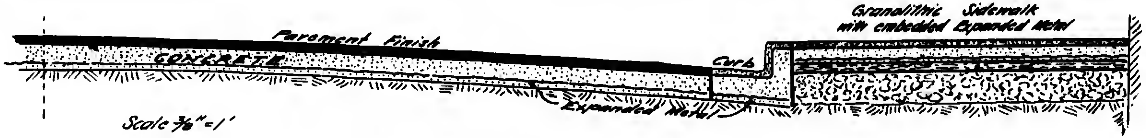


Fig. 6.—EXPANDED METAL IN ROADWAYS AND SIDEWALKS.

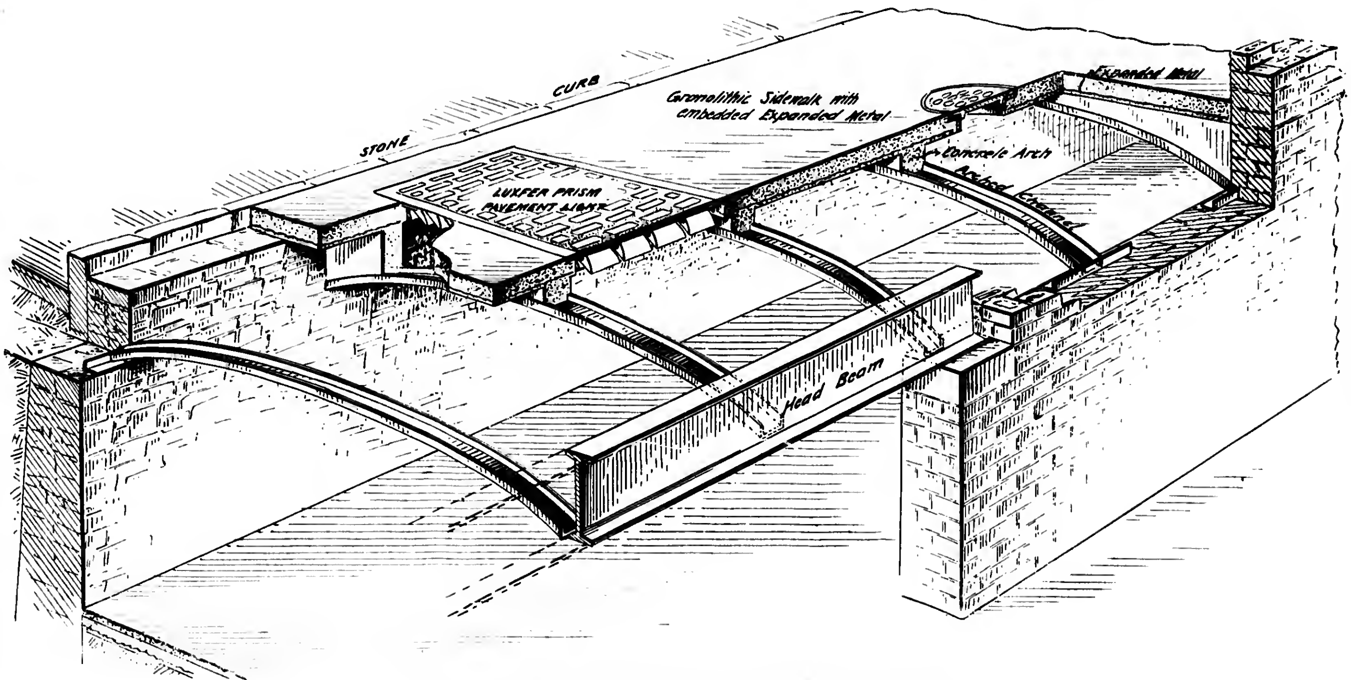
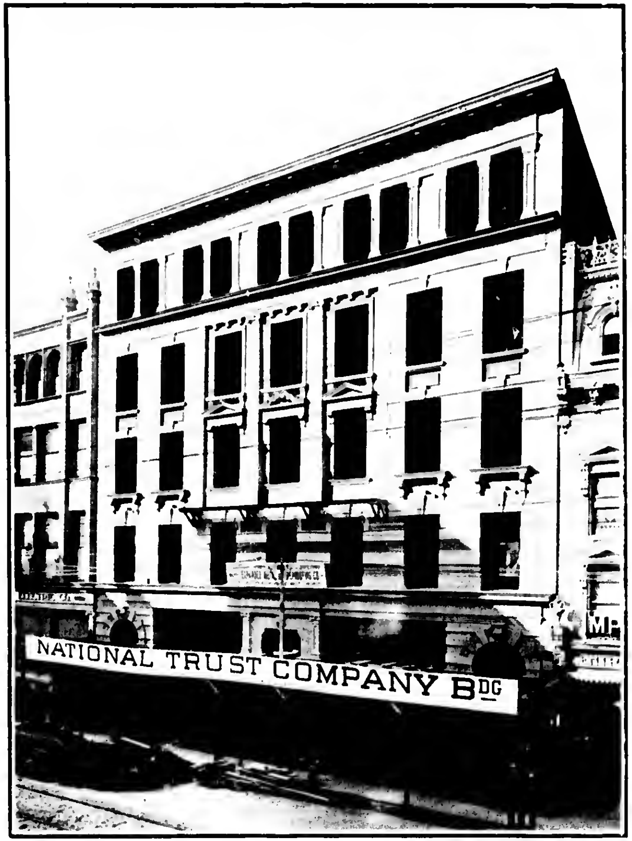


Fig. 7.—EXPANDED METAL FOR AREA SIDEWALKS.

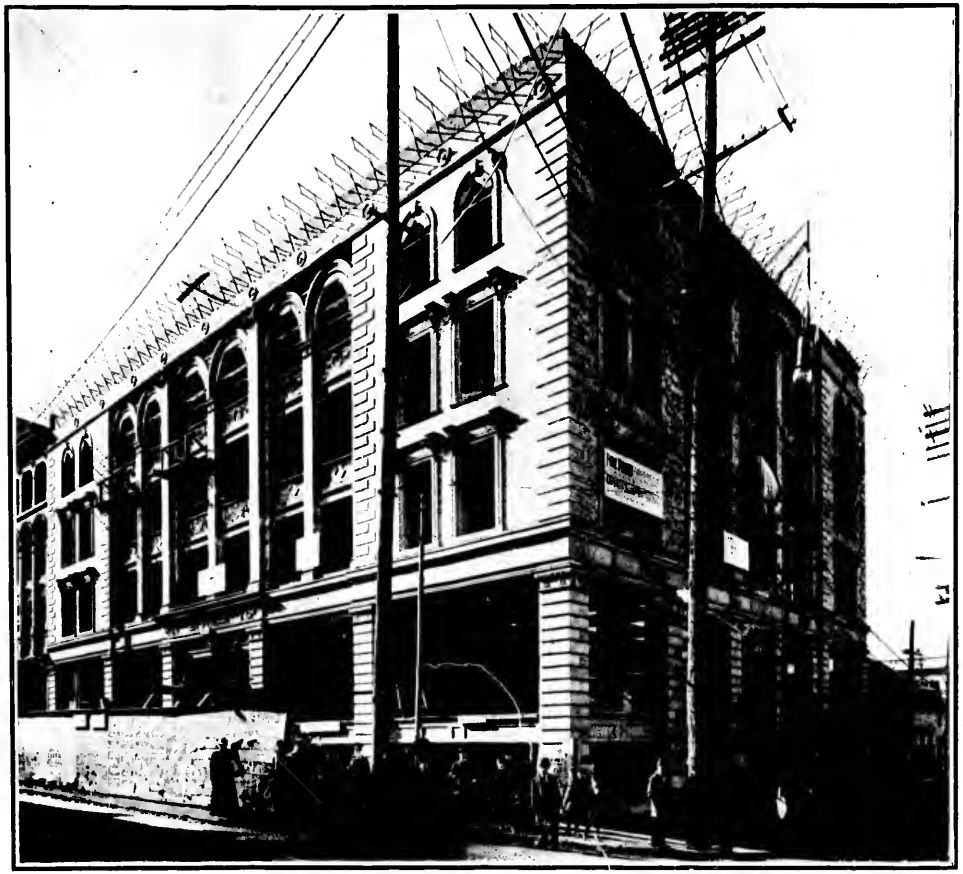


NATIONAL TRUST BUILDING, TORONTO.

Architect: Mr. Geo. W. Gouinlock, Toronto. The Expanded Metal Fireproofing System in Roof, Floors, Partitions, Gallery, etc.

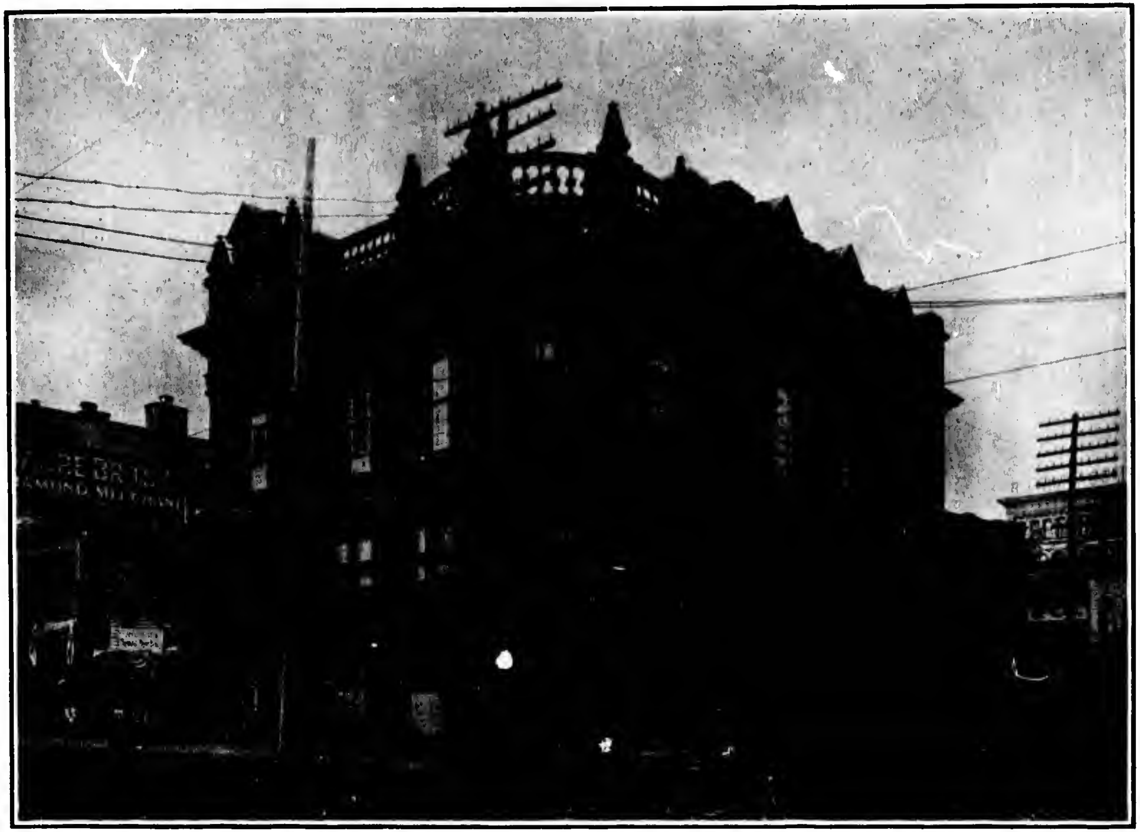
THE CANADIAN BANK OF COMMERCE, WINNIPEG.

Architects: Messrs. Darling & Pearson, Toronto. Expanded Metal Floors throughout.



LA PRESSE BUILDING, MONTREAL.

Architects: Messrs. Hutchison & Wood, Montreal. The Expanded Metal Fireproof System throughout.



THE DOMINION BANK, WINNIPEG.

Architects: Messrs. Darling & Pearson, Toronto. Expanded Metal Floor and Lath.