N.Z. BUILDING PROGRESS.

DIRECTORY

OF SUPPLIERS OF MATERIALS, &c., &c.

We frequently get enquiries from Architects, Builders, Engineers, &c., asking for names and addresses of suppliers of specialities connected with the various trades. Suppliers frequently assume that because they send out a printed circular or make a call now and then on users, that they have done all that is necessary to "keep the users' memory green." This is quite a mistake. The User must have **instant and ready means of reference** to some reliable source of information that he sees regularly.

This is why we have started this **"Directory"** to which hundreds of our clients refer almost daily. If you are a regular advertiser with us, your name goes into the Directory **free of charge.** If not, write us for terms which are nominal.

Architectural Works—
"Progress" Publishing Dept., 10 Willis Street

Baths—
Hargreaves, Jas., Auckland

Bricks—
Glenmore Brick Yards, Hillsborough, Christchurch

Building Stone—
Wilson, J. & A., Ltd., Buckle Street, Wellington

Builders' Hardware—
Odlin, C. and A. Co., Cable Street, Wellington.

Buying Agents (English)—
Wm. Wilson & Sons, Abchurch Lane, London, E.C

Cement Pipes—
Cement Pipe Co., Masterton

Cement—
Craig, J. J., Ltd., 100 Queen Street, Auckland
Golden Bay Cement Coy., Nathans' Buildings, Wellington
Reese Bros., Christchurch.
Chote, W. A., Farish Street, Wellington
Milburn Lime and Cement Co., Ltd.

Concrete Paint—
Holmes, Francis, Woodward Street, Wellington; Lichfield Street, Christchurch

Directory—
H. J. Clark, 46 Morgan St., Petersham, Sydney, Australia

Fire Bricks—
Tyneside Proprietary, Ltd. Customhouse Quay, Wellington

Electrical Equipment—
Tolley and Son Ltd., Chew's Lane, Wellington.

Glass Manufacturers—
Pilkington Bros., Ltd., C/o F. Butcher, P.O. Box 1094, Auckland.

Hotels—
McCarthy's Family Hotel, Taupo Quay, Wanganui

Incandescent Lighting Plants—
W. G. Wilson, Stuart Street and Octagon Dunedin

Leadlights—
Bradley Bros., 782 Columbo Street, Christchurch

Marine Engines—
Bailey, Chas., Junr., Freeman's Bay, Auckland

Patent Agents—
Baldwin & Rayward, Auckland, Wellington, Christchurch and Dunedin

Photographers—
Bartlett, W. H., 10 Willis Street, Wellington, and Queen Street, Auckland

Roofing Tiles and Slates—
Briscoe and Co., Ltd., Auckland, Wellington, Christchurch, Dunedin and Invercargill
Chambers, John & Son, Ltd., Auckland, Wellington, Gisborne, Christchurch and Dunedin
Gaulter, Aubrey & Co., Featherston Street, Wellington
Lorimer, James and Co., Christchurch.
Redpath and Sons, Ltd., Christchurch, Wellington, Auckland

Steel Construction—
Burt, A. and T. Ltd., Auckland, Wellington, Christchurch, Timaru, Dunedin, Invercargill

Timber Merchants—
Leyland O'Brien, & Coy., Auckland

N.Z. BUILDING PROGRESS

Published Monthly by the Proprietors, Harry H. Tombs Ltd.

8 Farish Street —— Wellington, New Zealand

TELEPHONE 1651 P.O. BOX 481.

Annual Subscriptions:—To any address 7/6 post free. Note: 1/- will be allowed on this account if paid in advance.

Remittances should be made by Post Office or Money Order. All cheques, plus exchange, to be made payable to Harry H. Tombs Ltd., and sent direct to P.O. Box 481, Wellington.

All communications to be addressed to "**The Proprietors, 'Progress,' Box 481, Wellington.**"

Advertising Rates will be sent on application. The value of "Progress" as an advertising medium is recognized by advertisers. Circulation considered, it is the cheapest advertising medium of its kind in the Dominion.

To Our Advertisers—All copy for advertising matter must be in our hands by the 10th of the month preceding publication, otherwise no responsibility with regard to insertion will be undertaken.

The Editor will at all times be glad to receive Illustrated Articles on subjects of interest for consideration, provided the articles are short and to the point, and the facts authentic.

Should subscribers continue to receive copies of this journal after expiry of current year, it will be accepted as an intimation that they are desirous of subscribing for a further period of twelve months.

In case of change of address, or irregularity of this paper's delivery, subscribers should send immediate notice.

Publisher's Announcements.

Our 58th Competition

We offer a prize of £2 2s. for the design adjudged to be the best for a

Presbyterian Church

for a small country town in New Zealand. The site is level, facing a main road, and has a depth of five chains and a width of one chain. Space is to be left for a manse in rear of church which is two miles from a wharf and has no railway connection.

Size: Total building to come under 60,000 feet cube for estimate cubing.

Accommodation: The church itself is to seat 220 persons (exclusive of choir) of which total there would be no objection to placing 20 to 25 in a gallery. A porch must be arranged for, and a vestibule or lobby as well as the pulpit or rostrum, organ and choir. A class room is required of about 300 feet super; a church vestry of about 180 feet super; and a Minister's vestry and lavatory of about 135 feet, all arranged en suite. A cleaner's room or closet of about 40 feet is necessary, and a small bell tower or flèche or turret arranged for.

General:—The church is to be designed with the view of employing (mostly for economy), materials at hand, and to withstand earthquake shocks. The materials at hand are ballast cement, wood, stone or marble, galvanized or bar iron, and imported roof coverings. The inserted features of whatever material, should be naturally applied and designed to express the true "Gothic spirit" of craftsmanship, but with local originality.

Drawings Required.—Plan, 2 elevations, 2 sections, (all to ⅛in. scale), and a small sketch view (not necessarily "set up"). The ventilation to be shown.

Approximate Estimate and abridged specification or scheduled test of materials proposed.

Mr. Frank Peck, F.R.I.B.A., of Nelson has kindly set this subject.

Designs must be sent in finished as above, under a nom-de-plume, addressed to **Progress**, 8 Farish Street, Wellington, and marked clearly "Fifty-eighth Prize Competition" on outside with a covering letter giving competitor's name, and address of employer. Designs to be sent in by November 21st, 1917.

Our 59th Competition

We offer a prize of £1 1s. 0d. for the design adjudged to be the best for a

Main Entrance to an Art Gallery

The Art Gallery is proposed to be erected in one of the leading towns of New Zealand which has a population of about 12,000 people, and the whole building is estimated to cost about £12,000. It is to be a single storey building faced with white stone or white marble. The entrance is to be in the centre of a central projecting portion, and is to be reached by a short flight of steps—the floor of the building being about 3 ft. above ground level. The doorway or doorways are to be recessed a few feet, so as to form an open portico. As this is the chief feature in a building devoted to the fine arts, naturally there will be a certain amount of statuary, sculpture, etc., while the architectural treatment will be rich though restrained and refined. The style employed is to be Classic Renaissance, and the correct proportions of the Orders used with their various mouldings, etc., according to Vignola, must be carried out. The object is to enable the student to apply the knowledge he has acquired of the Classic Orders, in a practical manner.

DRAWINGS REQUIRED: Ground plan; front elevation; separate elevation of recessed doorways, side elevation, and section. Drawings to be inked in, and correctly rendered with sepia, the sectional portions filled in with Indian ink. Scale: ¼ in. to the foot.

Mr. Basil Hooper, A.R.I.B.A., of Dunedin has kindly set this subject.

Designs must be sent in finished as above, under a nom-de-plume addressed to "**Progress**," 8 Farish Street, Wellington, and marked clearly "Fifty-ninth Competition" on outside with a covering letter giving competitor's name, and address of employer. Designs to be sent in by December 21st.

Conditions of "Progress" Competitions

The Editor reserves the right of publishing any or all the designs submitted, and while every care will be taken of drawings, no responsibility is accepted should any loss or damage be sustained. Those desiring their designs returned must send postage to cover cost of same. No award will be made unless at least three designs are sent in for any one competition. Unless otherwise stated drawings are to be in black and white only.

Notice to Subscribers

"N.Z. Building Progress" is posted each month through the G.P.O. at Wellington. If any subscriber should not get his copy, another will be sent him if we are notified in good time. The paper is supplied from year to year only, and if subscribers continue to receive the paper after expiry of the current year, we shall accept it as an intimation of their desire to continue for another twelve months. We undertake to supply the paper for such further term. Notice of discontinuance must be sent to the Manager, 8 Farish Street, Wellington in writing, as no Agent has authority to receive notice of discontinuance on our behalf. **The subscription is 7/6 per annum. A discount of 1/- will be allowed off this amount if subscription is paid in advance.**

Vol. XIII. No. 3. Monthly

REGISTERED AS A NEWSPAPER

N.Z. BUILDING PROGRESS

(With which is incorporated "The Scientific New Zealander")

A Journal for Progressive men interested in the development of New Zealand's Architecture, Building, Engineering and Industries

Editor: Chas. E. Wheeler.

Incorporating the Journal of the New Zealand Institute of Architects.

PRICE 6d. per Copy; 7s. 6d. per annum post free. (Note: 1s. Discount allowed if paid in advance).

WELLINGTON, AUCKLAND, CHRISTCHURCH, AND DUNEDIN, NEW ZEALAND, NOVEMBER, 1917.

Contents for November

Editorial Comment

The Town Planning Bill.

The Hon. G. W. Russell deserves hearty congratulation for carrying out his promise that he would prepare a Town Planning Bill for consideration during the recess. There were problems more urgent, and the Minister is one of the busiest in the Cabinet, but he managed to get his measure printed in time for introduction the night before the session's end. Its reception was such as would not give much joy to Town Planners. The House thought it was one of the measures which the Government wished to rush through at the last moment, when members had packed their bags, and were thirsting for freedom. Before the Minister in charge could explain that it was only introduced for consideration after the session, some protests were heard indicating that a thorough campaign to educate parliamentarians will have to be undertaken before the reform can be approved by the legislature. Some members evidently regard it as a fad. Typical of this trend of ignorance and contempt was the remark of the member for Palmerston North, Mr. David Buick, who complained that the Hon. G. W. Russell was "only fooling the House." Perhaps that member forgot that his own leader included Town Planning in the Reform Party's election programme, otherwise he would surely not have implied that his leader had been guilty of fooling the country.

A Practical Reform.

The first thing to demonstrate to gentlemen suspicious of fads is that Town Planning is as important to a growing community as plans are in erecting a dwelling. There are certain essentials to health, well-being, and comfort in urban life, but New Zealand towns usually grow up without regard to them until the deficiency is obvious, when the expensive process begins of remedying mistakes. Palmerston North must have had experiences of its own, if Mr. Buick will inquire. The Town Planning Bill seeks to deal with the law-

out of residental and industrial areas to the best advantage. It is proposed in clause 12 that the Governor-General may on the recommendation of the Minister and either with or without the consent of the local authority, by Proclamation, declare that any district, together with or without adjacent land as is defined by the Proclamation, shall be subject to the provisions of the Act, and thereupon the district and such adjacent land shall be subject to those provisions accordingly:

Provided that the Councils of the cities of Auckland, Wellington, Christchurch, and Dunedin may by resolution passed at an ordinary meeting of the Council apply to have such city or such city and the adjacent land be proclaimed as a town planning area. It will be seen by the wording of this clause that an active Minister, with a keen Town Planning Commission, stimulated by public opinion in any district, can secure for that district the advantages of the Act even if the existing local authority is not awake to them. However, the Minister in framing his Bill has been particularly careful to avoid setting up an authority in opposition to the local bodies. To use his own phrase, he will not interfere with their sovereign powers. This will be regarded by many Town Planners as a weak spot in the measure, though we have regarded it as sound policy to avoid antagonising existing local bodies.

The Weak Spot.

Much as we admire the Minister's enterprise in preparing the Town Planning Bill we must strongly criticise his evident desire to avoid taking valuable aid from those who have become expert town planners. The whole measure centres upon the central administrative body, the Town Planning Commission. This body must be composed of men keenly alive to the advantages of the reform, well versed in its machinery, and equipped with sufficient knowledge to give the Board a paramount and undisputed authority, this being all the more needful for the reason that the Board will have no direct power. Its function is to be advisory, and nothing can be done without the approval of the Minister and the "responsible authority," a local authority having charge of any particular scheme. This is how the Minister proposes to constitute his Town Planning Commission: The Surveyor-General, the Engineer-in-Chief Public Works Department, the Government Architect, the Valuer-General, the Chief Health Officer, the Under-Secretary Internal Affairs Department (or his appointee). Three persons appointed by the Governor-General, who shall hold office during the pleasure of the Governor-General, including one person appointed by the Governor-General on the recommendation of the Municipal Association, and one person appointed by the Governor-General on the recommendation of the New Zealand Institute of Architects, who shall each hold office for the term of three years from the date of his appointment.

At least six members of the Board will be busy departmental heads who have quite enough to do to attend to their present work. Some of them are already loaded with "extras," and they will scarcely relish any additional burdens. We may expect to get a very valuable member from the Institute of Architects, but as he will have to look after his professional work first, his initiative and vigor as a national Town Planner will be greatly curbed. The Minister has provided for a third Government nominee. In this, a few Town Planning enthusiasts who saw the draft Bill before printing (the editor of "Progress" being among the number) saw hope of bringing in a capable Town Planner with international experience, but the Minister showed no inclination to accept that advice. The Bill, in fact, contains no financial provision which would enable such an expert to take part in its administration. Consequently, while we are pleased at seeing a Town Planning Bill come forward in charge of a vigorous and experienced Minister, we realise that it will require substantial amendment to give it vital force.

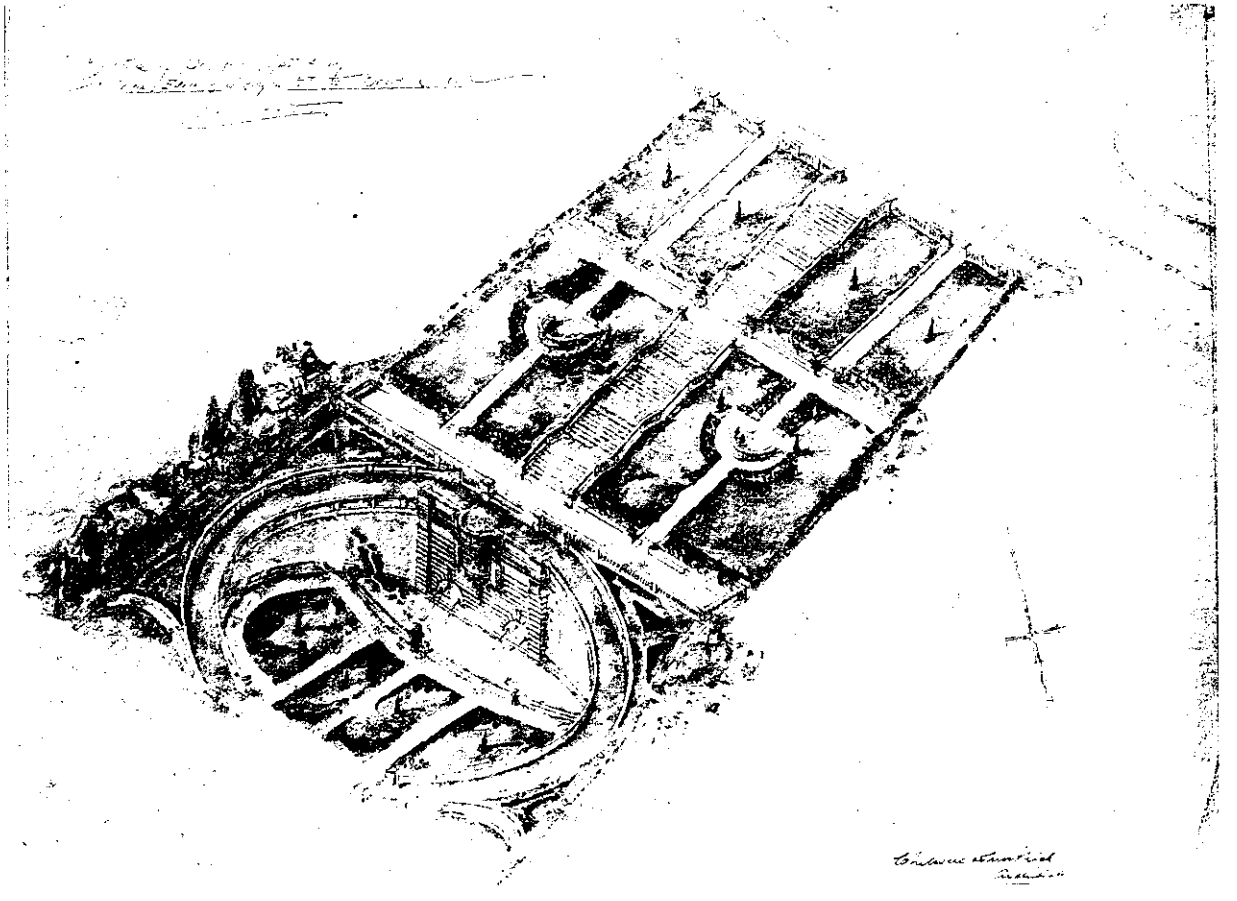
State Interference.

One of the important political developments forced on by the war is the growth of the principle of State interference. Conservative England has been obliged to adopt the doctrine extensively, but New Zealand's administrators, less troubled with imminent danger, have been loth to depart from familiar paths. Parliament itself is more advanced on this subject than the National Government, for a Select Committee comprising a well-balanced assortment of the members from both parties considered the cost of living problem and made a number of extremely radical proposals for State trading. They suggested that the whole of our coastal, intercolonial and overseas transport should be done by steamers owned on co-operative lines, the State, the primary producers and the importers having shares. This is the form of modified State ownership which has worked well with the Bank of New Zealand, though we confess that the influence of the State upon that institution has not made it any more liberal than its nominal competitors in dealing with its customers. New Zealand business men tolerate a series of charges for exchange and book-keeping which are iniquitous, and without precedent. As for transport, there is no doubt that State control would remove many of the difficulties now troubling the business world, and secure for the producer a better return for his output in the world's markets, because our exports would be carried by sea on the same terms as they are carried on land—at a rate only a trifle above the actual cost of the operation. It may yet be found inevitable that the liquor problem will find its only permanent solution in State control. The liquor trade is so badly run by private enterprise that in some respects it constitutes a danger to the community. This is a statement fully borne out by the National Efficiency Board's report. The Prime Minister has promised that next session Parliament will be asked to legislate on the lines of the Efficiency Board's report, so as to give the people an opportunity of deciding by a bare majority the important issues: Continuance, or National No-license with compensation. It would be a great advantage to add a third issue, that of State ownership and control of the liquor traffic. It is one of the businesses in which the principle we are discussing would make for national efficiency.

Civic Improvements in Auckland.

There is a Civic League in Auckland which was started three years ago for the purpose of interesting women in all civic matters. The League is absolutely non-denominational and non-political, and is divided into different sub-committees, viz:—Health, Education, Entertainment, House and Town Planning, and reading circles. Suitable premises have been lent by Messrs. Hallenstein Bros. for the use of the League during the war. A Sewing Committee has been set up for Red Cross work as well as a Mothers' Committee, the object of the latter being to collect old clothes and teach poor mothers to cut out and make up children's garments out of them.

The interest this paper has in the League centres on the Town Planning branch, which seems to have laid itself out to improve Auckland city. A design by Messrs. Chilwell and Trevithick, A.R.I.B.A., is published which shows a suggested right-of-way from Eden Street and Jermyn Street to Beach Road. Immediately facing the future railway station is a steep bank known as Eden Street, but now covered with rubbish. Having heard that it had been suggested to the City Council to cut up this bank for building sites, the Civic League protested against it. Mr. Chilwell kindly drew for the League a scheme for terraced gardens and steps with a fountain at the bottom. This fountain could drain the water from the bank. We can imagine that if the station was built well back from the road with a big circular courtyard in front, as is done on the Continent, and terraced gardens immediately opposite, the first thing that would meet the traveller's eyes on arrival in Auckland would be a beautiful "Place" worthy of any city.



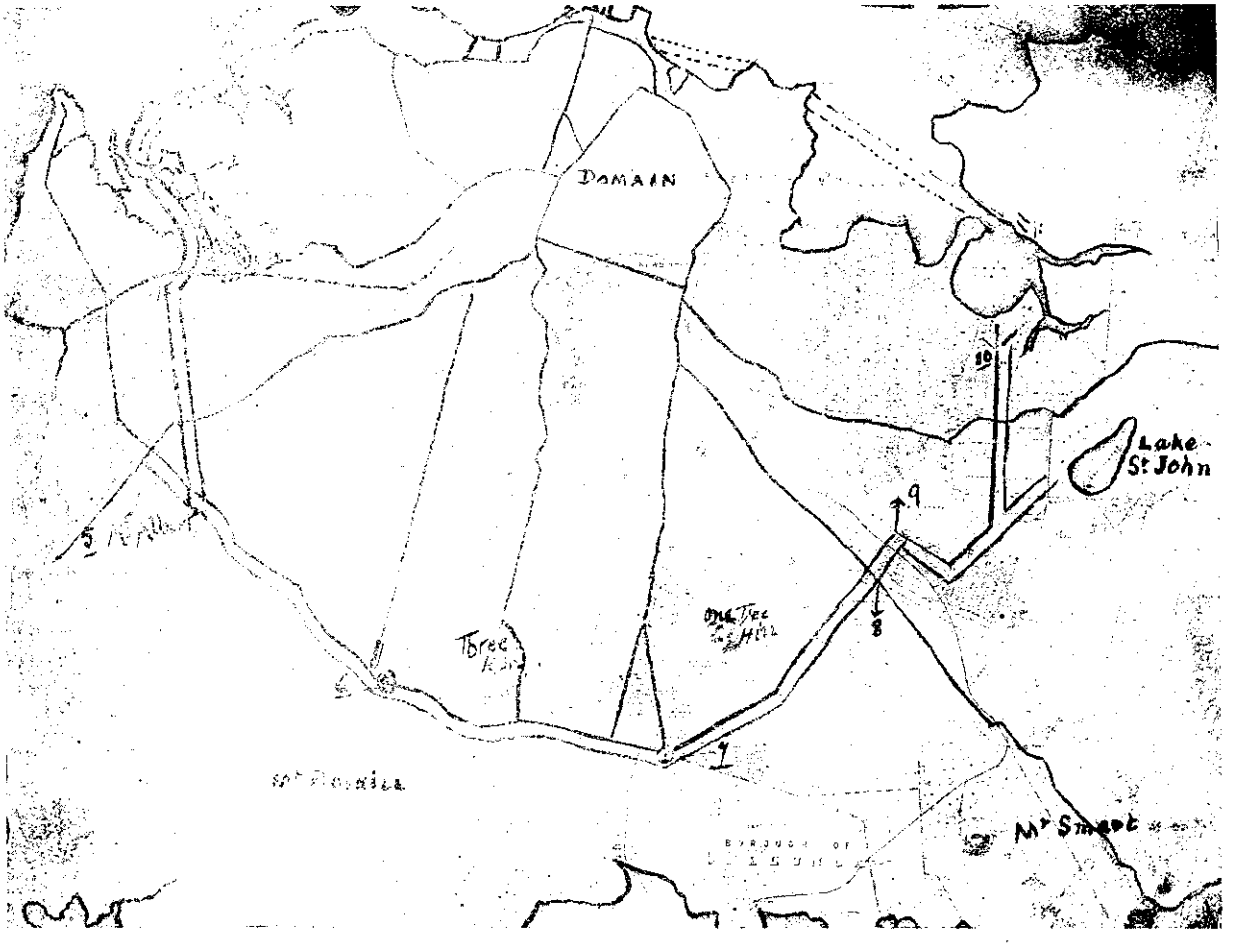
Proposed Right-of-way from Eden Street and Jermyn Street to Beach Road, Auckland.
Messrs. Chilwell and Trevithick, A.R.I.B.A., Architects.

At the top of the steps are the Law Courts, the finest buildings in Auckland, also Government House and the Metropolitan Grounds, which may become the site of the new University. It is therefore very important to provide a direct approach from Beach Road to the top hill.

The suspension bridge promised by the Government, the League thinks, will be very unsightly, and the idea of a vast opening in front of the railway and that of a bridge over the street being incompatible the Railway Place should be the most important feature of a modern town.

Mt. Albert Reserve (where the Government may sometime stop quarrying), the One Tree Hill Domain, the Racecourse, and the park round St. John, (the accomplishment of this scheme being probably delayed but not abandoned).

The scheme is for a boulevard two chain wide with a double row of trees in the middle. Most of the land being still pastoral, it lends itself admirably to great civic design, star-shaped places offering vistas of mountain ranges, and volcanic hills. Like the other schemes, the League claims this to be a utilitarian as well as a beautifying plan.



Scheme for connecting up Auckland's Suburbs by a Circular Boulevard, utilising the existing roads—a Suggestion by the Secretary of the Civic League, Mrs. S. V. Irwin.

Mr. Chilwell's design was presented by the League to Mr. Gunson, Mayor of Auckland, who received it very sympathetically.

Any one living in Auckland must be struck by the disconnection of its suburbs. The different tramway lines stretch out like the arms of an octopus, and no attempt is made to link up the suburbs.

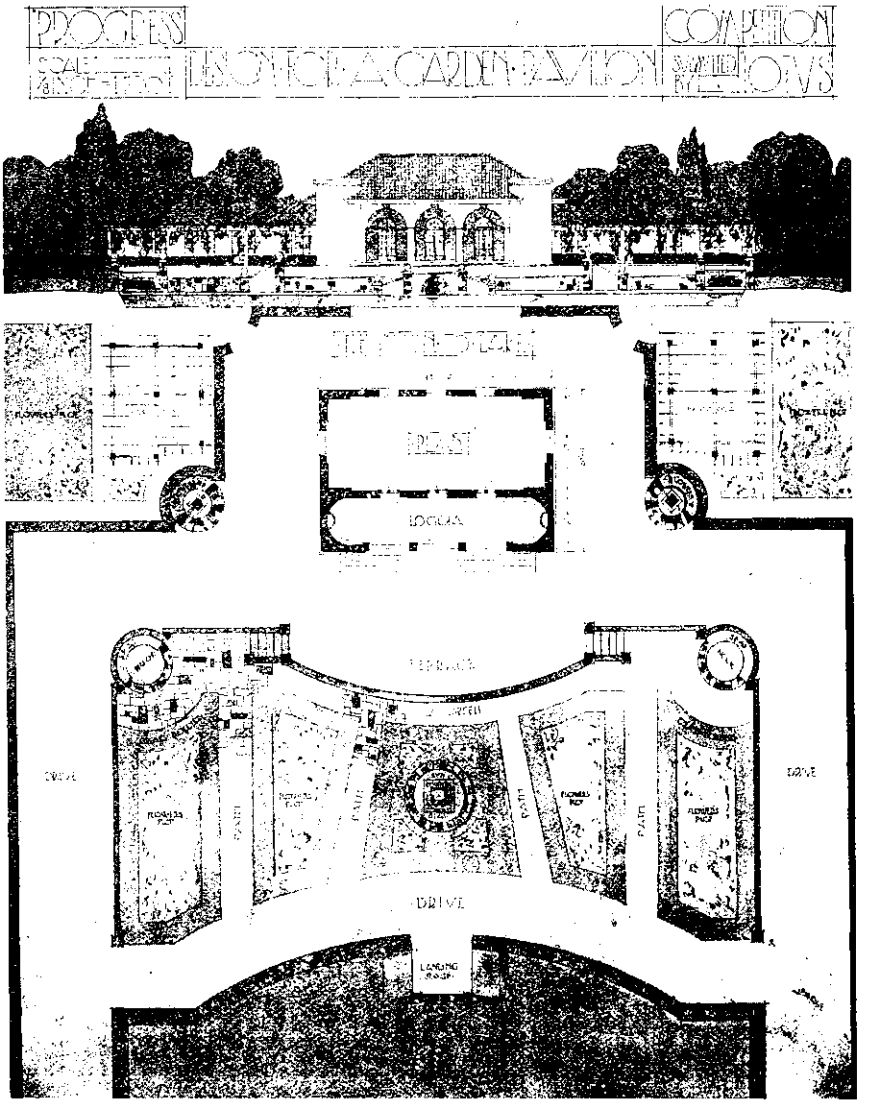
A scheme devised by Mrs. S. V. Irwin for a circular boulevard on the continental principle is illustrated on this page. It utilises mostly roads already formed and City Council land. It touches the Western Springs, which could be transformed into a beautiful park with a natural lake and spring, and

The plans have been submitted to many influential men in Auckland, the Mayor of Auckland, the Mayors of different boroughs interested, and has received great encouragement from all sides.

Notter and Firth state that:—"A change equal to three times an hour is all that can be borne under the conditions of warming in England, or that is practically attainable with natural ventilation, and, if this be correct, from 1,000 to 1,200 cubic feet should be the minimum allowance for the initial air-space."

Our 56th Competition.

This competition drew only two designs, viz:—"Pylon" by G. Glenton-Hunt, with Messrs. Wade and Wade, architects, Auckland; and "Lotus," by Harold L. White, City Engineer's Department, Auckland. Mr. C. H. Mitchell, A.R.I.B.A., who kindly set this subject, reports as follows:—



Winning Design, "Lotus," in our 56th Competition, by Harold L. White, City Engineer's Department, Auckland.

"It is dissappointing that only two designs were received for the above competition, which I place in order of merit as follows:—'Lotus' 1st, 'Pylon' 2nd. The problem set is similar to junior subjects given in many ateliers and architectural schools, and forms a basis of more intricate designs and consequently is a good grounding for the students.

In any good design each unit must be in proportion to, and harmonise with the other, and although lacking in this proportion the design by 'Lotus' has much to recommend it owing to its simple treatment, and first class results would be assured if he were to study the problem on similar lines to those described later. As drawn, the pavilion rises behind a solid balustrade in the foreground, and the top of this balustrade appears, from the elevation, to be the ground line of the Pavilion, thus making the following illusion—the vertical distances between the evident ground line and the line of eaves, and between the latter and the ridge, appear to be too nearly equal, and the floor line appears to be only 10 inches above the evident ground line, but this would have been obviated had the foreground (alone) been shown slightly in perspective, thus showing the true height of the Pavilion (similar to the treatment of buildings illustrated by the numerous design plates

of The Grande Prix de Rome, The Ecole de Beaux Arts, and others).

The dimensions of the three openings to the loggia and the width of the piers between them are the worst defects, and if 'Lotus' had studied the following rule taken from almost any text book on design "that the proportion of circular headed arched openings should be twice the height of their width," the result as regards the proportion of the building would have been almost beyond criticism. To obtain this the piers should be widened to approximately twice their present width, and the openings narrowed in consequence, and made, as near as possible, twice as high as they are wide. The distance between the crown of the arches and the line of eaves is hardly enough, and would be improved if slightly deepened. Further, the width of the doors entering into the tea room scale only 3 ft. 8 inches between the jambs. Now, I am sure, if 'Lotus' had considered that in case of one only of the leaves of the door being open at a time the 1 ft. 7 inch opening would be very cramped for a person of average size to pass through in comfort, and he would have made them at least 5 ft. in width.

In offering these suggestions to 'Lotus' I am not condemning his design, but calling the attention of other students to likely mistakes, as one has only to look about to note, in practice, window and door openings out of all pleasing proportion, and it is this proportion of openings that would be severely criticised by an architectural critic in the modern schools of architecture.

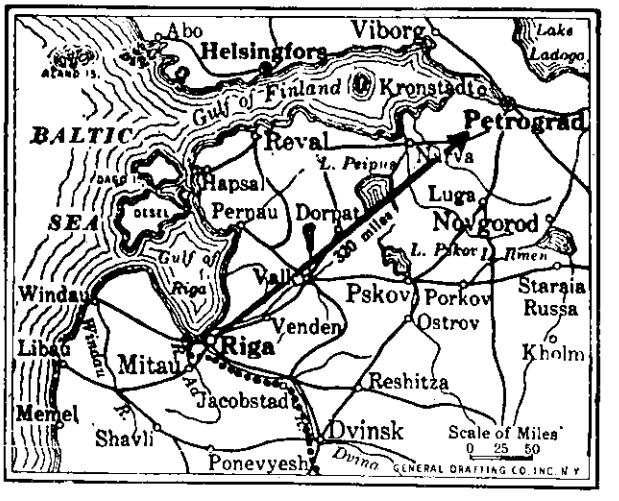
The design by 'Pylon' is, as his nom-de-plume infers, chiefly pylons, and no doubt he would have been able to produce a much better attempt had he kept more to the conditions and less to an elaborate scheme. 'Pylons' idea is good, but such a Pavilion is not asked for, nor was it desired, and as it involved far more knowledge of design than is expected of students, his attempt in detail is poor.

In conclusion, I suggest as a help to other students studying design problems, that they be not in too much hurry to use the Tee and Set squares, but work up the main lines of the design in free-hand; and if the first attempt does not satisfy you, then (and it is unlikely to), put a piece of tracing paper over it and alter the proportion of the units slightly, on lines as suggested to "Lotus." Continue this process until you obtain something that is pleasing to look at, then, and not until then, use the Tee and Set squares."

"To design a comfortable and beautiful house for a limited sum of money is perhaps one of the most difficult problems the modern architect has to solve. It is also the most important problem—for the housing question, as applied to the great majority of the people, is still a question which remains unanswered in an intelligent way. The long, unlovely streets which the jerry builder creates, or his undesirable villa residences, are the only available dwellings for the average man."—H. Baillie Scott.

The Capture of Riga.

The map reproduced on this page gives details which show where Russia's weakness now lays. The capture of Riga opens a way to Petrograd, which is



329 miles in a direct line. This town, the third seaport of Russia, has a population 47 per cent. German, and since the beginning of the war has been a centre of German intrigue. It was founded by the merchants of Bremen some 800 years ago. The dotted line shows the former front.

The requirements of the Local Government Board, London, and other authorities, in regard to ventilation, fix the minimum allowance of air space per occupant as follows:—In common lodging-houses occupied at night only, 300 cubic feet; ditto, day and night, 400 cubic feet; ditto, seamen, 400 cubic feet; ditto, in Belgium, 469 cubic feet; ditto in New York 600 cubic feet. The minimum allowance of sleeping space in common lodging-houses in London was raised by the L.C.C. regulations to 250 cubic feet.

* * * *

Dr. Macfie writes:—"How can we expect to ventilate a small room? Suppose there are only two gas jets; yet, even so there are less than 100 cubic feet per head, and in order to keep the air reasonably pure it would have to be changed ten to thirty times an hour. How are we to change it ten to thirty times an hour without causing a draught?"

* * * *

A report of the Advisory Committee on Rural Cottages, London, says:—"As a result of further investigation and particularly of further medical evievidence, we recommend that the minimum allowance of air-space in the bedrooms of five-apartment dwellings be fixed at 400 cubic feet per adult."

* * * *

Dr. Whiteleggе says:—"It is found experimentally that with ordinary appliances, and under the average atmospheric conditions of the climate of England, the air of a room cannot be changed more than about three times an hour without causing inconvenient draughts."

The Lighting of Picture Galleries and Museums

By S. HURST SEAGER, F.R.I.B.A.

Note.—The discussion that has arisen over the introduction of Mr. Seager's method of Lighting, in the recent competition for an Art Gallery in Wanganui, has induced us to publish some details of his system. The paper is reprinted from the Journal of the Institute of British Architects, which paper printed the article in 1912.

The lighting of picture galleries and museums is a problem which has been before the architectural profession since the early part of the nineteenth century. It is a problem of such universal public interest, that it is hard to realize that we appear to be as far from a true solution as in the earliest days. Anybody would very naturally think that if we require a gallery perfect in every way, we have only to go note-book in hand to the European centres of art, and copy exactly the form of gallery suited to our requirements. Let me at once state that we should be grievously disappointed. There is not a single European picture gallery that I am acquainted with that approaches perfection—some are atrociously bad, some are fairly lighted in parts, but not a single one is free from defects which should have been avoided. In 1907 and 1908 I went note-book in hand to all the principal British, French, Italian, and some of the German galleries, and am therefore in a position to support the statement made by Mr. A. W. Weissman, the architect to the City Museum, Amsterdam, in a paper read before the R.I.B.A. in 1907. He said: "Before designing my gallery, I determined to visit the European galleries, but I could not find a room which was entirely satisfactory. I therefore had to try for myself."

The question came prominently before the public as long ago as 1853. At that time it was proposed to enlarge or rebuild the English National Gallery. The Gallery had been built by Wilkin. It was completed in 1838, and the opinion expressed by a writer in that year, quoted in a leading article of the "Builder," has been endorsed from time to time ever since by those who have been anxious to see our national collection worthily housed.

"In short," he writes, "judging from the profound deficiency evinced in the present National Gallery, and considering the distinguished names that were connected with the examination and approval of the designs for that building, it would be difficult indeed to imagine that either British statesmen or English architects have any enlarged or sound idea about the requirements of a National Gallery, beyond its mere name."

The article in the "Builder" concludes with these words:

"We sincerely hope that, when the matter comes before Parliament, men of all parties and political opinions will unite their endeavours to make such arrangements as may obtain for us a structure completely adapted for the purpose, and worthy of the age and country: not a building good enough, but the best possible; scientifically correct, structurally perfect, and architecturally magnificent."

This was written in 1853, in the early days of picture galleries and museums. It was then seventeen years since the National Gallery had been opened, and only twenty years since the opening of the first public picture gallery—the Alt Pinacothek at Munich. In this year Ruskin wrote to the "Times" as follows:—

"We are about to build a new National Gallery: may it not be arranged so that the pictures we place therein may at once be safe and visible?

"I know that this has never yet been done in any gallery in Europe, for the European public have never yet reflected that a picture which was worth buying was also worth seeing. Some time or other they will assuredly awake to the perception of this wonderful truth, and it would be some credit to our English common sense if we were the first to act upon it.

"I say that a picture which is worth buying is also worth seeing—that is, worth so much room of ground and wall as shall enable us to see it to the best advantage. It is not commonly so understood. Nations, like individuals, buy their pictures in mere ostentation, and are content, so that their possessions are acknowledged, that they should be hung in any dark or out-of-the-way corners which their frames will fit. Or, at best, the popular idea of a National Gallery is that of a magnificent palace, whose walls must be decorated with coloured panels, every one of which shall cost £1,000, and be discernible, through a telescope, for the work of a mighty hand. I have no doubt that in a few years more there will be a change of feeling in this matter, and that men will begin to perceive, what is indeed the truth, that every noble picture is a manuscript book, of which only one copy exists, or ever can exist; that of a National Gallery is a great library, of which the books must be read upon their shelves; that every manuscript ought, therefore, to be placed where it can be read most easily; and that the style of the architecture and the effect of the saloons are matters of no importance whatsoever, but that our solicitude ought to begin and end in the two imperative requirements—that every picture in the gallery should be perfectly seen and perfectly safe: that none should be thrust up, or down, or aside, to make room for more important ones; that all should be in a good light, all on a level with the eye, and all secure from damp, cold, impurity of atmosphere, and every other avoidable cause of deterioration."

Modern examples show that it is as necessary to impress these views to-day as it was at the time they were written. Unfortunately they have hitherto had but little weight with those entrusted with the design and care of our galleries and museums, for although our National Gallery was proved so deficient, nothing was done, and the original portion of the building remains to-day with all the defects complained of fifty-eight years ago. In 1876, E. M. Barry added a new wing which followed the old method of top-lighting, but with the addition of an inner ceiling light. In these rooms such irritating reflections were found to be produced from a white marble border placed round the floor that the border had to be removed.

Within the last year, further new rooms have been added. (Fig. 1). It would have been thought that with the experience gained from failures in the past and the advanced knowledge of the laws of light, we should at last have had a gallery quite free from defects—that the editorial plea of 1853 for a building "scientifically correct, structurally perfect, and architecturally magnificent," would be granted. It was not to be, for so scientifically incorrect are they, that they were no sooner opened to the public than a wail of lamentation went up from all classes, expressed very forcibly and freely in the "Times" and other papers. It was stated in various terms that the method of lighting was so bad that it was impossible to view the pictures with any degree of pleasure. The reflections were in every case so pronounced that the picture itself could not be properly seen from any point of view. All the pictures in the National Gallery are glazed, but I hope to show that it is possible

Fig. 1. New Room, National Gallery, London.—Showing usual ceiling light giving reflections in pictures.

to so arrange the lighting, that no inconvenience whatever is experienced from the reflecting surface. It is possible for pictures to be seen perfectly when glazed if only the laws of light are properly understood and acted upon. That they should not have been acted upon in such a work is remarkable, especially in view of the fact that the rooms were built to contain the great masterpieces of the world, for which enormous prices were paid.

It may be thought that this is an isolated instance among modern buildings—unfortunately it is not. The National Portrait Gallery, erected in recent years for the especial purpose of exhibiting the interesting collection of portraits of England's eminent men and women, is a lamentable failure. Some of the galleries are so dark that it is with difficulty one can see at all. Some are sidelighted in such a way that the reflections are overpowering. I spent some time with the attendants manipulating the window blinds in the endeavour to arrange them so that the pictures could be properly seen. We found it impossible.

The most recent English Museum building is the new portion of the Victoria and Albert Museum. We have only to look at a photograph (Fig. 2), of one of the galleries, published in the "Architectural Review" of July, 1909, to see that again

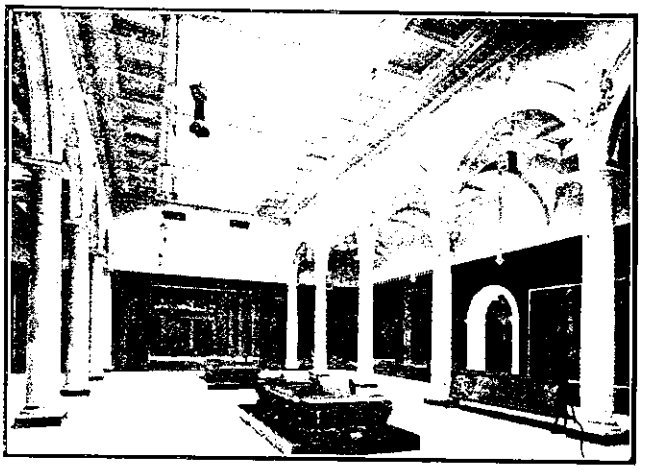


Fig 2. Gallery in new portion of Victoria and Albert Museum, London.—Showing columns and arches reflected in glazed exhibits.

precedent has been followed instead of principles, with the result that Raphael's celebrated cartoons, or other glazed exhibits on the walls, have become in the greater part, as can be easily seen in the photograph, merely reflections of the architectural features of the interior. Here, as in all other cases, the defect arises from allowing a flood of light to fall from the centre of the ceiling so that the spectators are much more brilliantly lighted than the pictures. Classicists consider this was the principle adopted for the Parthenon. It was the principle adopted in the first picture gallery at Munich, (Fig. 2a), and it has been thoughtlessly followed ever since. Thoughtlessly, for it can at once

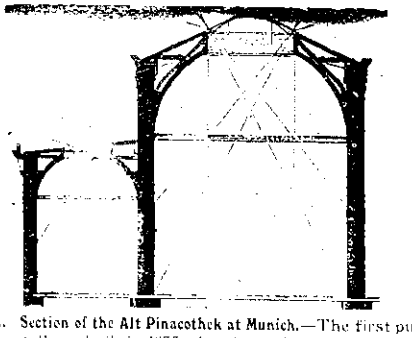


Fig. 2a. Section of the Alt Pinacothek at Munich.—The first public picture gallery, built in 1855, showing a bad example which has since been universally followed.

be seen that if the spectators are in a bright light and the reflecting surface of the glazed pictures in a subdued one, it is impossible to prevent painful reflections occurring. In addition to the galleries I have personally studied, I have examined the plans of very many others, and find this mistaken method is followed almost without exception.

Attention has always been directed to the size and form of the central ceiling light, and many methods have been claimed to be the best for ascertaining the exact relation the opening should bear to the size of the room. As, however, the principle of having a top or ceiling lights is wrong, the rooms are, of course, all, defective, and vary only in degree. Captain Fowke, who designed the galleries at the South Kensington Museum to contain the celebrated Sheepshanks collection, is perhaps, largely responsible for the continued copying of bad precedents, for in the "Builder" of 1853 he says he proposes to consider the question scientifically, and to show by diagrams that the ceiling light he proposed would have such proportions and such relations to the picture surfaces, that the pictures would be well lighted and quite free from reflections. His diagrams show that he has only taken into consideration the reflections of the ceiling light itself in the picture, quite ignoring the fact that if a flood of light falls into the centre of the room, all objects illuminated there by the top light become themselves sources, not of direct, but of reflected light, and it is the reflections of these objects that cause the greatest trouble. Every picture gallery gives instances of this. It must be bad indeed if the reflected image of the skylight is seen in the picture, but there is not a single gallery I am acquainted with, whether by personal inspection or by illustration, which is free from reflected images of the spectators and all objects within the well lighted area. How bad reflections can be in buildings specially designed as galleries or museums is shown by a photo taken in the Museum at Cairo. It is a top-lighted room with shallow glass cases lining the walls. It was absolutely impossible to see the exhibits. I tried in every way to get a photo free from reflections, but finally took one in which the reflected images—including the image of the photographer and his camera—quite overpower the contents of the cases (Fig. 3). Yet of such reflections as these Captain Fowke takes no heed, and consequently his gallery, purporting to be on exact scientific principles, is as unscientific as those which preceded and those which follow. In my examinations of galleries I used a photometer—a meter for taking the exact exposure for negatives by noting the length of time a piece of sensitized paper takes to reach a certain depth of colour. I found by this means that in every gallery having central ceiling lights or roof lights—whatever their proportion and however they varied in detail—the central portion of the room was much better illuminated than the walls on which the pictures were hung.*

Not only are irritating reflections thus created, but in all cases the pictures appear to be much less lighted than they are by reason of the contrast between the strong light in which the spectator stands and the subdued light on the walls. An extreme illustration of this effect is seen in standing outside a building and looking into door or window openings the interior, by contrast, appears to be quite dark; on entering of course it is found to be an illusion, that the interior is in fact well lighted, for the reason given under Law 4. In many cases of bad lighting this contrast between the well-lighted floor and the ill lighted walls is removed by subduing and diffusing the light from the skylights by means of inner translucent ceiling lights that is with ground glass which scatters the rays of light in all directions. This method is adopted, as I have said, in some of the rooms of the National Gallery and in Sydney, and it can at once be seen that this is not a desirable expedient. It does not get rid of the original evil, for the reflections are still there, although in a modified form, and, while the pictures can be better seen than before, they are in fact not so well lighted, and the whole gallery is gloomy and depressing.

Fig. 3. Gallery in Museum at Cairo. Showing reflections in glazed wall case of arches, and cases on opposite wall.

Not only do the large majority of pictures suffer by reason of their ineffective lighting, but many suffer considerably by being placed in positions for which they were never intended. It is, we must remember, only of late years that pictures have been painted in the hope that they will be bought either for private collections or for galleries. The great masterpieces were painted under commission to fill some particular place. The conditions of lighting were known beforehand, and the picture painted to suit them.

It is the striving for a brilliantly lighted room from the architect's point of view, apart from the consideration of the special purpose to which the building is to be applied, that has led to the retention of the usual forms of ceiling or skylight, and the total disregard of the special arrangements needed for the effective lighting of the pictures. An excellent illustration of these two points of view is afforded by two notices of the new rooms at the National Gallery in the April 1911 number of the

* The sensitised paper of course gives the actinic value of the light, but where white glass is used the actinic value and the visual value would correspond.

"Architectural Review." The architectural critic, in describing the new work, says that the rooms "are brilliantly lighted," while an editorial note in the same issue has to acknowledge, apparently reluctantly, that the complaints made of ill-arranged lighting, and consequent reflections, are just, and says "that although it is not true, as some correspondents stated, that it is absolutely impossible to see the pictures at all, still the reflections do exist to a most annoying extent."

On the one side we have the architects rejoicing that a brilliantly lighted room has been erected, on the other side the painters and picture lovers complaining that this brilliantly lighted architectural erection is in fact an architectonic inutility, in that it quite fails in the very purpose for which alone it was erected. "The excellence of every art must consist in the complete accomplishment of its purpose," is the legend cut in the entrance archway of the new Victoria and Albert Museum which leads to the gallery already referred to. In this connection Sir Lawrence Alma-Tadema may be quoted. In his speech at the reading of Mr. Weissman's paper, he said: "The best result is obtained, I believe, where the glass is in the sides of the ceiling, lighting the opposite walls only.....With top lighting, the floor is lighted, the pictures themselves are not."

This is the principle of lighting Mr. Fergusson believes was adopted for the Parthenon—a belief very widely supported. It is a more rational method, and is one that has been adopted in several galleries, certainly with only moderate success. Perfect success cannot be achieved by this principle, but failure has occurred because, as I hope to show, the methods adopted in carrying out the principle indicate that the principle was not clearly understood. The plea for this method of lighting was made in 1907, yet in spite of this we have in 1912 the new galleries designed on the old principle, leading to the same unfortunate result.

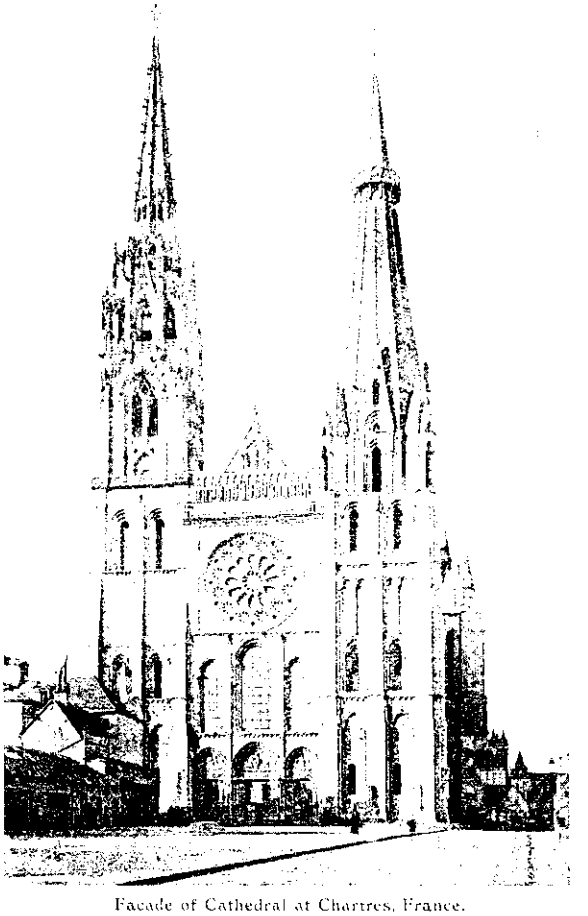
I have said enough to show clearly that all are agreed that the usual type of picture gallery, whether lantern-lighted, skylighted, or side-lighted, is either a partial or total failure as such, and that if we want to possess a picture gallery which shall be truly worthy of the name, we must disregard precedent entirely, and be guided solely by the principles which should govern the problem. Fortunately, the principles are few and simple, so few and so simple that it is astonishing they should ever have been disregarded.

1. *The angle of reflection of a ray of light is equal to the angle of incidence, that is to say that the angle at which a ray meets a reflecting surface will be the angle at which it leaves it.* If, therefore, those rays of light entering from the skylight fall on a glazed picture and make with its surface an angle of say 45°, the reflected ray from the picture to the floor will also have an angle of 45°, and so for any other angle. If we stand in such a way that these reflected rays fall upon the eye, we shall see, not the picture, but a reflected image of the skylight.

In some galleries this occurs with pictures hung high up on the side wall, and is of frequent occurrence in the end walls even when the pictures are hung on "the line" or just above it. It occurs in the end of walls of nearly all oblong galleries, as in our own galleries.

(To be continued.)

Chartres Cathedral, France



Facade of Cathedral at Chartres, France.

MADE IN GERMANY.—Geordie Ryton, the village cobbler, bought two clocks, one a grandfather's. He put it in a corner and placed a small nickel clock on the mantelshelf. The grandfather's clock has not been altered to the Daylight Saving Bill's requirements. "Hoo is't, Geordie," asked a customer, "ye've altered the smaal clock and not the gran'faither's clock?" "Wey," replied Geordie, "they said the gran'faither's clock's been tellin' the truth for ower sixty year, an' Aa can't find it in me heart te make a liar ov it noo. But the little begger wes made in Jarmany, so it'll be aall reet, he's as reet as can be for that job."—*Newcastle Chronicle.*

NITROGEN FROM THE AIR.

By J. ORCHISTON, M.I.E.E.

Mr. Orchiston's Paper on obtaining Nitrogen from the Air (a process that has been one of the main sources of supply of nitrates for Germany since she discovered it), which was published in condensed form in the newspapers, is here published in full, with an illustration of the plant required to carry out the scheme.

In 1785 Lord Cavendish and Mr. Priestley, an English chemist, discovered that by means of electrical sparks in a glass tube, nitrous vapours could be produced.

In 1902 D. R. Lovejoy and Charles S. Bradley published the results of their experiments at the Niagara Falls in the production of nitrogen from

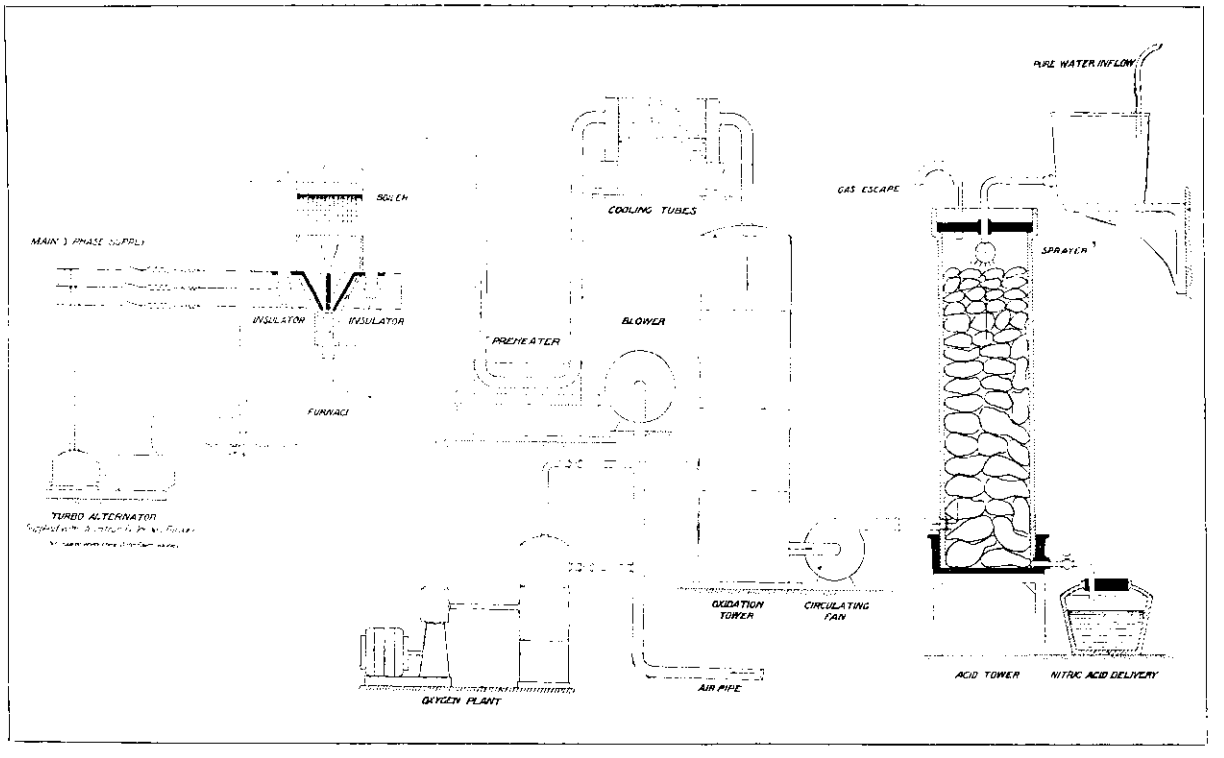


Diagram of Professor Kilburn Scott's three-phase Electric Furnace and Accessories for obtaining Nitrogen from the Air.

This furnace generates a temperature approximating 4000 degrees centigrade causing the nitrogen and oxygen of the air to combine forming nitric oxide. The gas then passes through the tubes of a steam boiler and other devices to procure rapid cooling, as it is reversible at high temperatures. After being reinforced with oxygen from the oxidation tower to form nitrogen peroxide, it then circulates through the acid fixation tower. This tower is filled with quartz or granite gravel, and has fresh water continually percolating through the gravel. The rising nitrogen peroxide gas combines with some of the hydrogen of the water, forming a dilute nitric acid. This dilute acid is next fed into other towers until it reaches a strength of from 55 to 40 per cent. of pure acid, the required standard for combining with calcium (limestone) to form calcium nitrate.

Notodden and Rjukan Falls. At that period the demands so far exceeded the production that they had orders on hand for all they could produce for twelve months ahead. It was then decided to enlist fresh capital to duplicate the factory at Rjukan. The Germans were at one time interested, but the Scandinavians would not let them have control, and the air. They used 12 h.p. of electric energy, which cost them at the rate of 18 dollars per h.p. per annum. Although this can only be classified as a laboratory experiment they demonstrated the fact that given cheap power the fixation of atmospheric nitrogen by electricity was a feasible proposition.

Shortly after Lovejoy's and Bradley's experiments, two Scandinavian inventors, Professor Birkeland and Doctor Eyde, of Norway, developed a practical scheme, and by 1911 they had some two hundred thousand horse power harnessed at the as the Norwegian Parliament passed laws having that effect, they withdrew. At the same time Lord Revelstoke was asked by French banks to appoint an expert to report on the process. The late Dr. S. P. Thompson, an electrical engineer, was chosen, and his favourable opinion caused the French to assist. They have had every reason to be satisfied with the investment, and their co-operation is fortunate for the Allies.

The duplication of the Rjukan plant which was commenced before the war, was completed last year.

The power developed on the Rjukan River now exceeds 300,000 h.p., wholly devoted to the fixation of atmospheric nitrogen by means of the direct arc process.

Before the war there were a few factories in Austria, Germany, France and Italy, where water power could be obtained at moderate cost. None of these, however, compared in size or output to that of the Norwegian factories. This is, no doubt, to be accounted for by the fact that these countries do not possess any large water powers which could be so cheaply harnessed as those of Norway.

Immediately prior to the war, Germany no doubt recognising that in spite of her submarines and Zeppelins, she might be cut off from the Chili nitrates, set about the establishment of immense works at Biterfeld, near Berlin, for the fixation of atmospheric nitrogen, using a poor class of lignite of low calorific value for generating the necessary power to drive the electric dynamos. Some hundreds of thousands of horsepower are now being generated, and according to the accounts received in the United States before relations were broken off, no less than 600,000 tons of cyanamide, 500,000 tons of nitrate, by means of the Haber process, and 400,000 tons from the gas retorts, a total of 1,500,000 tons of nitrogen compounds, were then being produced in Germany.

It is therefore very evident that but for the electric fixation of nitrogen, Germany would have been unable to find sufficient nitrogen to meet her enormous demand for the manufacture of explosives, and hence the war would, in all probability, have been over before now.

Prior to the war Germany was the largest importer of Chili nitrates, taking no less than 900,000 tons per annum. The United States was next, with 600,000 tons, while Great Britain only imported about one sixth the quantity that Germany did. The total exports of Chili nitrate was then about 2,000,000 tons per annum, now it exceeds 3,000,000, in spite of the fact that the central powers have ceased importations. Before the war it was estimated that two-thirds of the Chili exports were utilised as fertilizers, and one-third for explosives and other chemical works. Since the war these conditions have been reversed. I may here mention that Chili levies an export tax of some £2 10s. per ton, and must therefore be deriving a revenue at the present time of some seven or eight millions from this source alone.

Germany only produced some 20,000 tons of nitrate from the air in 1913, which grew to 100,000 tons during 1914, the first year of the war. After the battle of the Marne she realised that her reserves of nitrogen might not be equal to her needs, in spite of a windfall of 250,000 tons found in Antwerp. Every endeavour was then made to expedite the completion of fresh factories with the result that she is now turning out one million one hundred thousand tons of atmospheric nitrates per annum.

The power produced at the Biterfeld works costs £6 5s. 7½d. per h.p. per annum, which is a low figure for electric power produced by steam.

The cost of the hydro-electric power in Norway ranges from 5/- at Rjukan No. 1 to 24/7 at Notodden per h.p. year. It will therefore be noted that the cheap steam power developed in Germany does not compare favourably with the Norwegian water power schemes.

It has often been argued by engineers and financiers, especially in the United States and in Great Britain, that water powers have little advantage over first class steam plants, where coal can be obtained at moderate cost. This holds good where expensive races, dams, and pipe lines have to be provided, which, in addition to a high capital outlay, may involve heavy maintenance charges for the upkeep of the races, renewal of pipes, etc. In most cases first class water powers are located in mountainous regions far removed from close settlement. It is true that the modern development in the electric transmission of power has enabled many water powers to be utilised, which were otherwise of no practicable value owing to their inaccessible locations. Such electric transmission has its limits, however, largely from an £. s. d. point of view. The greater the distance the more expensive such transmission becomes, not only proportionately according to the added length of the transmission line, but the greater the distance the greater the electrical difficulties.

Reverting to the relative costs of the Norwegian and German power plants, these two systems are probably the cheapest of their kind, and among the largest power stations in the world. We have therefore a clear outline of the relative costs of both water and steam power under the most favourable conditions obtainable in each case. It will be observed that the power produced by the German steam plant at Biterfeld is over fifteen times more costly than that of the Norwegian water power at Rjukan. Hitherto the two principal methods of fixing atmospheric nitrogen have been 1st, that adopted by the Norwegians, called the direct arc process for the production of a dilute nitric acid, which I will explain shortly, and the other the manufacture of cyanamide, which process was accidentally discovered by Professor Adolph Frank and Dr. N. Caro, two Germans, while endeavouring to produce a cheap form of cyanide so largely used in mining. Briefly, cyanamide consists of ground calcium carbide impregnated with pure nitrogen gas obtained by liquifying the air under a pressure of some two hundred atmospheres. The process involves a considerable amount of labour, in addition to the cost of coke and lime for the manufacture of the calcium carbide. The finished product contains about 18 per cent. of nitrogen.

Under this system the amount of nitrogen fixed is four times as much for any given power as compared to the direct arc process mostly in vogue in Norway. Hence the German preference for the cyanamide process, seeing that with them power is costly as compared to Norway, while labour in Germany is cheap.

It may be said of the direct arc process that it is a glutton for power, and unless the power can be obtained in large quantity and at low cost such method would not be a payable proposition.

The principal advantage of the direct arc process is its great economy of labour as compared to the

gross value of the output. As far as I can at present judge, the value of the product should exceed one thousand pounds per annum for each man employed at the works.

It is a recognised fact that New Zealand cannot successfully compete in the world's markets in the supply of goods which depend upon labour as the chief item in their production. Only those products which emanate from the natural resources of the country figure largely in our exports, such as wool, frozen meat, butter, cheese, gold, flax, kauri gum and timber. Although at one time the Dominion was a large exporter of grain, she is now an importer, largely due to labour conditions, as although the gross return is much less it is found to be safer to devote the land to raising sheep for their wool and mutton. Continuous cropping will, of course, also exhaust the stored up nitrogen in the soil.

The point I wish to emphasise is that in the manufacture of calcium nitrate by the direct arc process, the amount of labour involved in comparison to the value of the output is less than that pertaining to any of our exports excepting that of wool, and it may even run wool for first place.

The whole question therefore hinges on whether we can harness water power in sufficiently large units, and at bedrock cost, for both capital outlay and annual upkeep.

I may set your minds at rest in so far as the North Island is concerned by stating there is no water power in this Island of sufficient magnitude, combined with cheapness in developing and facility for transport of the manufactured article, which would be of value for the purpose. The only water powers which comply with all requirements are those located on the West Coast of Otago, and in so far as the facilities for cheap installation and convenience to deep water harbours are concerned they are unique, and I doubt if they can be surpassed in any other part of the world.

The energy going to waste in the West of Otago approximates two million horse power. If the outlet of Lake Te Anau was diverted to George Sound by means of a five mile tunnel, no less than three quarters of a million horse-power could be obtained from this source alone. (a conservative estimate given by the late Mr. Hay, Chief Engineer of the Public Works Department). The initial capital per h.p. developed would be low, and in all probability the annual charges would not exceed the Norwegian record with the added advantage that the Te Anau power would be delivered alongside a deep water harbour: whereas the Norwegian power is 86 miles inland, involving the transport of goods by two sections of railway line separated by ferry steamers and finally conveyed by small river steamers to the Port of Skien.

I may here mention that the hydro-electric development at Niagara has cost about twenty pounds for each horse power installed, whereas the Te Anau power would probably be nearer five pounds.

The power sold at Niagara during the year 1909 realised £3 12s. 5d. per h.p. for that utilised in chemical works such as the manufacture of calcium carbide, carborundum, etc. This figure is too costly for the production of atmospheric nitrogen by means of the direct arc process. To better illustrate this, approximately one and a half horse power is required night and day continuously for a whole year to produce a ton of calcium nitrate. The Niagara charges for the power alone would therefore amount to about £5 8s. 8d.—a figure in excess of the whole estimated cost of producing a ton of calcium nitrate at the Bowen Falls, Milford Sound. On the Canadian side of the Falls, however, sixty-four thousand tons of cyanamide were turned out last year.

Perhaps I should here mention the fact that a syndicate was formed in Dunedin some months ago for the purpose of prosecuting the manufacture of atmospheric nitrogen and other electro-chemical productions. Application was made to the Government for the power contained in the Bowen River, Milford Sound, but so far consent has been withheld. The Bowen can be cheaply harnessed by means of a comparatively short incline tunnel, and would produce from 15,000 to 30,000 horse power. It is conveniently situated alongside deep-water, and has all the elements necessary for the establishment of a successful factory on a moderate scale. There are also a number of other possible powers, ranging from ten to twenty thousand horse power within five to fifteen miles, which could all be economically conveyed to the factory by electric transmission if required. The Bowen alone has sufficient capacity to produce one hundred thousand pounds worth of products per annum. It is therefore obvious that it would be in the best interests of the Dominion to encourage such an industry instead of allowing the water to run aimlessly to waste as hitherto. As the Bowen only represents from one to one and a half per cent. of the total energy available in the West of Otago it will be seen that there are vast possibilities in this region. It is only a matter of time when it will all be utilised producing many millions of pounds worth of useful products annually. As an indication of what can be done, the output of the two Norwegian factories at Notodden and Rjukan in 1911 (the year during which they held orders for twelve months ahead) was 90,000 tons of calcium nitrates, 12,000 tons of sodium nitrates, and 4,000 tons of ammonium nitrate. The calcium nitrate was being sold c.i.f. English ports at £7 15s. per ton, and the ammonium nitrate about twenty pounds. Allowing two pounds ten for transport charges across the lakes, rivers, and two separate lines of rail in addition to the ocean freight, this left only £5 10s. and £17 15s. per ton respectively, representing a net total of some six hundred and thirty thousand pounds at the factories. This provided a good dividend, and induced them to find fresh capital for duplicating their principal factory as already indicated.

At the present prices for calcium carbide in New Zealand the Bowen power would easily pay a hundred per cent. dividend, and carry forward a substantial balance, but of course things are altogether abnormal just now, nevertheless that would be a very profitable side line under any conditions, seeing that the cost of the power would be only one sixth of the Niagara power, where so much calcium carbide is manufactured.

Although nitrogen is one of the most prevalent elements forming over seventy-eight per cent. of the air we breath, the remainder being oxygen, it is very elusive, and therefore difficult to capture and imprison in a marketable form. Foods may vary, and so do explosives, but when analysed there is ever present one chemical element in both, and that is nitrogen. It is true there are other constituents, possibly in greater proportion, so why single out nitrogen? Because in nature's workshop and in man's munition factory nitrogen is the scarcest of the indispensable materials. The others are just as essential, but they can be obtained more easily. The supply of nitrogen is usually the first to give out, and when that happens the production comes to a standstill, either in the soil or the factory. Experience has shown that land holding three-tenths of one per cent. of nitrogen will prove very fruitful, other things being equal. It may produce from thirty to forty bushels of wheat to the acre. Soil containing two-tenths of one per cent. will probably be good for about twenty-five bushels per acre. If one-tenth of one per cent. it may produce fifteen bushels, but if this essential plant food be as low as one-twentieth of one per cent. the ground will be too poor to produce a profitable crop. In so far as the North Island is concerned there is not so much need for this fertilizer as in agricultural countries. As a rule virgin lands contain a fair percentage of this element.

In the early eighties a yield of one hundred and thirty bushels of potatoes per acre was considered a prime crop in Germany, but by 1914 the application of Chili nitrates had made it possible to count upon an output of two hundred and ten bushels per acre. Because the same course was not followed by the farmers in Russia, Austro-Hungary, France and Italy with similar, if not better soil, they have not improved upon their crops of thirty or forty years ago. On the other hand Great Britain, Belgium and Holland, profiting by Germany's example, were able to increase their production from fifty to one hundred per cent.

Experience has shown that every pound of nitrogen rightly applied to the soil increases the yield of wheat, rye, barley or oats, by about twenty pounds of grain and forty lbs. of straw. In the case of potatoes one pound of nitrogen will better the yield of about eighty-five pounds.

Hitherto nitrogen fertilisers have not been much in demand in New Zealand. This is accounted for by the fact that virgin soils are not so deficient in this element as ground which has had a number of crops taken off it. Another, and a very good one, is the fact that Chili nitrates have been too costly as compared to phosphatic manure. It is estimated that calcium nitrate can be produced at the Bowen and sold to the farmers within the Dominion at about one half the price previously charged for Chili sodium nitrate. It should not be overlooked that when nitrate of soda, the natural product of Chili gives up its nitrogen to plants sodium is left behind, and may be deleterious to the soil. On the other hand electrically produced fertilisers containing calcium, leave only lime in the soil, which is usually advantageous.

Before closing this paper it should be mentioned that Prof. John E. Bucher, of Brown University, New York, has brought out a patent for the fixation of atmospheric nitrogen without the aid of electricity. It seems to be a modification of the Haber process largely used in Germany. The substance of his discovery is that nitrogen will combine with an alkali and carbon in the presence of iron as a catalyst producing the cyanide. Reduced to concrete terms this means that he mixes soda ash and powdered iron with powdered coke; upon heating this mixture in an ordinary furnace and running air over it, the result is cyanide of soda, leaving the iron uncombined. It is obvious that soda ash, powdered iron and coke cannot be obtained for nothing, and that coal must be consumed in heating the furnace I am therefore inclined to think that the Norwegians, with their cheap power, will not be greatly alarmed, nor will the promoters of the Bowen Falls scheme. The chief advantage of this discovery is that a factory can be quickly installed and may be producing nitrogen before the surveys of a large hydro-electric scheme are completed. There is an enormous demand for nitrogen in the United States at present for explosives, as well as for fertilisers, and it appears that the Government are devoting four million dollars for the fixation of atmospheric nitrogen, possibly adopting Prof. Bucher's scheme. A twenty million dollar vote was passed some time ago for the establishment of a hydro-electric factory for nitrogen fixation, but from the latest accounts the committee were still considering the question of a site. A great deal of preliminary survey work is involved before the best selection can be fixed upon.

Houses that will not Burn.

Why should we build combustible dwellings and then pay insurance companies to reimburse us in case they should go up in smoke? If they do not burn, we have had no "run for our money," while if they do, we usually lose many things that money will never replace. Why not build an incombustible house to start with? A writer in "Expert American Industries" (New York) assures us that such a thing is now a reality, and he gives a description of it in minute detail, the salient parts of which we quote below. The interesting thing is that a house that will not burn costs only a little over 30 per cent. more than a quick burner, the respective prices, as given in the magazine named above, being 21 and 16 cents per cubic foot. The frame is of steel, and all walls, partitions, ceilings, floors, and roof are steel and cement. The roof is of concrete and over the concrete is placed a waterproofing which is so elastic and pliable that contraction and expansion have no effect upon it. The waterproof film is always perfect and protects the concrete. The partitions are two inches thick and are of solid concrete reinforced with a special material. In addition to being fire-retardant, like the entire structure, and proof against fire, flood, wind, and earthquake, the partitions are wonderful space-savers. Conduits, water-pipes, etc., are taken care of as easily as with hollow partitions. We read on:—

"The stairway, an important detail in the construction of any fireproof building, is proof against the action of flames. There is no chance for the stairway to be transformed into a vertical flue to carry fire upward, as there is nothing in it to burn.

"The interior trim is of wood fastened with screws. Metal trim can be used if desired. Details of this character can be adapted to the taste of the builder without much affecting the fireproof qualities of the structure. . . . .

"The cost of the fireproof house as built is approximately 21 cents per cubic foot.

"If built with 12-inch solid brick walls with same interior it would cost 28 cents per cubic foot. . . .

If built with stucco on hollow tile with wood interior it would cost 17 cents per cubic foot.

"If built of stucco on metal lath with wood interior it would cost 16 cents per cubic foot."

The man who wishes to build an incombustible house, however, is by no means limited to one kind. Another is illustrated and described in "The Scientific American" (New York), and doubtless there are, or soon will be, as many varieties as there now are of houses that will blaze. Says the last-named paper:—

"Boards of concrete, with joists, rafters, and stair-frames of the same material, are used in the construction of a novel building in Los Angeles, California, the whole being set upon a concrete foundation. Though put together after the manner of a frame-structure, the building is as fireproof and durable as the more common types of cement houses, but it requires less material and is lighter in weight.

"The various parts are poured into forms on the ground near the site and in that way the danger of breakage is eliminated. The clapboards are poured in sets of ten, the forms being securely clamped together, and the cement allowed to harden in them for several days. Then they are taken out and allowed to cure before being set up. This should be done while the preliminary work is going on, such as excavating and laying the foundation.

"The joists, rafters, and other parts are formed in the same manner, and various types of reinforcing are used for each. The boards are reinforced with mesh like chicken-wire, while the timbers have iron rods of varying thickness to strengthen them. These are allowed to project at one end in order to fit into corresponding holes in other timbers, so that the whole framework dovetails. The method of attaching the boards to the 2 by 4's is with nails, and nail-holes are bored into the cement boards before they have set, by running a wire through them. As the cement timbers will not take the nails a strip of wood about an inch and a-half thick is wired to the cement scantling."

Personal.

Mr. F. de J. Clere, F.R.I.B.A., of Wellington, announces that he has taken Mr. L. C. Williams, A.R.I.B.A., into partnership, and that the firm will be known in the future as Clere and Williams, carrying on business at 157 Featherston Street.

Obituary.

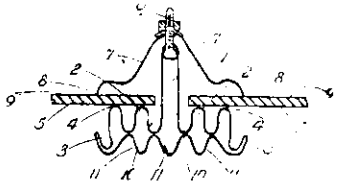
Mr. W. A. P. Clarkson, who died suddenly at his residence in Rugby street on Friday, the 9th inst., was a well-known Christchurch architect, and eldest son of the late Mr. Samuel Clarkson, one of Canterbury's early colonists. The late Mr. Clarkson was born in Christchurch, and at the time of his death was fifty-four years of age. In his youth he was articled to Mr. J. C. Maddison, and on the completion of his time left for England, where he studied his profession, and gained an A.R.I.B.A. degree. After travelling around England, Mr. Clarkson came back to New Zealand, visiting South Africa and Australia en route, and set up in business on his own account in Christchurch. He designed several prominent buildings, including the Canterbury Hall, and (in conjunction with Mr. F. J. Barlow) Messrs. Tonks, Norton and Co.'s premises, Hereford street, and a number of other public and private buildings. During part of his career he was in partnership with Mr. R. A. Ballantyne, but subsequently again launched out on his own account. He was president of the Christchurch Architects' Institute for several years, and on its council at the time of his death. The late Mr. Clarkson was well-known and popular among city architects, but took no active part in public life. He was an ardent horticulturist.

* * * *

By the death of Second Lieut. Murdoch Keith Macleod (killed in action) the architectural profession has lost one of the most gifted of the younger New Zealand architects. He had in a greater measure than many that essential combination of qualities which go to the making of a successful architect—a good draughtsman, with power of invention and design, excellent business capacity, and, above all, a perfect sense of fairness and integrity. His frank and genial manner endeared him to all with whom he had business or social relations. Born in Canterbury on October 6th, 1890, he passed his early years in the country and received his primary education at the Templeton School. Moving to Christchurch in 1904, he entered the Boys' High School, where he took the Second Form prize in 1906, being first in French and first in art. His promise in art led the headmaster to recommend that he should enter the architectural profession, and as a result he was articled to the firm of Messrs. Hurst Seager and Wood in August, 1906. During the term of his indentures he attended classes at the Technical College and at the School of Art, where he gained a free scholarship in 1910, and continued to hold it during 1911. He was looked upon by the masters as one of the school's best students. From 1908 to 1910 he completed his indentures under Mr. Hurst Seager, and then became his assistant. In March, 1914, he became a partner, and was actively engaged principally in domestic work until he enlisted in the 16th Reinforcement. He entered the N.C.O. class, and soon gained his sergeant's stripes, and afterwards his lieutenancy. He spent twelve months in camp, and did not leave till February 16th last, with the 22nd Reinforcements. He reached the front just after the battle of Messines, and met his death on 13th inst.

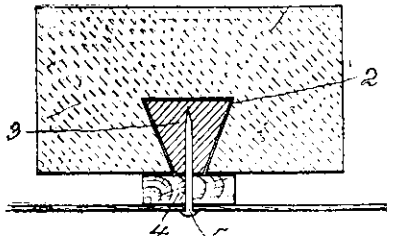
Patents of Interest to Builders.

Glazing Bar.—A patent No. 39059 has been taken out by W. Stanley Cayzer, of St. Kilda, Dunedin, according to which the bar consists of a central vertical hollow web-member 1 projecting upwards and flanked on either side by a series of corrugations 2 ending in a groove 3, the tops 4 of the said corrugations 2 being straight and adapted to bear the lower



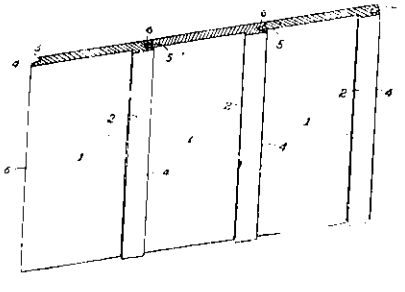
side of the glass 5. Screws or bolts 6 are attached to the central hollow web-member 1, and are used to secure a sheet-metal cap-member 7 having its outer edges 8 straight and so disposed as to bear firmly on the upper surface 9 of the glass and prevent moisture from passing through. In one form of the invention a double series of corrugations 11 being placed below the other 2, thus forming a reinforcement.

Building Brick.—A patent, No. 38,905, has been taken out by Henry Pugh and Harry V. Baker of Christchurch. According to this invention, in one side of the brick 1 is formed, in the process of its manufacture, a vertical groove or mortise 2, having inwardly flaring sides adapted to re-



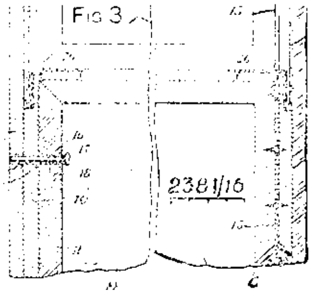
ceive dovetailwise a correspondingly shaped block of wood 3, which may be dropped into place when the brick is being laid. In practice, the bricks so formed are employed in place of the ordinary bricks at those positions in the construction where woodwork 4 is to be attached, thus providing the necessary hold for the nails or fastenings 5.

Panelling.—A patent for wall panelling No. 38,470, has been taken out by Geo. A. Nicks and F. Henderson, of Mt. Eden, Auckland. At present, it is said, panelling is constructed by first securing wide or panel boards side by side, and then covering the meeting-edges of or spaces between said boards by means of separate strips or covering-pieces.



According to this invention, the separate covering-pieces or strips are dispensed with, and each section or board of the panelling is formed so that when a number of sections are fitted together side by side the whole construction or assemblage of sections has the appearance of panelling constructed and fitted in the ordinary way.

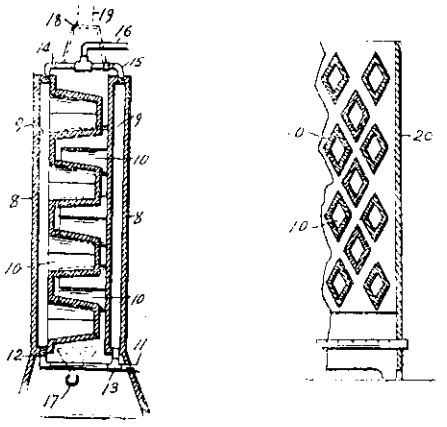
Window Mounting.—A patent, No, 2,381, has been taken out by W. J. Connors, of California. To enable both sides of the upper and lower sections to be cleaned without the use of a step-ladder or removel of the wire screen, each sash, which contains an inwardly opening hinged glazed section, is adapted to slide on the stile when locking-bolts are partially withdrawn.



Headed bushings 18, 19, 20 are inserted in the hinged section 11, sliding sash 10, and casing stile 1 respectively. The locking-bolt 16 is provided with a groove into which a tongue from the bushing 18 projects to prevent total removal of the bolt. To strengthen the sash L-shaped metal strips 25 are secured to each corner of the sashes may be formed of sheet metal.

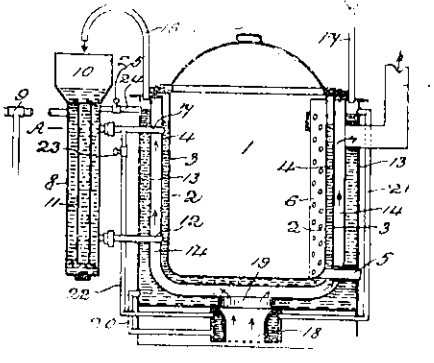
Water-Heater.—A patent, no 38,006, has been taken out by J. D Jackson of 18 Sorth Street, Manly, Sydney. Externally the heater is preferably of rectangular shape, and comprises essentially a water-jacket or outer water-space on two or more sides, transversely or longitudinally with which are arranged or fitted at intervals a series of hollow baffles or tubes in communication with a jacket on opposite sides alternately. The said baffles or tubes may, however, be open at both ends, being secured to opposite inner walls of the

water-jackets. The baffles or tubes are also arranged vertically in rows, but each row is staggered relatively to the one above and below it, so that the rising heating gases strike first against the baffles or tubes in the lowermost row and are diverted against those in the row above, and so on to the outlet for the waste gases, which extends the length of the



heater. The cold-water inlet is at the bottom, and in those having the baffles closed at one end a branched pipe leads to each jacket, a similar branched pipe from each jacket at top leading to the hot-water outlet. The gas-burner preferably consists of a perforated tube which extends substantially the whole length of the heater.

Geyser or Water Heating Apparatus.—A patent No. 37,736, has been taken out by Mathew Arlow, of 204 Castle Street, Christchurch. According to this invention, the water-jacket 4 of the vessel 1 is surrounded by a second water-jacket 13, which is arranged concentric with the water-jacket 4 at a suitable interval, so as to provide an intermediate flue-space 14, which the heated gases from the fire are caused to traverse in passing to the chimney or funnel 15, thus utilising the heat, which would otherwise be lost in radiation, to heat the water in the jacket 13. The hot water generated in the jacket 13 rises through the pipe 16, and is discharged in to the funnel 10, thus feeding the water-jacket 4. For the purpose of supplying cold water to the jacket 13, the latter may be provided with an inlet-pipe 17, into which water may be poured or allowed to flow from a tap, or an



ordinary ball cock or other device may be employed to provide the feed automatically as required. The necessary heating for the water in the jackets 4 and 13 is provided by means of a small furnace 18, arranged in the base or foundation upon which the apparatus is supported, and a suitable opening or aperture 19 is provided in the bottom of the water-jacket 13 directly above the furnace to permit of the heated gases passing therethrough and so entering the flue-space 14, as indicated by the arrows. The furnace 18 preferably takes the form of a double-check boiler, similar to those at present employed in ranges for heating the water in domestic water-services, and consisting of a hollow vessel of cast iron of any desired shape, and adapted to contain water, or such boiler may consist of a suitably formed coil of

tubing. By this arrangement water is supplied to the boiler from the jacket 13, as by means of a pipe 20, and the hot water and steam from such boiler delivered to the jacket 13 by means of one or more pipes 21. To enable the steam from the boiler to be employed directly without passing through the jacket 13, however, a pipe 22 is provided to communicate between the top of the boiler and the pipe 7, a suitable cock 23 being arranged in the pipe 22 to intercept the flow of such steam when desired. To enable steam or hot water from the jacket 13 to be employed directly without passing through the jacket 4, a pipe 24 is employed to communicate between the water jacket 13 and the cylinder 8, such pipe being provided with a cock 25, by means of which the flow of steam or hot water may be controlled as desired.

Building Notes.

AUCKLAND.

There is a proposal to raise £50,000 to build a suitable Soldiers' Club in Auckland emanating from the Returned Soldiers' Association. The purpose of the Club, it was stated, would be to provide accommodation for crippled, homeless, returned soldiers, to offer accommodation for visiting country members, and to provide reading and writing-rooms, diningrooms, social hall, billiardroom, games, gymnasium and other facilities. It was stated that about £20,000 would be required for the purchase of a site, and that about £30,000 would be needed to cover the cost of the building.

The Pukekohe Collieries, Ltd., called for tenders for the erection of 10 workers' cottages at Pukekohe last month.

Messrs. W. A. McCann and L. V. Moses, architects, called for tenders for a villa to be erected at Mt. Eden.

One part of the Auckland market buildings was occupied last month, and Fletcher Bros. have undertaken to complete the whole contract in December.

CANTERBURY.

Messrs. Collins and Harman called for tenders for additions to Nurses' Home, Christchurch Hospital, during the month.

The Education Board called for tenders for addition in brick to Berkeeham School.

Messrs. Hurst Seager and McLeod are callin for tenders for the erection of a wooden Anglican Church at Cuivenden, and Mr. Lovell Smith, called for tenders for a residence in Collingwood St., New Brighton.

The Ashburton Hospital trustees have written to the South Canterbury Board agreeing to the sale of the Sanatorium land which the two bodies named bought conjointly near Fairlie. The land is to be sold, as there is no prospect of building on it as originally intended.

DUNEDIN.

Building matters in Dunedin are reported to be much better than last month. A tender amounting to £3,500 has been accepted by the Public Works Department from Mr. J. A. McKinnon for alterations to the old Police Station to provide accommodation for certain Government departments now housed elsewhere, and tenders have been called for the erection of additional storage accommodation at the Burnside Freezing Works, the estimated cost being over £10,000, for which work Mr. Panton, of Timaru, is the architect. Tenders have also been called for a cool store at Victoria Wharf costing £4,000, for which work Mr. Leslie D. Coombs, A.R.I.B.A., is architect. Mr. Ascoombe is architect for a new house for Mr. W. Telford at Waiwera, which will cost about £5,000. There is also a proposal to add an assembly room to the Technical School, though builders have a doubt whether this work will be gone on with immediately, and minor alterations at the Dunedin Hospital and other small work about the town should shortly be put in hand. There is also the building of the new hospital at Wakari, the plans for which were sent to Wellington for approval some time ago. Carpenters are fairly plentiful, but there is a distinct shortage of bricklayers. A number of bricklayers are at present employed on the alterations at the Balclutha Freezing Works.

Messrs Salmond and Vanes, A.R.I.B.A., have in hand the McGlashan College (Presbyterian Boys' School), and Mr. Mandeno the Bank of New Zealand at Mosgiel, as well as the additions to the Technical School, Dunedin.

The annual meeting of the Otago branch of the N.Z. Institute of Architects was held last month, the following having been elected officers:—Mr. Basil Hooper, A.R.I.B.A., President; Mr. Parton, Vice-President; Mr. Mandeno, Secretary; and Messrs. Wales, Salmond, Walden and McFie (Associate Member), Committee.

A contract has been let by the Board of Governors of Columba College to Messrs. Fletcher Bros. for extensive additions to Columba College. Messrs. Mason and Wales are the architects. The additions comprise a three storey block, with out-buildings. The ground floor will contain a suite of music rooms, and also a dining hall to seat over 100 persons. The first floor will have a suite of rooms for hospital purposes. This will be capable of being isolated in case of necessity at a moment's notice. The bedrooms will be arranged for one, or two, or three boarders each. It is expected that the building will be finished about the end of April next. The front and side elevations will be built, as is the rest of the house, of bluestone faced with white Oamaru stone. When completed the house will afford accommodation for 80 boarders. The contract price is £6,620.

WELLINGTON.

"Our building scheme for the present year is a fairly extensive one," said the Managing Director of the W.F.C.A. at the annual meeting of the Coy., "as we have let a contract for a warehouse at the corner of Waring-Taylor and Featherston streets, and another contract for a wool store at Thornton Quay, both in Wellington. The warehouse is being built on a section we are leasing from the City Corporation on a 50 years' lease. In addition to these contracts, we made during the past year large additions to our brick store, Masterton, and purchased a brick building in Dannevirke containing offices for the stock department and United Farmers' branch."