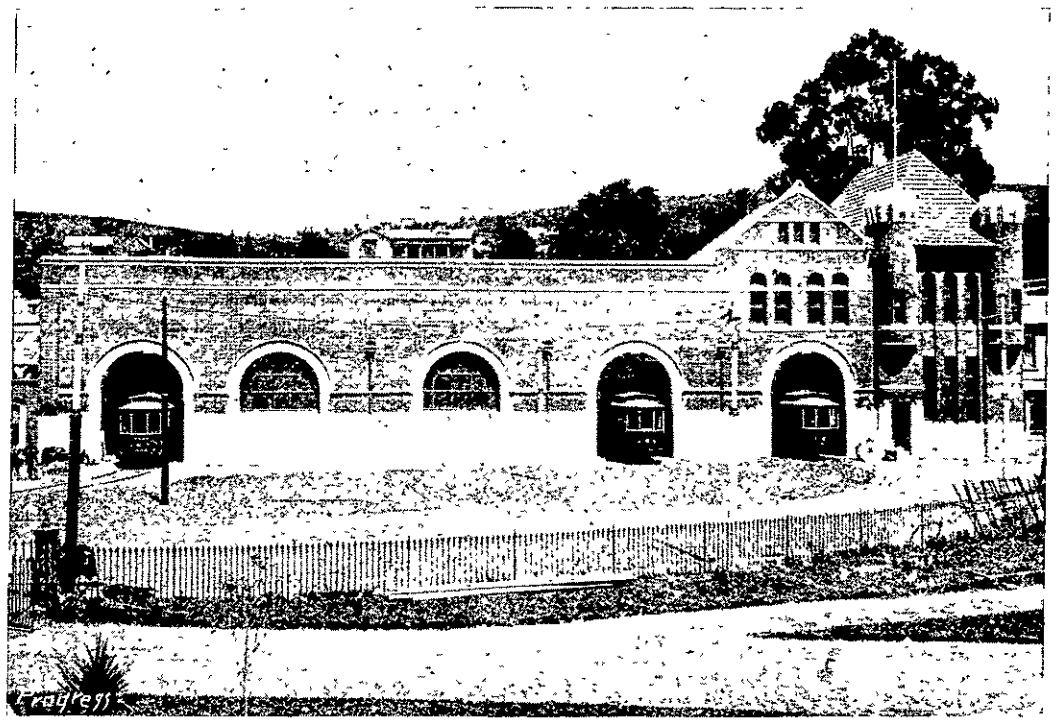
the feeder wire is carried overhead on the poles. The conduits also carry the cables for the arc lamps—there being one lamp on every second pole through the main streets, controlled from the power house.

The rails are 93 lbs. to the yard, in lengths of forty feet, laid on Australian hardwood sleepers 7 ft. 6 in. x 9 ft. x 4½ in., and are to standard gauge of 4 ft. 8½ in. Tie rods are placed about every 8 ft. The whole of the track is ballasted and top dressed with asphalt, except in Custom House square, where Neuchatel asphalt is laid, thus making a clean, smooth surface. Where the ground is at all poor, a good bed of concrete has been laid underneath. Each rail joint is bonded with Brown's plastic bond, and each rail is cross-bonded to the other side of the track by a No. OO copper wire. Every eighty feet of double track is also cross-bonded in the same manner between the inner rails. As evidence of the smartness with which the contractors worked on the permanent way, it took exactly twelve working days to do 130 chains of the city section from Albany street, to Dowling street. The work was commenced on the 7th. January, 1904, and tracks were boxed up on the 23rd. of that month. The total length of single track when completed will be twenty miles, of which fifteen-and-a-half is now open for traffic. The total number of passengers carried from the opening of the line to the end of May, 1905,—that is, seventeen months—was 10¾ millions, with only two fatal accidents, and during the greater part of that time only half of the system was running During the twelve months ending May 31st., over 7 millions were carried, which shows that the system has a good future before it when completed 650,000 car miles were run during that twelve months.

Several cars still in traffic have done over 41,000 miles each without renewing wheels.

£250,000 was voted for this system, and the whole of the work was carried out by Messrs. Noyes Bros., who were appointed consulting and construction engineers to the Dunedin Corporation. Mr. W. G. T. Goodman is chief engineer to Messrs. Noyes Bros, he having been assisted in the work of construction by Messrs. F. R. Shepherd, J. H Brearley, E. W. Ackland, and J. Bowman.



CAR HOUSE, DUNEDIN ELECTRIC TRAMS. [*Guy, Photo, Dunedin.*

NOTES ON EARTHQUAKES AND THEIR RELATION TO BUILDING CONSTRUCTION IN NEW ZEALAND.

By F. DE J. CLERE, F.R.I.B.A.

SECOND PAPER.

The following are notes on the Building Regulations for Ischia, Italy.

"A solid foundation should be obtained so far as is technically possible."

"Construction of iron and timber are much more safe than those of simple masonry"

"Walls built of brick are better than those of stone."

"Vaults and arches of masonry above ground should be prohibited."

"Buildings should not have more than two stories and a cellar."

"Composite construction of iron and masonry cannot be considered with regard to safety, comfort and durability as adapted to countries threatened by earthquakes"

"In the province of Belluno a great many buildings have been strengthened by means of keys, chains and iron bands."

"In the Levant buildings are frequently framed together, and then covered on each side with a trellis of laths or canes, which are in their turn plastered."

"According to a long experience, cellars may be constructed with ordinary masonry."

Timber-framed buildings, covered with rough cast, are strongly recommended; the danger from fire being prevented by anti-igneous preparations,

After the terrible earthquake in Lisbon of 1755, this timber construction was insisted upon, and the number of stories, above the soil, was limited to two. The timber used was fir from northern Europe. When the law was relaxed, timber buildings of four or five stories were built.

In Japan this system of "barrack masonry," as it is called, is very extensively used, and the rough-cast surface offers the greatest resistance to flames.

In lower Chili, it is the custom to construct buildings of only one story. Bricks are notched to fit the timber framing.

In Lima the ground floor is generally of strong masonry, and when there is an upper floor it is of very light timber.

In Calabria houses, which were not built on the "barrack" system, contained a special earthquake- proof room with an internal frame of iron bars, in which people could take refuge.

For roofs complete trusses should be used and not mere rafters resting on walls.

Embossed ornaments likely to fall are forbidden for ceilings.

Vaults (arched floors) made of stone or brick (exercising thrust)- are forbidden in any part above the cellar.

Chimney flues which reduce the walls to less than the regulation thickness are forbidden.

In the regulations for the Ligurian Commune the rules drawn up are largely of the nature of ordinary good building regulations, and in most respects are similar to those of New Zealand Squared stones are insisted upon, but the assumption is that ordinary lime-mortar is used. Flints are forbidden, as mortar does not well adhere to them.

The building laws of Manila and of Ischia contain many other regulations than those noted herein, but they relate largely to the power and duties of the controlling bodies, or have reference to matters that are not applicable to the conditions of life in New Zealand, or to the materials which are in use in this part of the globe.

It must, I think, strike the reader that the building regulations are exceedingly crude, and, if similar ones become law in a progressive country, they would tend to check improvements in general construction. Then the thickness required for walls must be an indication that the masonry is exceedingly bad The sweeping condemnation of composite construction is certainly against modern ideas and in direct contradiction to those of Ischia, where the "barrack" system is strongly recommended.

In some parts of Central America, I understand that walls are formed by posts fixed into the ground and cased in large sun-dried bricks—each brick being made in lengths to cover the distance between the centres of the posts, a groove in each end containing half the timber.

After my 27 years experience in this colony, and after reading all I can find on the subject of earthquakes, I have come to the conclusion that the aim of our laws should be to promote strong buildings, and that very little else can be done to counteract the effects of earthquakes Brickwork is better than rubble masonry in many respects, for the strength of the whole wall is even, and owing to the proportion and shape of each brick there is no wedging tendency in any part of the wall On the other hand rubble formed with strong cement has much of the nature of good concrete, and, as such, its use ought not to be forbidden

(To be concluded.)

Advance, New Zealand!

THERE is no surer indication of the enterprise and progressiveness of a people than the amount of activity displayed by its inventors. It is gratifying to know that New Zealand in this, as well as in many other matters, leads the world. The following statistics are based upon the patent records of the Australian Commonwealth, and show the ratio according to population, of the applications for Patents of Australia filed by residents of the countries given below.—

Country	Year	Applications	Population	Applications per 10,000
Australia ..	1904	2,563	3,984,376	6.4
Canada	1903	5,793	5,528,847	10.4
Great Britain ..	1904	29,655	42,789,552	7.0
New Zealand ..	1904	1,491	857,533	17.4
United States of America ..	1900	50,213	76,303,387	6.6

Provisional Protection for Inventions.

By E. S. BALDWIN, M.E., Queen's Prizeman, South Kensington.

GREAT Britain and her colonies stand alone in providing means for the provisional protection of inventions, and even Great Britain has recently curtailed the period of provisional protection from nine to six months This innovation has apparently been tacitly accepted by patent agents and inventors, and we may well be surprised that such a curtailment of acquired rights should have been so accepted. Provisional protection, besides other benefits, grants protection upon a specification in which merely the nature of the invention is set out. The application is kept secret until the complete specification is filed. Thus the inventor can pursue his experiments or trials in public without fear of invalidating his rights to protection, and be protected against anticipation as effectually as if he had complete protection. He cannot, however, sue for acts of infringement committed before the acceptance and gazetting of his complete specification.

Provisional protection affords the further benefit that the invention is not published abroad by the fact of filing his application. His subsequent application for patent abroad is, therefore, not invalidated by publication of the invention by his own act. He can obtain protection at a small cost while he arranged his finances for the larger outlay to protect the invention in foreign countries.

The important question almost daily arises of adding to a specification after it has been accepted. The Act allows amendment of a specification by way of correction, disclaimer or explanation. Anything which would increase the scope of the specification would not be allowed. A fresh application must be made to protect the added matter, and the usual taxes must be paid on both applications.

A very beneficial alteration in the law might be made by allowing an applicant to add to his specification during the period of protection, with the proviso that he could not sue for infringement of any added part upon acts committed prior to the date of filing such added part If this alteration was made in the patent law, one set of taxes would be payable on the whole invention. Seeing the large surplus derived from Patent Office fees, the concession suggested might well receive the attention of our legislators.

Gas engines of 5,400 brake horse power are being built for the new power station of the California Gas and Electric Company at San Francisco.