NEW ZEALAND
GOVERNMENT GAZETTE.

(PROVINCE OF WELLINGTON.)

Published by Authority.

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By His Honor's command,

WILLIAM FITZHERBERT, *Provincial Secretary*

VOL. II.] WEDNESDAY, OCTOBER 17, 1855. [No. 14.

PROCLAMATION.

By His Honor ISAAC EARL FEATHERSTON, ESQ., *Superintendent of the Province of Wellington, in the Islands of New Zealand.*

WHEREAS an Act was passed by the Provincial Council of the said Province (Session I, No. 13) for the purpose of making further and other provisions relative to fencing within the Province; and, by the said Act, it is enacted that the Superintendent, whenever it shall appear to him expedient so to do, may by Proclamation, declare that the said Act shall come into operation within any Town or District of the Province, and, by the same Proclamation, declare the limits of such Town or District. AND WHEREAS it appears expedient to me that the said Act should be brought into operation within the Town of "Grey Town" in the Wairarapa District in the said Province. Now, THEREFORE, I, the said Isaac Earl Featherston, Superintendent of the Province of Wellington, by virtue of the authority in me vested as aforesaid, in this behalf, do hereby proclaim and declare that the said Act of the Provincial Council of the Province of Wellington, Session I, No. 13, intituled an Act to make further provisions relative to fencing within Districts of the Province, shall come into operation within the Town of Grey Town, aforesaid. And, I, the said Superintendent do hereby also declare that the limits of the said Town, for the purposes aforesaid, shall be the boundaries thereof, as described and laid down in the Government plan of the same Town.

GIVEN under my hand and issued under the public seal of the Province of Wellington, at Wellington, the fourth day of October, one thousand eight hundred and fifty-five.

I. E. FEATHERSTON,
Superintendent.

By his Honor's command,
WILLIAM FITZHERBERT,
Provincial Secretary.

Provincial Secretary's Office.
Wellington, October 6th, 1855.

HIS Honor the Superintendent directs the publication of the following Report of the Commission appointed to enquire into the amount of damage sustained by the City of Wellington and suburbs from the late earthquake, for general information.

By his Honor's command,
WILLIAM FITZHERBERT,
Provincial Secretary.

REPORT

Of the Commission, appointed by his Honor the Superintendent to inquire into the amount of damage sustained by the City of Wellington and Suburbs, from the Earthquake which occurred on the evening of the 23rd January, 1855 *(and if any individual distress was occasioned thereby) also to report on the material and mode of building, best calculated to resist the effects of the Earthquakes peculiar to New Zealand.*

The Commissioners, after a careful inspection of the whole of the buildings in Wellington, beg to report, that they estimate the loss sustained from injuries to buildings of every description, (including merchandise and household effects, as near as they can ascertain) at the sum of £15,408. In respect of individual distress the Commissioners have much pleasure in stating, that none whatever has come under their notice, though personal loss, in some cases, they regret to say, has been severe.

As regards what may be considered the most important part of their duties, viz.—the materials and mode of building best calculated to resist the effects of the earthquakes peculiar to New Zealand; the Commissioners would premise by saying, that chimneys have sustained the most damage, the greater part of them (about three-fifths of the total number) had their tops thrown down, or so dislocated as to require taking down, about one-fifth were entirely down, and about one-fifth remained uninjured.

Those chimneys which were the most massive, built inside the buildings, and carried through the ridges, stood the best, the lower portion of them being in most cases uninjured. The Commissioners are therefore of opinion that the safest plan is to build chimneys inside, and carry them up through the ridges, at the same time building-in the angle of each jamb, a piece of 4½ x 4 in. red pine, with the chimney bar and two side 4½ x 3 in. cross-pieces secured to it; the angle pieces being also firmly fixed to the joists, above and below; the jambs ought to be 14 in. work, and the back 9 in.; the shafts may then be carried up to 18 in., or 24 in. above the ridges of the roofs, and ought to be cased up to their junction with them, with scantling and boards; the chimney breasts ought to be built up square.

Double chimneys stand better than single ones, there larger base, weight, and solidity, assist very materially to retain a wooden building in its place. Chimneys built in the angles of rooms are also recommended.

Outside chimneys are least to be relied on if placed against a gable, their narrow base, tapering form, and non-protected state on one side, added to the oscillation on the other, makes their downfall a matter of certainty; if the shafts were built in the centre of their bases, and carried up clear of the woodwork, their chance of retaining their perpendicular would be much enhanced.

Chimneys with circular shafts are recommended from the strength the circular form confers on brickwork, they may be further strengthened by circular iron straps girthing the shaft and attached to the boxing of the chimney.

In reference to buildings in general the Commissioners have not been solely guided by the fact, that they are required to withstand the effects of an Earthquake, but have also taken into consideration that they should be built in such a manner and with such materials, as will lesson the danger from fire, and retard the progress of decay.

Had Earthquakes been their only study, buildings entirely constructed of wood would have been recommended, for sound and well constructed wooden houses receive no damage from earthquakes, but timber being very combustible, and subject to rapid decay, it becomes a matter of urgent importance to a City like Wellington, daily increasing in size, and the buildings once detached now being united in block, or in street line, to be provided with building materials of such a nature as will combine 3 properties, viz.—strength, durability, and incombustibility,—stone or brick naturally present themselves as the most likely to resist decay or fire, but the

least calculated to withstand earthquakes, from their want of strength, as the following data shew.

Specific cohesion and strength of materials.

Iron.	Yellow Deal.	Portland Stone	Com. Free Stone.	Bricks.	Mortar, 16 Year's old.
9.880	0.900	0.083	0.022	0.030	0.005

From the above we learn that Iron is about ten times stronger than Yellow Deal, (a pine of great strength) and yellow deal is ten times stronger than Portland Stone, forty-one times the strength of common Free Stone, and thirty times stronger than brick.

This, and the recent Earthquake, leads us to the conclusion that brick or stone of themselves, for the high walls of a building are unsafe, and therefore ought to be discontinued, unless combined with iron or wood, and simply forming a fire-proof covering to a building.

Buildings with their sides and roofs covered with slate, offer great protection from fire, and are not subject to decay; but from their brittleness they are only serviceable on the side of a building on which there is no traffic.

Galvanized corrugated iron is stronger than slate, affords protection from fire, is very durable and keeps all internal timbers well ventilated, which is the best preservative they can have,—it affords protection from fire, up to a certain degree of heat, that degree attained, it warps, bursts the rivulets, and leaves the frame a prey to fire—as in the case of the great fire at San Francisco; but irrespective of this one disadvantage, as a covering to buildings it is far superior to boarding.

The common sheet iron, corrugated only, is not recommended, even with careful painting it corrodes, and as there are points beyond the reach of the paint brush, there it corrodes as rapidly as a red pine board would rot. An instance of this may be seen in Mr. Warburton's iron store, were the ends of the corrugated sheets resting on the ground plate, are eaten into holes by corrosion. Iron houses —such as imported from England—are in nine cases out of ten, so deficient in the strength of the timbers and bracing, as to be unfit for a windy country like New Zealand. In England they are used as sheds and railway stations only. In this country they will be found to be unsuitable. In Australia they have been found not to answer; and have become unsaleable—hence the heavy shipments of them, that have been made to New Zealand.

The shape of these iron houses are the most unpleasing to the eye that can be well imagined.

Were iron houses constructed according to designs supplied from this colony, and all external parts of them galvanized, they would be much superior to wooden buildings, though exceedingly expensive. They ought to have some pretensions to architectural design, and able to withstand the effects of earthquakes—gales of wind—and a saline atmosphere: the absence of these three requisites are very apparent in Mr. Allen's iron store opposite the Post Office.

In the course of their enquiries and inspection two things have invariably presented themselves, in those parts of the town were the most damage occurred, namely dilapidated buildings and defective foundations; buildings erected on loose gravelly, or swampy foundations; buildings with the ground plates partially or entirely decayed, or destitute of braces—have suffered severely while both houses, and stores, where the timbers were sound and the foundations good, have escaped without almost any injury, even brick houses, on a good foundation have escaped material injury—for instance, Mr. Hickson's private residence on a foundation of concreted clay; Captain Henton's house; Mr. Eades' store, on rock; Mr. Holdsworth's house in Karori Road, and others.

From Mr. Bowler's Office to Kumutoto Stream, good buildings have really suffered very little, the foundations along here being rock, cropping out, or within three or four feet of the surface. In one place, the chimnies in three two-story houses are uninjured, and these buildings are plastered inside, which is also uninjured. Mr. Laing's two-story building with plaster front, large brick oven, and chimney, hardly received any damage. From this evidence it will appear that a good foundation assists in no small degree to preserve a house from damage during an earthquake.

Before building, the foundation should be the first consideration. The building sites in Wellington are generally composed of loose gravel, fine and coarse

alluvial deposits, in some cases dry; in others, swampy and concreted gravel, hard clay, or laminated rock. The three latter descriptions of ground require but little preparation; the artificial foundations to carry the building, may be piles, brick and piles, or all brick, for, in nine cases out of ten, where the foundations are all brick, and not more than one foot high, they are uninjured; even in a great many cases, where the brick walls are two feet high and the natural foundation good, they are uninjured; for instance, the New Church in Willis Street, and the Mechanics' Institution.

In foundations all brick, the ground plate should always be kept half an inch above the brickwork, and a strip of lead, iron, or slate, inserted between the two at intervals of four feet; and the bottom weather board ought always to have its under edge one inch lower than the under side of the ground plate, in order to keep all dry.

In bad or indifferent natural foundations, if consisting of loose gravel, the trenches, after having been dug out to a depth of three feet by a width of two feet six inches, should be filled in to a depth of one foot with concrete formed of the shingle thrown out, and Roman cement, or stone lime and then built up to the required height in brickwork. If the ground is new made or swampy, a sill of the heart of Totara 24 in. x 7 in. may be laid level at the bottom of the trench, which has previously been prepared by ramming; a brick wall may then be built on it, or piles tenoned into it, the tenon being dovetailed and wedged (after being inserted in the sill) the spaces between the piles can then be filled in with brickwork.

Piles, of themselves, fixed in the ordinary way, in ground of a loose or yielding nature, are useless for heavy buildings, intended for warehouses; they do not afford bearing surface enough, and when charged with heavy weights, are liable to sink, oscillate, and, if Totara, to split. They will do, if driven with a piling engine, or placed close together; for ordinary dwellings or light buildings, they answer very well. For some years to come, timber will be the principal material used in building, but the time will arrive when the Colony is richer, when more experience is gained, and when labour and talent are more abundant, when substantial and durable erections of stone and brick will be both numerous and safe, as they are found to be in countries subject to much more violent earthquakes than this. Rome, remarkable for the grandeur and number of stone buildings, has been subject to very violent earthquakes, and their buildings were very high; the Coliseum was 167 feet high by 627 feet in diameter, and held 87,000 spectators. In 439, A.D., a tremendous earthquake damaged this massive stone edifice, and another earthquake in 496 A.D., again damaged it, and shook down the Podium; other earthquakes occurred of a subsequent date, yet this immense building, though about 1,900 years old, has survived earthquakes, fire, and Barbarian spoliation, and at this day, one side of it retains its original height and the grandeur of its ancient proportions.

It is quite easy even at this time to demonstrate that the more massive brick or stone works are, the better they will stand, provided the material and foundations are good. It is obvious that if we can build a block of brickwork in cement, so as to make it a solid body, adhering together in all its parts like stone or wood, and give it the form of a pyramid, it will neither fall to pieces nor turn over. Free stone is only composed of silica and other particles cemented together with a calcareous earth. The pyramidal form is an important one in nature; the high conical hills which surround us partake of it, yet they never overturn—there they stand for ages. We see many pinnacle rocks with their bases sunk in the earth, and their tapering forms rising high in the air; also poles placed in the ground by man, and the beacon at the heads, though half rotten, and 40 feet high, yet these remain as they were before the earthquake, incontestibly proving that solidity, cohesion, and the pyramidal form offer most resistance, and are the three conditions, which, when combined, are most capable of withstanding the shock of an earthquake.

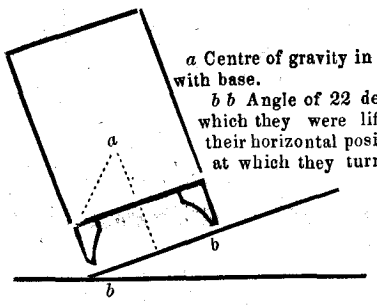
During the continuance of the late earthquake, the earth was upheaved; a wave-like motion was imparted to it; all bodies on its surface partook of that motion; they oscillated from side to side; all vertical bodies became inclined—at what angle it would be difficult to state, had not a trivial occurrence been noticed, which enables us to form a tolerably accurate idea of the angle to which buildings, &c., were lifted.

In one house, a chest of drawers, standing with its front or narrow part in the direction of the shake, was upset,

while in the same house another chest of drawers standing with its end or length in the line of the shake, was left standing.

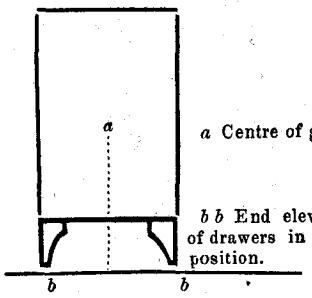
The depth, that is, from back to front, of the drawers which turned over, was 1ft. 7in., and the height 3ft. 7in., or rather more than double the depth.

Now with these simple facts before us, aided by a reference to the laws of gravity, which inform us that when the line of the centre of gravity of any body falls without the base, that body falls; we are enabled by finding the centre of gravity of a chest of drawers, and placing it so that its line falls outside the base, to define the angle to which vertical bodies were lifted from their horizontal position during the late earthquake, and that the angle appears to be about 22 degrees, as the diagrams below explain.



a Centre of gravity in a line with base.

b b Angle of 22 degrees to which they were lifted from their horizontal position, and at which they turned over.



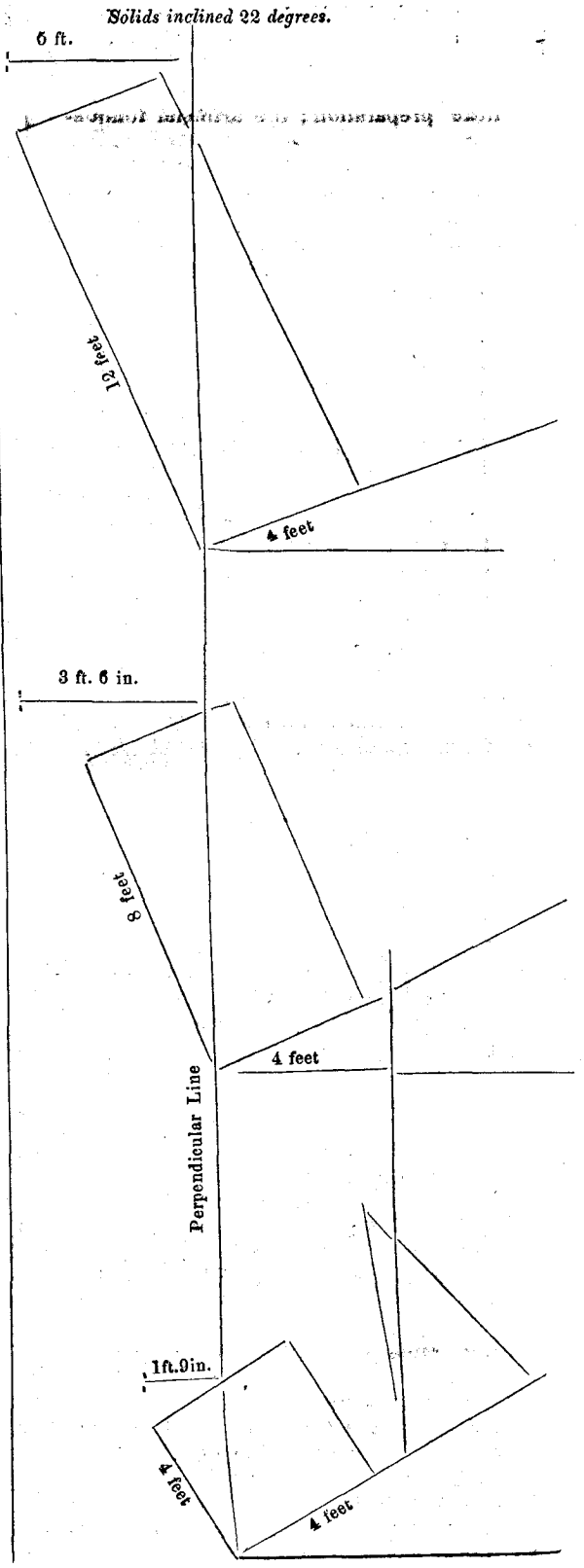
a Centre of gravity.

b b End elevation of chest of drawers in their horizontal position.

This angle may be termed the angle of inclination, and from it we are able to give the proportion the height of a building ought to bear to its base. High buildings with narrow bases are unsafe.

We may lay it down as a general rule, that the height of a building should not exceed the width of the narrowest portion of its base. The bad effects of an inattention to this have been exhibited in the Council Chamber and Mr. M'Kay's house at the Hutt, which were high buildings standing on a narrow base; at right angles to the axis of the oscillation, while the two long buildings which were

Solids inclined 22 degrees.



respectively joined to them at right angles, and consequently had their long bases parallel to the line of movement, remained, comparatively speaking, uninjured; a proof of the correctness of the views just advanced.

The figures of solids annexed, show that bodies lifted from their horizontal position to an angle of 22 degrees, if 4 feet high, are thrown 1 ft. 9 in. out of perpendicular, if 8 ft. high, 3 ft. 6 in., if 12 ft. high, 5 ft. 3 in., and if 16 ft. high, 7 ft.

Another illustration of the correctness of this theory, was seen in a brickfield, where rows of bricks were drying in parallel rows, within two feet of each other, when those four feet high were thrown down, while those two feet high remained standing. The rows were at right angles to the line of direction of the shake. Respecting the horizontal form of a building, a square or parallelogram is suitable; and for the elevation of public buildings, for a high one story building, the pyramidal or Gothic is recommended; and where a two story building is desirable, the same style with a clerc story; but for a low one story building, the Grecian proportions will be found to answer. Where heavy fire proof stores, or a solid brick building is required, the mode in which the gaol is built is recommended; the whole of the brickwork of this building, is with the exception of a trifling crack, uninjured; the massive stone base, the stone quoins, and the window stone dressings, are not injured in the slightest degree; the stone entablature was injured and was taken down; this portion of the stone work was top heavy, some of the stones nearly on the balance, and others of them had no iron rod passing through them at all; whereas, if two iron rods had passed through the two ends of each stone, the result would have been very different.

The first brick buildings erected in Wellington, were in general entirely built of brick; the mortar generally used being of a very inferior description.

Clay being the principle ingredient used, and in the specimens examined by the Commissioners, all traces of a cementing nature had entirely disappeared, and where in constant contact, at the foundations, with wet and damp; this substitute for mortar was found to have changed to a dirty yellow substance of a soft and yielding nature, merely affording a bedding to the bricks, whereas if it had been made of proper material, it would gradually have hardened till time had changed it to stone; but this process is exceedingly slow, and if a good hydraulic lime could be found in this country, (and it is said to exist in the north) it would be invaluable,—Roman and other cements are cheaper in London, than stone or shell lime is in Wellington, and nothing but the high price of English cement here, prevents it from entirely superseding the ordinary lime now in use.

The use of clay in the preparation of mortar ought to be entirely discarded, as it eats away all virtue from the lime, and is well known to possess no properties of a cementing nature. The buildings alluded to above were constructed of brick alone, wood not being used to strengthen them. In the earthquake of 1848, many of these erections suffered severe damage, since that heavy two storied stores were constructed, by erecting a wooden frame and casing it with brick, there being in general four inch of brick outside the frame and nine inch built inside the studs; these stores have again suffered and the timbers, red pine and matai built in the brick work, are found to be decayed, but totara forming the ground plate, always wet, is perfectly sound: as may be seen in Capt. Rhodes brick bonding Store.

From this it follows that the timbers from decay and original lightness were not strong enough to retain the brickwork, when the side of the building was seven or eight feet out of the perpendicular. An inclined mass of brickwork like the side of Messrs. Bethune and Hunter's store, weighing about 26 tons, exclusive of the heavy goods, shifting to the inclined side, was quite sufficient to partly tear itself away from the angles of the building.

Now if a one storied building were cased with 14 inch brickwork, with here and there holdfasts driven into the studs, and turned down over the brickwork; and if the timbers of the framing were all Totara the studs and braces nine inch by four inch, and the plates nine inch by six inch, there would be little to apprehend from decay or earthquakes. Mr. Stoke's printing-office, though only brick nogged in a totara frame, exhibits not the slightest symptoms of decay or damage, and it is not weatherboarded. Where a two storied fire proof store is required, it has occurred to the Commissioners, that a building of the following description would be found to answer:—

First.—That a strong frame of red pine, matai, or black birch should be erected with posts ten inch by ten inch, passing through the centre of the building, having short girders to carry the first floor, tenoned into them, and their ends tenoned to receive a beam, on which the collars of the rafters could be notched. The ground plate should be eleven inch by seven inch, and bands of iron two and a half inch by half inch, fixed four feet apart, and nine inches from the studs, and extending all round the building; thus, for a building seventeen feet high it would take five of these horizontal bands, at the same time vertical bars of two and a half inch by half inch iron, should be fixed, having five-eight of an inch bolts passing through them at their intersections with the horizontal bands. These bolts would also pass through every third stud, and be screwed up with nuts and washers from the inside; a casing of 9in. brickwork might then be built outside the wooden frame, at the same time inserting and nailing pieces of zinc, 5in. wide, on the edge outside each stud, which would prevent contact between the timbers and the brickwork, thereby preserving the former from decay. The outside might be cemented, and consequently the ironwork would be hidden from view.

The top plates may be strengthened by diagonal iron ties, and the first floor by timber ones, let in flush with the upper edge of the joists.

When a new wing or part of a building is to be added to an old erection, it ought to be as strongly connected with it, as though it had originally been one building: the want of this precaution may be seen in more than one place. Plastering externally has generally failed, and and has received general condemnation. Internal plastering has been found to stand, except where the frame-work has given from deficient bracing or shrinking; if the side or end framing of a house but move half an inch from the position in which it was fixed when plastered, the keys become injured or broken, The same result is produced in external plastering, and also by the plaster being soaked by heavy rains, which causes the laths to swell and break the key, at the same time rotting the laths and timbers. If a building is constructed of strong and seasoned timber, well braced and externally boarded with inch boards, and then battened with Totara battens, lathed with Totara laths, and plastered with good stone lime, in the autumn, winter, or spring, and then in the summer painted four coats in oil, and every summer afterwards two coats in oil—plastering will have been fairly tried, and if it does not stand after this, let it be abandoned.

Mr. Clifford in the wing he built some four years ago to a great extent complied with these conditions, and neither the weather or earthquake has injured the plastering or cornice internally or externally.

To plaster a building externally without painting it, is money thrown away.

The upper surface of all external plaster cornices, should be covered with lead, wood, (totara) or slate, in such a way as to form the upper covering member of the ordinary cornice moulding, (cyma recta) so that in case of shrinking or swelling of the wood, the cornice will not be forced away at its upper part; if slate is the covering, it may be worked in cement with the uppermost member.

The bracing of a building is one of its most important details: braces let into studs the general size, 4 x 1½ ins., are not recommended, solid braces are much superior to these, as can be easily proved, for in 6 in. framing the brace would measure about 6 x 4 in. A section of this represents an area of 24 in, but a let-in-brace of 4 x 1½ ins., gives a sectional area of 6 in. only, it is, therefore four times weaker than a solid brace is. The defect in a solid brace is, that by cutting the studs in two, the building is weakened laterally, to a certain extent this is correct; but the main use of a brace is to hold a building in its place in a direction parallel with the line of itself, if in a shake a building is inclined at an angle of 22 degrees, the braces have then to retain the building in its proper form, but for these braces the building would be dislocated in all its parts, or it would assume the form of a rhombus, as Mr. Watkin's old shop did.

To make a let-in-brace as strong as a solid one, and avoid weakening a building laterally, the following is recommended: the studs should be 7 in. wide, and the braces 8 x 1½ ins. let in flush, one on each side of the framing, and opposite each other, these two braces forming a double brace, and measuring each 8 x 1½ ins., together represent a sectional area of 24 inches, being thereby the strength of a solid brace 6 x 4 ins., and leaving 4 ins. in width, in the centre of each stud. In shop fronts it is

very injudicious to leave them without braces; for the sake of having a front all window, 2 spaces, at least 2 feet 6 inches wide, should be left for braces; any unsightliness may be easily hidden by a pilaster in the centre of them; the absence of these braces has been felt in the shops of Mr. Watkin and Mr. Pickett. Timber being the principal material used in building here, has induced the Commissioners to consider as part of their duties, the testing of the various sorts of Australian and New Zealand woods, in order to shew their comparative strength. The specimens selected for the experiments, were first split from straight grained pieces, and then planed up to bare one inch square, and cut into lengths of 2 ft. 2 in. long, the pieces were perfectly dry, and had been seasoning for six months. The ends of the specimens rested in a notch 1 inch square; there being a clear length or space of 2 feet for testing them; an iron loop was made with the upper end of it square, and just large enough for one of these pieces of wood, and the lower end rounded, in order not to cut the cords which passed through it, for the purpose of supporting the scale which held the weight below, the iron loop was then placed in the centre of one of the specimens, and weights gradually placed in the scale till it broke.

The results will speak for themselves and may be depended on. The first specimen of black birch taking 472 lbs. to break it, excited some surprise, and, as the Commissioners felt that it perhaps might be a chance piece, stronger than the ordinary timber of that kind, they procured another specimen which broke with 472½ lbs, thus, not only establishing its reputation for strength, but its durability; for the last-named piece was a portion of a piece which had been in the ground wet and dry for a period of ten years, and is now there perfectly sound and hard as a bone; of course it was the heart of black birch, and, when split, had that sour or acid smell so peculiar to English oak—in fact it always has that sour smell, and, for strength and durability, appears to be the oak of New Zealand. Two specimens of English oak were tested some time ago in England; one broke with a weight of 455 lbs., the other with 482 lbs. The specimens were 2 feet along and 1 inch square. As to the durability of these woods, blue gum, iron bark, black birch, and totara, are very durable where exposed to wet and dry alternately. Red and white pine, matai, Sydney cedar, kauri pine, and stringy bark, are of very little use in wet or damp situations, or where excluded from the air, but, if kept dry and well ventilated, will last a great many years. One great cause of the decay of timber is its not being cut at the proper season, and when cut, not dried before used. All trees for building purposes ought to be cut down in winter, and have three months drying before being used. Painting unseasoned timber only hastens the progress of decay.

New Zealand Woods.		The piece was brkn. by lb
White pine	Low land grown (Hutt)	232
White pine	Hill grown (Karori)	267
Matai	Hill grown	372
Matai	Low land (Hutt)	363
Red Pine		313
Totara		231
Totara	Second specimen	238
Kauri pine	From the Pro. of Auck	280
Kauri pine	Second specimen	258
Black birch		472
Black birch	Second specimen	472½
A. birch	With a red grain	392
Rata		416
Manuka		441
	European Wood.	
Yel. deal	From the Baltic	288
	Australian Woods.	
Stringy brk.		410
Blue gnm		443
Iron bark		450
Cedar	Average of 2 specimens	190

In the act of breaking, the deflection was least in totara and cedar, which are the most brittle of all the specimens; matai sustained a heavy weight, then snapped suddenly; matai, white pine, kauri, red pine, rata and stringy bark stand next; iron bark, blue gum, manuka, showed the greatest deflection, and broke gradually; the strength and toughness of the fibres of iron bark and manuka was most surprising.

The Commissioners having thus far, to the best of their judgment and ability, collected and collated all the evidence respecting the late earthquake, have now to bring their labours to a close. In doing so, they consider the present opportunity an appropriate one for concluding their report by making a few general remarks connected with the late earthquake.

Our fellow colonists in the other Provinces of these islands, appear to have

been extremely anxious to attribute to Wellington an exclusive property in earthquakes; but, without any desire to abdicate our rights, we do not see how we can honestly claim the monopoly in a property which appears unfortunately to be the partnership property of all New Zealand. The *Taranaki Herald* has adduced as a proof of its mildness there, that the Church built of stone, is still standing. We can show here in Wellington, four or five brick-built buildings which stood the earthquake of 1848, and the late one, and are still uninjured; some of them have been mentioned in the course of this report. Another remarkable fact connected with the earthquakes in this country, is, that they are eccentric in their movements; that they move in different lines, at times leaving Wellington uninjured, while other places suffer severely. This statement may surprise some of our neighbours, but such is the case, for on the 1st January, 1853, the shock of an earthquake was felt in Wellington, the shock was considered a very long one, but so mild and slight as to be only felt by those sitting or standing, and of course not the slightest damage was done. It was felt in a slighter degree here, than the last one was said to be felt at Auckland.

But, from the following paragraphs, taken from the Nelson and Taranaki papers, at these places it was felt severely.

"EARTHQUAKE.—A severe shock of an earthquake was felt on Saturday evening, last (Jan. 1st.) about half-past eight o'clock. The vibration of the earth was considerable, and lasted for several minutes, the shock apparently coming from the N.E. During the subsequent 36 hours, several lighter shocks were felt, but none of them had the force of the first. The only damage done by this earthquake (which was the most severe we have experienced since the shocks of 1848) was the shaking down of the top of a chimney of a house belonging to S. Stephens, Esq., in the Rewaka.—*Nelson Examiner*, Jan. 8, 1853.

In Wellington there were no subsequent shocks.

"EARTHQUAKE.—On Saturday night last, the town of New Plymouth and its vicinity, was visited with a more severe shock of an earthquake than the oldest settlers in this place can remember. The first and strongest shock took place about 22 minutes past 8 p.m., and appeared to come from seaward, and to take a south easterly direction across the island, lasting two minutes; although happily no injury to life or limb occured, severa narrow escapes are mentioned, and a number of chimnies were thrown down, and buildings and goods seriously damaged. Among others, the houses of Mr. Norris, Mr. Hughes, and Mr. Shaw, have suffered severely. The greatest alarm was for some time felt, and nearly the whole population fled from the houses into the streets. The shocks have continued at intervals ever since, with more or less severity, but the principal damage was occasioned by the first shock, which was considerably the strongest one felt. We trust that before this account is before our readers, all apprehension from this startling visitation will have ceased. —*Taranaki Herald*, Jan. 5, 1853.

Now, had any person, anxious to make a book, or fond of appearing in print, been on the spot to witness the alarm, confusion and excitement consequent on such a distressing occurrence, he might have written an account as long as that which has been published with reference to the late earthquake in January last.

This Nelson and Taranaki earthquake which has been alluded to, was no ordinary affair; the brig *Marmion* felt it off Cape Farewell, and her passengers fancied she was bumping on the rocks.

These facts are adduced to prove that the earthquakes of this country change their line of direction, and that the whole of these islands are subject to them more or less. In 1848, Auckland and Otago, it is said, did not feel the shocks that were felt here; but, in 1855, they did feel them, and Auckland, in a very sensible degree.

There are parts of the Province of Wellington (the Ahuriri) which, during the last earthquake of January 23rd, felt it very little—in about the same degree that Canterbury did.

Since January 23rd, a shock has been felt at Otago; this was in last April, according to the Otago *Witness*, which was somewhat sharp, persons standing being conscious of a reeling sensation.

This evidence, the Commission feel convinced will satisfy all unprejudiced minds that the earthquakes of this country are not confined to Wellington and its neighbourhood, but that their ramifications extend through the length and breadth of these islands, every portion of them being more or less subject to them.

One fact, then, is now clearly revealed to all New Zealand, which is, that we live in a country subject to earthquakes—

generally of a description hardly noticeable, but, occasionally at lesser or greater intervals, of a violent nature. It is in vain to disguise this truth; our country abounds with evidences of volcanic action which everywhere present themselves from the Trap Rocks off Stewart's island, to the Three Kings of the North Cape, and proclaim its igneous origin. We may, therefore, correctly assert that the whole of the Colonists of New Zealand are interested in this matter; for, though some Provinces have, of late years, sustained no damage, yet they have been warned by the slight shocks they have already felt, that they are within the orbit of those mysterious and subterranean forces which have inflicted severe loss on their less fortunate fellow colonists in the other Provinces; and it behoves all to adapt their dwellings and other buildings to the country in which they live; for, though the earth does not sink or open and engulph the people, as it did at Lisbon or Jamaica, (on the contrary it appears to be undergoing a gradual upheaval in the neighbourhood of Wellington in a perceptible degree, it having been raised 2 feet during the recent earthquake,) yet serious damage and even loss of life must be the result if this precaution in building is neglected.

The phenomenon of this country being in course of upheaval, is not confined to New Zealand. Norway, at this time, is being gradually upheaved at the rate of 4 feet in a century, and other places at a more rapid rate. The recent sudden upheaval of part of the Province of Wellington, there is good reason to believe is a very rare occurence. No white man that we can learn of, has ever witnessed it before. One of the oldest inhabitants of Cook's straits, Mr. John Guard, says "the last earthquake was the most violent one he ever knew in this country," and he has lived in it for a period of twenty-two years, and he never before witnessed a perceptible rise of the land after the shock of an earthquake; but this ought not to make us less careful in the erection of buildings, for we must bear in mind that nothing will prevent this country from being rapidly peopled; its unrivalled climate, its vast natural capabilities and unlimited resources, are temptations too attractive to be resisted by enterprising Englishmen. It is a remarkable fact that the two most favored countries on earth in point of climate and soil, and almost insular in position—Greece and Italy, with their renowned and magnificent capitals of Athens and Rome, where liberty, the arts and sciences and literature were nurtured, and where they flourished and were brought to perfection, which modern civilization is still proud to acknowledge as worthy of imitation; in fact the source of its own origin,—were and are now subject to earthquakes in comparison to which those in New Zealand sink into insignificance. Subjoined is a list of some of them, and also a number of minor ones, which have occurred in England from a very early date.

A. D.	
	GREECE.
107	150 Cities swallowed up.
	ITALY.
370	Nice destroyed.
1186	At Calabria, a city sunk in the sea.
1222	In Lombardy 200 lives lost.
1456	One in Naples, 40,000 people perished.
1688	Naples again, a third of the city destroyed.
1789	In Castello 30 houses swallowed up—100 destroyed.
1794	Near Naples, city of Torre del Greco nearly destroyed.
1832	In Calabria and Central Italy.
	ENGLAND.
1076	One.
1089	One again.
1090	One.
1142	One felt at Lincoln.
1175	One felt at Oxenhall.
1179	One.
1185	One that overthrew the church of Lincoln and others.
1199	One in Somersetshire.
1247	One, a church thrown down at Glastonbury.
1248	One.
1249	One.
1250	One at St. Albans.
1551	One at Reigate, Croyden, Dorking, and Surry.
1571	One in Herefordshire which overthrew Kingston Church.
1574	One in Yorkshire, Herefordshire, Worcestershire, Gloucestershire, &c.
1586	One felt in London and Westminster, when part of St. Paul's & the Temple Church fell, it was also felt at Sandwich, Dover, and Kent.
1583	In Dorsetshire, when it removed a considerable portion of ground.
1596	In Kent, where the hills became valleys filled with water.

1677 1678	One in Staffordshire and Dorsetshire.
1679	One in Oxfordshire and Staffordshire.
1683	One at Oxford.
1689	Lyme in Dorsetshire nearly destroyed.
1734	One at Arundle.
1734	One in Ireland which destroyed 5 churches and 100 houses.
1745	One in Somersetshire.
1750	Two felt in London.
1786	One in Scotland and different parts of England.
1790	One in Westmoreland
1791	One in Scotland.
1792	One in Bedford, Leicester, Lincoln and Nottingham.
1793	One in Shaftsbury and Salisbury, but not much damage done.
1795	One in different parts of the North of England.
1808	One at Dunning in Scotland
1816	One in the North of Scotland.
1822	One in Ireland.
1852 Sep. 2	A shock of Earthquake felt at Liverpool, Holyhead, and at Manchester, about 4h.30m. AM.
1853 Apl. 1	A shock of Earthquake felt at Havre, Constance, Caen, Southampton, and other places. At Caen barrells on the quay were set in motion and rolled along.

From the following paragraph taken from the Melbourne *Argus*, of March 5th, 1855, Australia appears to be subject to slight Earthquakes.

Earthquakes—A correspondent residing in Truro has communicated the following. "On Monday last about 8 a.m., a slight vibration of the earth supposed to be the shock of an Earthquake, was experienced in this neighbourhood. At Truro it caused a dull rumbling motion such as would be produced by a heavily laden waggon passing somewhat quickly by. At Barton, one mile distant, the sensation was considerable, buildings shook to their foundations, plates, &c., for the moment chattering on the shelves, and persons being conscious of a staggering impulse as they stood on the floor of their houses. How far beyond us this tremour extended I am unable to state, nor do I know if any other cause besides that mentioned above, to which the shock felt here can be assigned. The air at the time was tranquil, and though hazy, the sky was cloudless, there were no indications of a tempest near or distant nor was the heat excessive."

The shock of an Earthquake, such as described above, if in New Zealand would be considered a sharp one, the movement appears to have been strong, and had it continued for one or two minutes serious damage to buildings must have taken place, nothing but its being a momentary one prevented such a catastrophe.

The Commissioners having now arrived at the conclusion of their report, trust, that though it may be found to be neither free from imperfections, nor so complete as it might to be, yet notwithstanding these defects, a portion of the information contained in it will be found useful to the community at large.

CHARLES MILLS.
CHARLES R. CARTER.

Sept. 4th, 1855.

ADDENDA.

In *Chambers' Journal* for March 14th, 1840, which has been kindly forwarded by a gentleman, for the perusal of the Commissioners, is a paper on "Earthquakes in Great Britain," one portion of which bears such a striking analogy to a violent New Zealand earthquake that at the risk of being tedious the Commissioners cannot forbear giving an extract therefrom. "The earthquake which took place on the evening of the 13th of August, 1816, about ten minutes before eleven o'clock, was felt throughout the greater part of Scotland, but evidently was strongest in a tract extending from western Ross-shire, through eastern Inverness-shire, and so on through the province of Moray—the direction being from W.N.W. to E.S.E. Directly to the north and south of Inverness, it was comparatively slight, but yet was perceptible to many in *Edinburgh and Glasgow*. At no considerable seat of population was its action nearly so intense as at *Invernes*. The streets of that town had been emptied of the inhabitants, most of whom had retired to bed, when suddenly the percussion took place. "I could think of nothing" says a gentleman residing there, "that could give so good an idea of what we felt, as that of a person seated on the back of a horse, when he suddenly and violently shakes himself." A noise like distant thunder was heard. The tremor

lasted for about twenty seconds, or in the opinion of some, nearly a minute.

The force was sufficient to throw some persons out of bed. All others who had gone to rest instantly sprung from their places of repose, and with little ceremony as to clothing, joined the crowds, who had rushed into the streets, which immediately became a scene of wild and unusual terror, no one knowing but that a second shock was instantly to bury them under the ruins of their houses. Under this apprehension, many hurried, ill prepared as they were, out of town, and spent the greater part of the night in the fields.

It was found that already great damage had been done to the buildings. Many were rent from top to bottom; great numbers of chimney tops had been shaken down. From a stack of chimnies on the Mason Lodge, a coping stone weighing fifty or sixty pounds was thrown to the other side of the street, a distance of not less than twenty yards—a fact strikingly showing the extent of the vibration. It was remarkable that the newer houses suffered more dilapidation than the older. Amidst the crashing of falling stones and tiles, and the shrieks and lamentations of alarmed women, one curious circumstance was not observed in the town, but was noticed by three gentlemen who were approaching it from the Westward: the great bell tolled twice. In the morning another important fact became known, namely, that the beautiful steeple which had recently been attached to the County jail had suffered a twist at the distance of a few feet from the top.

The spire was there of an octagonal shape, and the twist which was from the East towards the North, was to the extent of about a sixteenth of the whole circumference, the angle of the removed part being turned to the centre of the adjacent *face* in that direction. The present writer speaks of this result from personal observation, for in 1826 he saw the steeple in the condition described, it has since been repaired. Most of the stones detached from the chimney tops were thrown in the same direction, and it was from this fact that the inference was drawn that the direction of the motion in the first instance was from North-west to South-east, for such being the case, loose parts at the top of a tall building would naturally be left behind, or thrown in the contrary direction.

Some gentlemen who had been in the West Indies, where earthquakes are frequent, remarked of this shock, that it was smarter than any they had ever known in that part of the world.

At Cromarty a huge fragment of rock was disengaged from a precipice, and the gable wall of a newly built house was rent diagonally from top to bottom. Further to the North, three arches, which had recently been built as part of a roadway across a small arm of the Sea in the County of Sutherland, were thrown down."

P.S.—During the progress of these sheets through the press, we observed the following paragraph in the *Sydney Empire* of September 21st, 1855:—

EARTHQUAKE AT MELBOURNE.

The shock of an earthquake was experienced in Melbourne and its vicinity shortly before three o'clock on Monday morning last. The *Argus* says:—" The shock appears to have been of so violent a character as to have attracted general notice, notwithstanding its occurrence at an hour when but a very small fraction of the population can be supposed to have been sensible of any ordinary noise or motion. Of course, accounts as to the peculiar nature of the shock differ considerably; some describing it as being a rolling motion, while others say that they were sensible of a heaving vibration. We have received information from numbers of persons, describing the effect of the phenomenon upon their houses. The dwellers in wooden cottages appear to have been most sensible of its occurrence, and in some of the large hotels of the city a considerable amount of alarm prevailed, caused by the ringing of the bells, the rustling of the window frames and clashing of crockery, kitchen utensils, &c. At the Imperial Hotel the terror and confusion were so great that most of the inmates left their apartments, and promenaded the streets, where they imagined they were safer than under anything in shape of a roof. We hear that the walls of the Benevolent Asylum experienced some damage from the vibration, and reports of trifling injuries having been done to other buildings have reached us. In the neighbourhood of Brighton and St. Kilda the shock (some say there was more than one) was severely felt, and the general opinion appears to be that the line of action was from east to west.

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