

### *11.01 Plaster & Plasterboards*

- a. **plastering practice**
- b. **lathing**
- c. **hard plaster & scagliola**
- d. **modelling**
- e. **gypsum plaster**
- f. **proto-fibrous plaster**
- g. **fibrous plaster**
- h. **plasterboard**
- i. **structural plaster**

#### *a. plastering practice*

The plastering trade was at first confined mainly to interior walls and ceilings because, at least at Sydney, there was no local material from which a durable exterior stucco could be made. It was applied to brick and stone walls, or to lathing on ceilings and timber walls. On occasion, as in the house 'D'Estaville', in the Melbourne suburb of Kew in 1859, lath and plaster was used on top of the ceiling joists to create a trafficable attic floor. Despite the lack of local materials really suitable for stucco in early Sydney, Cunningham speaks of 'brick plastered and whitewashed' as being fairly normal.<sup>1</sup> This probably implies the use of makeshift materials, for elsewhere he proposes an external plaster for slab houses consisting of 'alluvial soil, mixed with a portion of cow-dung to prevent it from cracking, and with chopped straw to enable it to adhere.'<sup>2</sup> Such inferior finishes would be out of the question when imported hydraulic lime or cement could be used, or later when such materials were obtained locally, and the use of these more durable materials has been discussed already.

Hair reinforcing might be used in internal plastering, though it was not normal in external work, and it would be supplied by tanners such as William Pawley of Sydney,<sup>3</sup> much as with the hair in mortar, discussed above. A specification of 1854 calls for kitchens, sculleries &c to be rendered in a 'mortar' of

one part of good fresh Port Phillip lime and two of sand and loam, in equal proportions well mixed with pure fresh water and with the addition of a sufficient quantity of long pile hair. The fine work shall be well soaked and may have a small quantity of sharp drift sand added.<sup>4</sup>

The base coat for internal plastering was typically a lime mortar, onto which a much thicker layer of plaster could be applied, and it is interesting to find a Victorian

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<sup>1</sup> Peter Cunningham, *Two Years in New South Wales*, (2 vols, London 1827), I, p 43.

<sup>2</sup> Cunningham, *Two Years in New South Wales*, II, p 162.

<sup>3</sup> Barrie Dyster, *Servant and Master* (Melbourne 1891), p 38.

<sup>4</sup> Russell, Watts & Pritchard, 'Specification of the works to be executed in the erection of Two of a row of eight Dwelling houses and offices at North Elwood near St Kilda for Joseph Docker Esqr ... December 13th 1854' (Melbourne 1854), p 18.

specification of 1891 still requiring the use of 'Head's [*sic*, for Heads] lime' in this coat, referring to an early colonial material from Port Phillip Heads, long since superseded by lime from Lilydale and elsewhere.<sup>5</sup>

Trade practices such as the running of mouldings were probably entirely British in character (or at least European, for French practice at least was essentially the same<sup>6</sup>). Plasterer's tools were generally imported, and the American trowels were regarded as best, but by 1866 Marsden & Deacon of Fitzroy, Victoria, were making trowels which the jurors at the Intercolonial Exhibition thought better mounted than the American ones.<sup>7</sup>

### ***b. lathing***

The best laths were usually of split timber, which bonded well. Whether split or sawn, the ideal size of laths was about  $\frac{3}{16}$  inch by one inch [4.5 x 25 mm], and the Cooperative Society of Plasterers warned against the much larger American sawn laths which came onto the market in the 1850s. These were  $\frac{3}{8}$  inch by  $1\frac{1}{2}$  to two inches [9 x 38-51 mm], and liable to twist and swell, and destroy the work.<sup>8</sup> However, American sawn laths were again in use later in the century, when a Melbourne house had 'American sawn laths with joints properly broken and spaced at least  $\frac{1}{2}$  inch apart to form a good key'.<sup>9</sup> Indeed, they are often found in practice.

In 1799 Edmund Cartwright obtained a British patent for the use of wire netting in place of timber as lathing for plaster.<sup>10</sup> Wire lathing was later used at the Pantechicon in Belgrave Square, London, and another patent was obtained in 1841 by Louis Leconte.<sup>11</sup> Hexagonal wire netting was similarly used as lathing for the 'wire stucco ceiling' of the Neues Museum, Berlin, in the 1840s.<sup>12</sup> In 1856 the owner of a Manning prefabricated house in Melbourne, who had already plastered it inside and out to counteract the heat, recalled a report on the subject of wire lathing, and speculated as to whether the use of a wire network instead of timber laths would be a useful fireproofing measure, in a settlement where fires were so prevalent.<sup>13</sup> Something of the sort was later to be realised in 'Johnson's patent fireproof wire lathing'. The Australian agents were Schmedes, Erbsloh & Co, who released the material in Brisbane in 1887. Narrow strips of hoop iron were fixed horizontally across the studs of a wall, using staples. Over these was fixed  $\frac{3}{4}$  inch [19 mm]

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<sup>5</sup> W S Law, 'Specifications of Residence Drummond St. Carlton for Mrs. L. Abrahams' (Kensington [New South Wales] 1989), p 105.

<sup>6</sup> See J Claudel & L Leroque, *Pratique de l'Art de Construire: Maçonnerie* (Paris 1850), p 488, for the method of running a cornice.

<sup>7</sup> Intercolonial Exhibition of Australasia, 1866-67, *Official Record* (Melbourne 1867), pp 30, 331.

<sup>8</sup> *Australian Builder*, 27 (4 September 1856), p 219.

<sup>9</sup> L J Flannagan's specification for the Richard Shann house, 'Mendip Hills', North Preston, of 1888, p 38. Melbourne University Architectural Collection, WD HOU 172, La Trobe Library.

<sup>10</sup> William Millar, *Plastering Plain and Decorative* (London 1905 [1897]), p 91.

<sup>11</sup> John Gwilt [revised Wyatt Papworth], *An Encyclopaedia of Architecture* (London 1899 [1842]), §2246c, p 706.

<sup>12</sup> Werner Lorenz, 'Classicism and High Technology - the Berlin Neues Museum', *Construction History*, XV (1999), p 49.

<sup>13</sup> *Builder*, XIV, 689 (19 April 1856), p 222.

galvanised wire netting, and to this the plaster was applied.<sup>14</sup> At the Centennial Exhibition of 1888-9, Johnson, Clapham & Morris of Manchester in their own right showed their 'patent wire lathing'.<sup>15</sup>

Expanded metal, made by creating a staggered pattern of slits in a sheet of metal, and then pulling it apart to create a diamond grid, was invented by the American John F Golding in 1884.<sup>16</sup> It was used as lathing for plaster, and in Britain Thomas Potter appears to have carried out some of the earliest experiments with plaster on expanded metal, as a fire-resistant construction.<sup>17</sup> In the United States the invention was controlled by the Expanded Metal Co and the Standard Fireproofing Co, both of Chicago, and the rights for different parts of the country were licensed to eight other companies, which apparently had published their own literature from about 1886. In 1896 they jointly published a small handbook, *Expanded Metal and its Uses in Fire-Proof Construction*.<sup>18</sup> By 1906 there were nine United States manufacturers, who advertised under the umbrella of the Associated Expanded Metal Companies,<sup>19</sup> though the General Fireproofing Company advertised separately.<sup>20</sup> In France it was called métal déployé, and by 1899 the Compagnie Française du Métal Déployé was making it in steel, copper and aluminium for applications including both plaster and reinforced concrete.<sup>21</sup>

At the Centennial Exhibition of 1888-9 in Melbourne, the Expanded Metal Lathing and Fencing Company Limited had a machine at work in the annexe producing expanded metal according to the patent of J F 'Goulding', from whom the company had acquired the Australasian rights.<sup>22</sup> By early September their factory building was ready, with four machines installed, and was expected to be working by the end of the month. The company had ordered two further machines,<sup>23</sup> one of them from Wright & Edwards, which was designed to mould the material into profiles suitable for uses such as cornices.<sup>24</sup> The machines were to be paid for by the sale of the patent rights for New South Wales.<sup>25</sup> In December a promotional display was mounted at a meeting of the Architectural and Engineering Association.<sup>26</sup> The earliest proposal to use of the material in Australia was John Kirkpatrick's winning design for the Australian Club in Sydney. Kirkpatrick proposed to divide or unite rooms as required by the raising or lowering of counterbalanced partitions, which were to be framed in

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<sup>14</sup> *Australasian Builder & Contractor's News*, 27 August 1887, p 263. See also Millar, *Plastering*, p 94.

<sup>15</sup> Centennial International Exhibition 1888-1889, *Official Record* (Melbourne 1890), pp 467, 737, 964. It seems that this lathing was used for what is almost certainly a single cottage, though it appears as if it were two separate exhibits. One was listed as a 'fire-proof and vermin-proof cottage' by Johnson, Clapham & Morris, the other a 'patent fire-proof wire-lathing cottage by R Johnson, also of Manchester: *ibid*, p 459.

<sup>16</sup> B E Jones [ed], *Cassell's Reinforced Concrete* (London 1913), p 8.

<sup>17</sup> Thomas Potter, *Concrete: its Use in Buildings* (new ed, 2 vols, London c 1894 [1877]), II, p 242.

<sup>18</sup> *Expanded Metal and its Uses in Fire-Proof Construction* (Chicago 1896).

<sup>19</sup> 'Sweet's' *Indexed Catalogue of Building Construction* (1st ed, New York 1906), p 93.

<sup>20</sup> *Sweet's Catalogue* (1906), pp 136-8.

<sup>21</sup> *La Revue Technique*, 25 December 1899, p 22.

<sup>22</sup> *Australasian Builder & Contractor's News*, 24 August 1889, p 186.

<sup>23</sup> *Australasian Builder & Contractor's News*, 7 September 1889, p 222.

<sup>24</sup> *Australasian Builder & Contractor's News*, 24 August 1889, p 186.

<sup>25</sup> *Australasian Builder & Contractor's News*, 7 September 1889, p 222.

<sup>26</sup> *Australasian Builder & Contractor's News*, 21 December 1889, p 597.

light iron and faced with plaster on expanded metal.<sup>27</sup> In 1890 it was specified by Reed, Smart & Tappin for the ceiling of the McCoy Hall of the Melbourne Museum,<sup>28</sup> and by Wright, Reed & Beaver for the top floor ceilings of the National Mutual Assurance building in Collins Street.<sup>29</sup> In the same year there was published, a testimonial for it by the Melbourne architect C A D'Ebro which suggests that he also must have used it.<sup>30</sup> Subsequently, as we have seen, D'Ebro became a great promoter of its use in reinforcing concrete.

By the turn of the century there were also available in Britain Hanley's Patent Corrugated Woven-Wire Lathing, 'Jhimil' Patent Metal Lath, Bostwick Patent Fireproof Metal Lath Patent Metal Lathing Sheets, and Helical Metal Lathing. Which of these were available in Australia it is impossible to say. William Millar, in *Plastering Plain and Decorative*, devoted most attention to 'Jhimil', the precise form of which is unclear, though it was made in steel, in sheets six feet by eighteen inches [1.8 x 0.45 m], and was said to combine great strength with a perfect key. The Helical Lathing, invented by T L Banks, sounds the most remarkable - a flat steel wire or ribbon twisted or woven into the required size, the stock one being 10 ft 6 in by 2 ft 6 in [3.15 x 0.75 m].<sup>31</sup> In 1913 James Moore & Sons of Melbourne advertised 'Bacula' lathing, which is a mystery, and Keylock Intersecting Steel Lathing.<sup>32</sup>

By 1936, when patent protection had expired on all the earlier American products, the United States Gypsum Co had acquired the metal lath division of the Youngstown Pressed Steel Company, and the north Western Expanded Metal Company, and as a result was able to market diamond mesh lath, 1/8 inch Z-rib lath, 3/8 inch rib lath, 3/4 inch rib lath, 'Expanded Stuccomesh' (a larger expanded metal than the diamond mesh), Bostwick sheet lath (a punched sheet), and a number of metal plastering beads and other accessories.<sup>33</sup> Although similar products would have been available in Australia, one imagines that the range would be smaller.

### *c. hard plaster & scagliola*

Artificial marbling in general, and *scagliola* in particular, were characteristic arts of the Victorian age, based upon practices and recipes which were often more or less secret.<sup>34</sup> Scagliola is the earlier form of artificial marble based upon plaster of Paris.

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<sup>27</sup> *Australasian Builder & Contractor's News*, 15 June 1889, pp 50-51.

<sup>28</sup> Bates Smart Collection, Melbourne University Archives, item 3.14.

<sup>29</sup> Wright, Reed & Beaver, 'Specification for Erection of Premises for the National Mutual Life Association of Australasia. Corner of Collins & Queen Streets Melbourne', p 35.

<sup>30</sup> *Australasian Builder & Contractor's News*, 15 November 1890, p 362.

<sup>31</sup> Millar, *Plastering*, pp 92-4.

<sup>32</sup> James Moore & Sons Pty. Ltd., *Price List 96 August 1913* (Melbourne 1913), p 2.

<sup>33</sup> United States Gypsum Co, *A Catalog of Building Materials* (Chicago 1936), § A, pp 4-9.

<sup>34</sup> For marbling and scagliola see Andrew Ure, *Dictionary of Arts, Manufactures and Mines* (London 1839), sv Scagliola; *Builder*, III, 101 (11 January 1845), p 20; [J L Tarbuck], *The Builder's Practical Director* (Leipzig, no date [c 1858]), p 228; John Gwilt (revised Wyatt Papworth), *Encyclopædia of Architecture* London 1888), § 2250k, pp 709-10; R B Wragg, 'The History of Scagliola', *Country Life*, 10 October 1957, pp 718-21.

believed to have been invented in Italy by Guido Sassi,<sup>35</sup> whose first work was in 1615, and according to Papworth was first used in England at the Pantheon, in Oxford Street, London, opened in 1772.<sup>36</sup> If this is to be accepted, then it must be also understood that there was a distinct marbling technique which preceded scagliola, and which was used at Ham House, Surrey, in the early 1670s, and in many other buildings.<sup>37</sup> In 1833 Loudon reported that one Brown was the principal scagliola maker in London. He had a 'rich and elegant museum' in University Street, and claimed to have brought the art to a higher degree of perfection than had ever been achieved on the Continent, where it was never seen as much more than an inferior imitation of marble.<sup>38</sup> Subsequently Bellman, Ivy & Carter Ltd claimed to have been making scagliola in England from about 1839, and by 1924 had their own version, called 'Marbric'.<sup>39</sup>

For scagliola, plaster of Paris was sieved and mixed with Flanders glue, isinglass and other materials, and then with the required colour. It was normally designed to simulate marble, and the various shades required were mixed in separate batches, and were then combined together on the surface to create a marbled effect (a skilled operation, about which no further detail is given. The finished work was smoothed off and then highly polished.<sup>40</sup> A somewhat guarded account of the scagliola at the State Savings Bank, Sydney, in 1928, is consistent with this tradition. It was made of finely ground plaster of Paris 'mixed and coloured with earthy and mineral colours' to a recipe of Melocco Brothers, and polished with a machine devised by the architect, Ross.<sup>41</sup>

On the other hand a nineteenth century description of scagliola had it based upon Keene's cement, which is not strictly correct:

The work ... is roughed in with gauged stuff (lime and hair and plaster), and when quite dry, Keene's cement is mixed in [batches], each with a separate colour worked up with it, - chrome, sienna, black, Venetian red, &c. as may be required. It is then laid out the required thickness, and cut into triangular pieces, and pressed into the prepared ground with the fingers. Then, when quite dry, the surface is levelled down (if a pedestal, it is put into a lathe and turned), and then polished – first, with a rough stone; second, with snake-stone; then flannel and putty powder, and finished up with beef fat and a linen rag. All holes must be made good with colour before polishing.<sup>42</sup>

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<sup>35</sup> *The Colonial Compendium and Export Catalogue of the Building Trades* (London 1924), p 18, where Sassi's work is incorrectly attributed to the early sixteenth century. On the other hand Papworth [see below] gives the name incorrectly as 'G. Fassi'.

<sup>36</sup> Papworth, *Dictionary of Architecture*, sv Scagliola. J C Loudon, *Encyclopaedia of Cottage, Farm and Villa Architecture and Furniture* (London 1853 [1833]), concurs that scagliola was introduced in Britain late in the eighteenth century.

<sup>37</sup> John Fowler & John Cornforth, *English Decoration in the 18th Century* (London 1974), pp 37-8.

<sup>38</sup> Loudon, *Cottage, Farm, and Villa Architecture*, § 2007, p 1011,

<sup>39</sup> *Colonial Compendium and Export Catalogue*, p 18.

<sup>40</sup> Nicholson, *Practical Builder*, p 383, quoted by Loudon, *Cottage, Farm and Villa Architecture*, § 2007, pp 1011-2, and by Papworth, *Dictionary of Architecture*, sv Scagliola.

<sup>41</sup> *Building*, 12 December 1922, p 62: I am indebted to Natica Schmeder for this reference.

<sup>42</sup> *Builder*, XIV, 703 (26 July 1856), p 414.

The hard plasters, otherwise known as Keene's, Martin's and Parian cements, played an even more prominent role in Victorian interiors. Keene's had been patented in England by J D Greenwood and R W Keene in about 1838, and was made by dissolving 1 lb [450 gm] of alum in a gallon [4.6 l] of water, and in this solution soaking 84 lb [38 kg] of gypsum in small lumps for three hours at 95°F, then letting these dry in the open for about eight days, calcining them at a dull red heat, and grinding and sifting them. If half a pound [230 gm] of copperas [iron sulphate] was added to the alum solution the resultant plaster would have 'a fine cream or yellow colour'.<sup>43</sup> Keene's cement set rapidly and hard, and in Australia came to be much favoured for highly finished plasterwork, especially when it required a marble or other fine finish, or was located in arrises, skirtings or other areas subject to damage.<sup>44</sup> By the end of the century an improved version, 'Howe's Improved Keene's Cement' was available.<sup>45</sup>

In 1856 the Co-operative Society of Plasterers placed an article in the *Australian Builder* urging the adoption of Keene's, or better still Parian cement, 'on account of the advantages it possesses for facilitating the progress of buildings which require to be finished within a limited space of time'.<sup>46</sup> Keene's cement could be painted immediately after application, though only to the extent of one coat.<sup>47</sup> Even this was enough to create at least an interim decorative scheme, and in a period when it was good practice to leave new plaster to dry for many months before painting, this gave the material a significant advantage. Even if it was unpainted but polished to resemble marble, it was far more acceptable than plain plaster. In Sydney the Centennial Hall (Town Hall) was reported in 1889 to have four pairs of Corinthian columns in polished Keene's cement, nine metres high and about 900 mm in diameter.<sup>48</sup> The specification for 'Benvenuta', Melbourne, in 1891 called for 'The whole to be worked in Portland cement and finished in Keen's [*sic*] showing a true and glass-like surface'.<sup>49</sup>

Parian cement had its origins in what had previously been known as Martin's cement. Martin had been granted an British patent in 1834 for the manufacture of an imitation marble or cement capable of receiving a high polish, and made by treating powdered chalk or gypsum first with a strong alkali, and then an acid, then in 1840 Martin obtained another patent for mixing the same materials in a solid state.<sup>50</sup> In 1846 John Keating obtained a British patent for what became known as Parian cement,<sup>51</sup> which was made in much the same way as Keene's but that borax [sodium borate] was

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<sup>43</sup> See especially Millar, *Plastering*, p 77; Andrew Ure, *Dictionary of Arts, Manufactures and Mines* (London 1839), svv Stone, Artificial; Copperas. Millar spells it 'Keen', without the terminal 'e', but that appears to be a mistake. In 1851 Keene exhibited his form of mosaic pavement, as well as examples of what he called 'Parian' work, apparently a gratuitous confusion with Martin's Parian cement as discussed below.

<sup>44</sup> Victorian Intercolonial Exhibition, 1875, *Official Catalogue* (Melbourne 1875), p 196; C B Mayes, *Australian Builders' Price-Book* (Melbourne 1862), p 79.

<sup>45</sup> Millar, *Plastering*, p 77.

<sup>46</sup> *Australian Builder*, 30 (26 September 1856), p 247.

<sup>47</sup> S Adsheed, *Modern Methods of Building* [reprint of a lecture to the RIBA, 1936] (London 1937), p 8.

<sup>48</sup> *Australasian Builder & Contractor's News*, 7 December 1889, p 537.

<sup>49</sup> Law, 'Specifications for Mrs. L. Abrahams', p 42.

<sup>50</sup> *Builder*, V, 207 (23 January 1847), p 37.

<sup>51</sup> *Builder*, IV, 163 (21 March 1846), p 141.

substituted for alum.<sup>52</sup> However, one Stevens, who had acquired Martin's rights, contended that Parian cement infringed the latter's patent, and succeeded in obtaining an injunction to prevent its manufacture.<sup>53</sup> By 1853 however (when Martin's first patent would have expired), Charles Francis & Sons were manufacturing Parian cement 'for internal use, to be painted in a few hours and papered within a couple of days'.<sup>54</sup> Prominent Australian examples of its use were the Oriental Bank in Melbourne<sup>55</sup> and the Chamber of Commerce in Geelong, where the pilasters, the 1.2 m sub-base and the entablature were all in Parian, and the panels between in Portland cement jointed to look like stone.<sup>56</sup>

The new hard plasters were quickly taken up for various forms of imitation marble, but many references fail to distinguish these from true scagliola. A Victorian patent was granted to T A Dunn in 1858 for the manufacture of paving tiles, pedestals, and other objects from cores of Portland cement, faced with Keene's, Martin's or Parian cement.<sup>57</sup> In the same year Dunn exhibited two pedestals of 'patent vitrified stone and marble' and six chimneypieces,<sup>58</sup> and at the Intercolonial Exhibition of 1866-7 he showed what he now called 'scagliola' chimneypieces and pedestals.<sup>59</sup> Others were executing artificial marbling *in situ*. In 1859 the first floor columns of the Melbourne Club were finished in imitation of Siena marble,<sup>60</sup> as was to be done in many other buildings subsequently. In 1862 Charles Mayes gave the costs of various types of scagliola in his price book.<sup>61</sup> The house 'Mintaro' at Monegetta, Victoria, of 1880-1, has particularly fine marbled columns in the hall, executed in Keene's cement by E A Parry.<sup>62</sup> Scagliola-like finishes enjoyed revival in the Art Deco period, and as late as 1941 a most dramatic scagliola stair balustrade was installed at the Sydney house 'Mahratta'.<sup>63</sup>

#### *d. modelling*

There was little modelling - except in the form of imported *papier mâché* elements, which will be discussed separately - until the mid-nineteenth century, and such information as we have is heavily biased towards Melbourne. E A Parry reached Melbourne from Wales in 1852 and was responsible for the interior work at Bishops court in 1853, and the exterior of St Patrick's Hall in 1855, but neither these nor his later work would have involved a great deal of modelling. In 1856, however, when modellers were invited to submit specimens of their work in connection with

<sup>52</sup> Joseph Gwilt [revised Wyatt Papworth], *Encyclopaedia of Architecture* (London 1899 [1842]), §1866, p 543.

<sup>53</sup> *Builder*, V, 207 (23 January 1847), p 37.

<sup>54</sup> *Builder*, XI, 519 (15 January 1853), p 48.

<sup>55</sup> *Australian Builder*, 30 April 1859, p 130.

<sup>56</sup> *Australian Builder*, 4 June 1859, p 170, quoting the *Geelong Advertiser*.

<sup>57</sup> Victorian patent no 82 to Thomas Alexander Dunn, 22 January 1858.

<sup>58</sup> Victoria Industrial Society, *Catalogue of the Eighth Annual Exhibition* (Melbourne 1858), p 36.

<sup>59</sup> Intercolonial Exhibition of Australasia, 1866-7, *Official Record* (Melbourne 1867), p 23.

<sup>60</sup> *Australian Builder*, 23 April 1859, p 123.

<sup>61</sup> C B Mayes, *The Australian Builders' Price-Book* (Melbourne 1862), p 78.

<sup>62</sup> Inspection, and see also *Australasian Sketcher*, 9 April 1881, p 117.

<sup>63</sup> Patrick Van Daele & Roy Lumby, *A Spirit of Progress: Art Deco Architecture in Australia* (Sydney 1999), pp 20-21.

the new Houses of Parliament, those who responded were Charles Summers (later known as a sculptor) and Scurry & Mackennal. Later in the year George Peck of Lonsdale Street was advertising as a 'carver, modeller, designer, and general art-workman'.<sup>64</sup> In Sydney the first modelling works was set up by Charles Wacey in 1861, and flourished for the next three decades.<sup>65</sup> At the 1870 Exhibition George Wacey, presumably a connection, displayed chimneypieces in scagliola and Keene's cement.<sup>66</sup>

The Melbourne modellers made a strong showing at the London International Exhibition of 1862, and the *Art Journal Catalogue* illustrated two terra cotta fountains, one designed by J S Mackennal and other by his future partner, James Scurry, together with the seal designed by Summers for the prize certificates of the immediately preceding exhibition held in Melbourne, and an inkstand by 'Levigny' [the Castlemaine goldsmith Ernest Leviny].<sup>67</sup> Summers was later to return to Europe and finish his career in Rome.

It is difficult to summarise the careers of these modellers. Apart from major sculptural elements their bread and butter output consisted of architectural ornaments – capitals, brackets or trusses, cornices, centre flowers and fountains, and most of this work is unrecorded. The largest centre flower in the colony to date, 2.35 m in diameter, was created for the St Kilda Town Hall in 1859 by an unknown, S W Smith,<sup>68</sup> but this was the sort of work already being superseded by imported papier mâché. The Melbourne house 'Benvenuta', of 1891 has some of the most elaborate modelling of the Boom period, with details such as Jacobean strapwork columns, and the specification nominates the proposed 'girth' of each cornice, to be run in Red Beach [?] plaster, and names various 'courses of enrichment', some with modillions and other elaboration. Details were yet to be supplied for all of this, but 'Stock models for the enrichments may be used for the above work if approved'. Pilasters and dadoes were run in Portland cement and finished in Keene's, and the modelling in the drawing room was 'to be in the style of Louis XIV' - a most unusual provision in a specification.<sup>69</sup>

### *e. gypsum plaster*

The local production of gypsum plaster occurred rather belatedly. In Victoria J C Knight made up a small sample from a local deposit in 1856,<sup>70</sup> and three years later what was described as a fine sample of plaster was made from gypsum discovered

<sup>64</sup> Miles Lewis, 'Tradition and Innovation in Victorian Building' (3 vols, PhD, University of Melbourne 1972), II, pp 424-5.

<sup>65</sup> Joanna Capon, *Plaster Work* (Milsons Point [NSW] 1991), p 13.

<sup>66</sup> *The Industrial Progress of New South Wales* (Sydney 1871), p 57.

<sup>67</sup> London, International Exhibition 1862, *Art Journal Catalogue* (London 1862), p 153. 'T S' Mackennal and 'T' Scurry are in fact James Simpson Mackennal and James Scurry.

<sup>68</sup> *Australian Builder*, 4 December 1859, p 409, quoting the *St. Kilda Chronicle*.

<sup>69</sup> Law, 'Specifications for Mrs. L. Abrahams', p 42.

<sup>70</sup> *Australian Builder*, 30 April 1856, p 72. The source may have been the West Melbourne Swamp or a deposit near Inglewood, but more probably the Cape Otway District, where a prospecting party actually attempted to mine the gypsum deposits: R B Smyth, *The Gold Fields and Mineral Districts of Victoria* (Melbourne 1869), p 441.

near Ballarat.<sup>71</sup> In 1861 W L Morton reported 'practically inexhaustible' deposits of gypsum in the Victorian Mallee, and dug a hole about 900 mm deep without finding bottom. He saw it as potentially valuable for top dressing, deodorising, and 'as a constituent in the manufacture of cement.'<sup>72</sup> However it was only in the 1880s that the first commercial gypsum deposits were found around Lake Tocchi on the York Peninsula, South Australia, and it was during World War I that a local plaster industry developed.<sup>73</sup>

In the twentieth century the domination of the Victorian market by overpriced gypsum plaster from New South Wales precipitated the establishment of the local company, Victor, by builders and architects. It is unclear whether there was any formal connection with the American Victor plaster, made by the Keystone Plaster Company of Philadelphia,<sup>74</sup> for the Victorian Victor company imported the South Australian material. New South Wales suppliers attempted to swamp the company by dumping underpriced plaster on the market, but Victor was able to raise sufficient capital to buy up the dumped plaster, and broke the opposition.<sup>75</sup> Victor hard plaster is mentioned as a standard dado finish in a specification for housing in 1925,<sup>76</sup> and in 1949 the company referred to its thirty years of experience.<sup>77</sup> Most prefabricated ornamental work was now made in fibrous plaster, or at least plaster reinforced with fibre by the modeller. The firm of Picton Hopkins in Melbourne was legendary, and it seems that similar work was done by G R Lumb & Sons Ltd of Lewisham, Sydney.<sup>78</sup>

#### *f. proto-fibrous plaster*

Fibrous plaster and plasterboard sheets were current in Australia in the same period as pulp boards, but have a longer history, evolving from the tradition of 'cannabic work' or hemp-reinforced plaster, used for ornamental purposes. Even more relevant, though not plaster based, is cannabic composition. This was said to have originated in Italy, and used hemp from the 'shorts' of rope factories or the waste of flax mills, sorted, cleaned of foreign matter, and mixed with a hot resinous compound. It was rolled under great pressure into sheets of about two square metres, and of varying thickness, and for ornamental work it was then stamped by metallic dies in a hydraulic press.<sup>79</sup>

The English patent was taken out by Albano in 1843. He saturated the sheets with a mixture of manganese, resin, and oil or gas tar, which he rolled in, dried, and then

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<sup>71</sup> *Australian Builder*, 2 July 1859, p 204.

<sup>72</sup> W L Morton [ed J O Randell], *Adventures of a Pioneer* (Carlton [Victoria] 1978 [1884-6]), pp 181-2.

<sup>73</sup> Capon, *Plaster Work*, p 11.

<sup>74</sup> *Sweet's Catalogue* (1906), p 73.

<sup>75</sup> Information from David Gawler, Melbourne, 1994.

<sup>76</sup> *Australian Home Builder*, 15 June 1925, p 57.

<sup>77</sup> F Wentworth & W L Richardson [eds], *Ramsay's Architectural and Engineering Catalogue* (Melbourne 1949), § 29.2.

<sup>78</sup> W L Richardson [eds, *Ramsay's Architectural and Engineering Specifications [Volume 1]* (Melbourne, no date [1934]), p 112.

<sup>79</sup> *Builder*, VIII, 383 (8 July 1850), p 268.

saturated with oil and ochre before they were stamped with the pattern. After pressing, the sheets were coated with a mixture of oil, resin, turpentine and ochre, restamped if necessary, dried, and further coated with a mixture of animal size and Spanish white.<sup>80</sup> Cannabic composition was used for the Royal Italian Opera House at Covent Garden (predecessor of the present structure) in about 1848, but for some reason was not promoted at all by the patentee until 1850.<sup>81</sup> By May of that year over a thousand patterns were in stock, and the material had reportedly been used in a number of important buildings in England and, even earlier, had been extensively used in Paris.<sup>82</sup>

We will see that in 1851 C F Bielefeld, the papier mâché manufacturer, patented the 'fibrous slab' which was used by Sydney Smirke in the dome of the British Museum reading room, and Bielefeld also produced a lighter, though flammable version, rolled between sheets of canvas, but these were not plaster based. In 1856 the French modeller Léonard Alexander [?Alexandre] Desachy, patented a 'fibrous plaster', which he at first envisaged as being principally for ornamental work, though the patent also embraced its use in sheet form.<sup>83</sup> Owen Jones is said to have been the first patron of the material, which was claimed to have been derived from ancient Egyptian precedents, and consisted of plaster of Paris reinforced with canvas or stiffened with wooden pieces.<sup>84</sup>

The London plasterer R W Hitchins developed, and patented in 1875, what became known as the 'rapid system of plastering', using fibrous plaster 'slabs' as a base, with a thin setting coat over. This still used a wire base as in Leconte's patent, and was also referred to as Hitchins's 'fireproof plaster', but shown at the Sydney Intercolonial Exhibition of 1879 simply as 'slabs for ceilings'.<sup>85</sup> It was followed shortly by Wilkinson & Co's 'fibrous plaster slabs'.<sup>86</sup> Fibrous plaster is said to have received 'its first great impetus' when it was used for the ceiling panels of the main building at the Paris Exposition of 1878.<sup>87</sup> But in the absence of other evidence this must be presumed to be of the canvas type. The 'patent fibrous plaster' shown at the Melbourne Centennial Exhibition of 1888-9 by G Jackson & Sons of London<sup>88</sup> is more debatable, for as advertised in Britain it was available in 'slabs' or 'ready for mixing',<sup>89</sup> the latter possibly implying plaster with fibre. Even at the turn of the century 'fibrous plaster slabs' were made, somewhat confusingly, on a base of canvas rather than of fibre.<sup>90</sup> However R W Hitchin was now making 'Salamander' slabs, in

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<sup>80</sup> Wyatt Papworth [ed], *The Dictionary of Architecture* (London 1853-92), sv Cannabic Composition.

<sup>81</sup> *Builder*, VIII, 383 (8 July 1850), p 268.

<sup>82</sup> *Builder*, VIII, 378 (4 May 1850), p 215.

<sup>83</sup> Stagg & Masters, *Decorative Plasterwork, Repair and Restoration* (Cheltenham 1986), cited with no page by Louise Coonan, *History of Building Construction* 1992.

<sup>84</sup> Millar, *Plastering*, pp 349-50.

<sup>85</sup> Sydney International Exhibition 1879, *Official Catalogue of the British Section* (London 1879), 51.

<sup>86</sup> Gwilt, *Encyclopædia*, §2246b, p 706. The idea of *in situ* plastering on wire is much earlier, and a reference to its use in 1856 has been cited above.

<sup>87</sup> W Verrall, *The Modern Plasterer* (2 vols, London, no date [?c1930]), II, p 112.

<sup>88</sup> Centennial Exhibition 1888-1889, *Official Record*, p 443.

<sup>89</sup> *Building News*, 20 April 1888, p iii.

<sup>90</sup> J E Sears [ed] *The Contractors, Merchants, and Estate Managers' Compendium and Catalogue* (15th ed, London 1901), following p 78: F McNeill & Co made 'Fibrous Plaster Slabs, with Lath

which the reinforcement was silicate cotton, which made them highly heat-resistant,<sup>91</sup> and also, it would seem, made them fibrous plaster in the later sense. But whether Hitchin was first is less certain, for Frederick Jones was using the same material by 1901, as will appear below.

It appears that 'fibrous plaster' of the Desachy type was introduced in Sydney by the modeller George T Cross of Bond Street and Surry Hills. It is hard to be absolutely certain, because although he produced a material under that name, nothing is said about its composition, and it is unclear when he began making it. Nonetheless we can reasonably infer that it was canvas plaster on the basis of a report that ceilings of the same material were already in extensive use in the United Kingdom.<sup>92</sup> Such canvas plastering was used locally in Rowe & Green's YWCA Building in Bathurst St, Sydney, in 1885,<sup>93</sup> and though the architects are credited with the innovation, it seems likely that it was Cross who made it, and that this was his first foray into the field. So it appears that Cross's plaster was based on lath and fabric, and that he was the first person to make canvas plaster work in Australia.<sup>94</sup> It was probably used for ornamental elements in the first instance, but by 1886 plain sheets of reinforced plaster seem to have been in use, for Cross advertised 'Fibrous Plaster Cornices and Ceilings, Either Plain or Ornamental'.<sup>95</sup>

In 1887 a great deal of canvas plaster was reported to be being used in Her Majesty's Theatre, Pitt Street, Sydney. This was for ornamental work, and the report gives a description of the manufacturing process based upon English and German sources rather than upon the actual work in Sydney. Mouldings were run in plaster, ornamental work moulded in clay and attached, and a plaster cast taken of the finished design and coated in shellac. Oiled plaster of a creamy consistency was floated across the whole piece with a brush. Then a layer of canvas was pressed down on it, leaving a space of 3-6 mm from the casting surface. More plaster was laid over that, then another layer of canvas, and a thin coat of plaster to finish. For larger sizes wooden stiffeners were attached. The product was light and transportable, could be fixed in place with screws, and was especially useful where speed was required. The more ornamental it was the greater the cost benefit of using canvas plaster.<sup>96</sup>

By 1890 Cross had a workshop measuring thirteen by twenty-six metres, and in it more than a thousand 'fibrous plaster' ceiling centrepieces, from 0.6 to 1.8 metres in diameter, and in 150 different patterns. Unlike older plaster centrepieces, each was made in one piece, and this made them especially suitable for fixing to wooden ceilings. Cross also had a range of cornices and ornamental work of all sorts (not necessarily of fibrous plaster), but had just begun making complete ceilings and

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and Canvas Centre' and 'with Metal Wire centre'. Fredk. Jones & Co. made 'fibrous plaster slabs based on laths and canvas, but also silicate cotton slabs, as discussed below. See also Miller, *Plastering*, pp 349 ff.

<sup>91</sup> Miller, *Plastering*, p 378.

<sup>92</sup> *Building and Engineering Journal*, 12 July 1890, p 244.

<sup>93</sup> *Australasian Builder and Contractor's News*, 2 July 1887, p 124. The building was dedicated on 5 September 1885: *Argus*, 7 September 1885, p 5.

<sup>94</sup> Capon, *Plaster Work*, p 17.

<sup>95</sup> Charles Mayes, *The Australian Builders' Price-Book* (5th ed, Melbourne 1886), p xxxiv.

<sup>96</sup> *Australasian Builder & Contractor's News*, 18 June 1887, p 99. The fibrous plaster in this building is also mentioned in *ABCN*, 22 October 1887, p 382.

cornices in squares of up to three metres, to be screwed directly to the joists, one of the first being for the house of A Bennett at Darling Point.<sup>97</sup> In what was doubtless a misprint, all cornices and centre flowers of the National Mutual Life Assurance building in Melbourne were specified to be 'in FIBRON'S Plaster'.<sup>98</sup>

Whilst anybody could use canvas plaster in New South Wales, it was absolutely protected in Victoria by a patent in the name of Ernest Braby of Sydney,<sup>99</sup> which probably retarded its introduction. This also explains the reference to the 'patent fibrous plaster' executed by one Thallon of Russell Street, Melbourne, at a suburban house in 1890.<sup>100</sup> The first maker to use canvas without any lathing whatsoever appears to have been one Blaikie of Auckland, New Zealand (whose patent slating has been mentioned already). His sheets must have been thinner and more uniform than those containing laths, but they were still designed to be finished off with a thin coating of plaster applied *in situ*. Their main merit, as was reported in 1889, was their resistance to fire, which had been demonstrated in a real conflagration in New Zealand.<sup>101</sup> By 1908 Mayes was able to report that 'The demand for [fibrous plaster ceilings and cornices] has increased to a wonderful extent of late years.' But as he goes on to mention Grant & Cocks of Sydney as specialists, he seems still to be referring to the old material formed on a canvas base.<sup>102</sup> Jeffries's *Australian Building Estimator* again mentions only Grant & Cox by name.<sup>103</sup>

### *g. fibrous plaster*

What distinguishes fibrous plaster from canvas plaster in the first instance is that it is based upon jute or other fibre rather than upon canvas. However, this is not in itself novel, for it is in the tradition of cannabic modelling. It is only when sheets of the material are pre-formed - at first as moulded panels, but later as plain sheets - that it approaches the modern concept of fibrous plaster. The other development out of cannabic work was the material known in the United States as 'staff', described by Sturgis in 1902 as a stiff plastering held together with a fibrous material and used for exterior surfaces and mouldings, particularly in temporary buildings.<sup>104</sup> He probably had in mind the Chicago World's Fair of 1893, where giant buildings were clad in this material, described by Larsen as a mixture of plaster and jute spread over wooden framework.<sup>105</sup> A later definition refers to a mixture of plaster of Paris with a little cement,<sup>106</sup> and its true descendants are cement-based materials, including Gunitite. Staff itself has not been reported in Australia.

<sup>97</sup> *Building and Engineering Journal*, 12 July 1890, p 244.

<sup>98</sup> Wright, Reed & Beaver, 'Specification for Erection of Premises for the National Mutual Life Association of Australasia. Corner of Collins & Queen Streets Melbourne' (Melbourne 1890), p 36.

<sup>99</sup> *Australasian Builder & Contractor's News*, 2 July 1887, p 124.

<sup>100</sup> *Building and Engineering Journal*, 22 August 1891, p 90: the house was designed by Philip Treeby, and was at the intersection of Dandenong and Alma Roads, Malvern.

<sup>101</sup> *Australasian Builder & Contractor's News*, 6 April 1889, p 334.

<sup>102</sup> C E Mayes, *The Australian Builders and Contractors' Price-Book* (7th ed, Sydney 1908), p 160.

<sup>103</sup> Walter Jeffries, *The Australian Building Estimator* (Sydney 1907), p 209.

<sup>104</sup> Russell Sturgis, *A Dictionary of Architecture and Building* (3 vols, New York 1901), III, p 593.

<sup>105</sup> Erik Larsen, *The Devil in the White City* (London 2003), p 120.

<sup>106</sup> H H Siegele, *Building Trades Dictionary* (Chicago 1946), p 315.

The first major local use of a fibrous plaster based upon hemp or jute, rather than canvas, is said to have been the W Gardiner & Co warehouse in Clarence Street, by the architects Rowe & Green in 1887,<sup>107</sup> but this is almost certainly wrong.<sup>108</sup> Graeme Butler reports the use in about 1900 of panels of plaster in plain coved surfaces, together with pre-formed cover straps of as Gothic character in the form of ribs, with bosses at the intersections. There are a number of examples of this at the Fairfield Hospital, Melbourne, though whether the material is canvas based has yet to be determined.<sup>109</sup> By 1901 another firm in Melbourne, Foster & Co [Alexander Foster] was making fibrous plaster.<sup>110</sup> In 1902-3 the Victorian homestead 'Burnewang', near Elmore, had fibrous plaster cornices throughout and, more significantly, a fibrous plaster panelled ceiling in the billiard room.<sup>111</sup> For the 1904 additions to 'Warrington' in the Melbourne suburb of Hawthorn the specification directs: 'Allow the sum of £100 for fibrous plaster ceilings to proposed drawing room and best bedroom over', while in other rooms there are references simply to 'fibre'. A marginal note refers to Waschatz and Wardrop & Scurry, apparently as potential contractors, but does not mention Foster. All of these must be assumed to refer to canvas-based plaster, but the names of Waschatz and Wardrop are relevant to the invention of the subsequent and truly fibrous type.

J M Freeland has given a circumstantial, but regrettably undocumented and rather suspect account, of the invention of true fibrous plaster. He stated that Grant & Cocks of Sydney had been using hemp to reinforce plaster as early as 1905, but this implies nothing more than traditional cannabic work for modelling and (as we have seen) there is no reason to believe that their sheets were of other than the standard canvas-based type. Freeland then claimed that fibrous plaster was invented by Robert Wardrop, a wood carver who emigrated from Victoria to New Zealand in 1900, and became associated with a German named Schafer in the Carrara Ceiling Company. Schafer used a German method of casting plaster mixed with cotton wool, called 'Stuccolin', but this was abandoned for reasons of cost, and in 1908 sheets reinforced with tow from old mattresses were produced, reasonably satisfactorily. In 1910 the company tried New Zealand flax as reinforcement, with great success, and the first sheets were exported to Melbourne in 1912. In the same year the Lottoid Company of Richmond, Melbourne, began importing flax and manufacturing in competition. After World War I flax from Java, rather than from New Zealand, was used.<sup>112</sup>

Whatever the basis of this account it contains significant elements of truth. The name Wardrop suggests a connection with the Melbourne man of that name who was also a pioneer of fibrous plaster - the firm of Wardrop & Scurry later claimed to have been the first to have been the first to introduce fibrous plaster 'for decorative purposes' in

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<sup>107</sup> *Town and Country Journal*, 28 January 1888, p 186, quoted in Dockrill, 'Developments in Architecture', I, p 94. W W Campbell, manager for Rowe & Green, claimed to have supervised the building: *ABCN*, 25 August 1894, p 73.

<sup>108</sup> *Australasian Builder & Contractor's News*, 2 July 1887, p 124, gives the address as York St, and explicitly refers to it as an example of canvas plastering, by the plasterer Thomas Nunn.

<sup>109</sup> Information from Graeme Butler, 1997.

<sup>110</sup> Smith, *Cyclopedia of Victoria* II, p 160.

<sup>111</sup> *Building and Engineering Journal*, 11 July 1903, p 155.

<sup>112</sup> J M Freeland, *Architecture in Australia*, (Melbourne 1968), p 222.

Victoria.<sup>113</sup> No date is given for this innovation, but the firm claimed to have been established in 1885,<sup>114</sup> and the reference is doubtless to fibrous plaster in the older sense. At 'Boisdale', Victoria, of 1892, is a frieze containing gum leaves, which must be preformed, and seems certain to be a local design. Elsewhere it is usually difficult to discern what is pre-formed and what is modelled in situ. Nor is it clear what is truly fibrous plaster, for the traditional cannabic work of modellers was based upon hemp fibre.

Joanna Capon names Otto Waschatz of Melbourne as the first to use fibrous plaster in Australia, but she does not specify a date, and Waschatz's own daughter made a more limited claim - that her father was the founder 'of the Plaster Sheet Industry of Australia'.<sup>115</sup> Waschatz may have been working at an early enough date for this to be true - that is before 1884 - but it must be assumed, in the absence of any other information, that his fibrous plaster was of the standard fabric-based type. Frank Cusack asserts that Waschatz 'patented the fibrous plaster wall sheet under the trade name "Lottoid"',<sup>116</sup> but this seems to refer to a later development (possibly the use of flax from 1912, as above). Waschatz's business passed to Sayer & Cossins Pty Ltd at the time of the Great War, and they published *The "Lottoid" Book* in about 1917.<sup>117</sup> Meanwhile the Melbourne architect J F Gibbins, according to his grandson, developed a system for producing fibrous plaster in about 1900. A large glass-topped table was taken to the site. Plaster was spread on it and impregnated with fibre, then the table was turned up on its side and the plaster sheet fixed directly to the wall.<sup>118</sup>

In Western Australia all cannabic and fibrous plaster elements had to be imported until local manufacture began in the 1890s.<sup>119</sup> In South Australia A W G Pitt bought out the ornamental modelling business of Barnes and Neale at about the turn of the century, and in 1901 tried making ornamental plaster sheets in the factory. At this stage they were three or four foot [0.3-1.2 m] squares reinforced with hessian and lath on edge, and designed to be fixed onto ceiling joists. Soon the hessian was replaced with flax fibre, and then that in turn with teased sisal (obtainable from the ropeworks between Bowden and Croydon). This made lighter construction and larger panels possible, and it is claimed to have been the first fibrous plaster sheet in Australia.<sup>120</sup> The claim cannot easily be disproved, but it must be treated with some reserve in the light of Cross's advertisement. The use of hemp to reinforce plaster - cannabic work - was, after all, well established in Australia and elsewhere,<sup>121</sup> even if not used for sheet

<sup>113</sup> James Smith [ed], *The Cyclopaedia of Victoria* (3 vols, Melbourne 1903, 1904, 1905), II, pp 159-160.

<sup>114</sup> *Every Man's Home*, II (October 1922), p 42.

<sup>115</sup> Draft letter of Mrs E Wicks to C P Jarman, Secretary of the Fibrous Plaster Association of New South Wales, 4 February 1952, quoted to me by Anne Mancini, from the original then in the possession of J Waschatz.

<sup>116</sup> GET Frank Cusack ref to Waschatz and Lottoid.

<sup>117</sup> George Tibbits, 'The Conservatorium of Music and Melba Hall, &c' (Melbourne 1996), p 6, refers to information on *The "Lottoid" Book* from Terry Lane of the National Gallery. Waschatz also employed artists such as Robert Prenzel.

<sup>118</sup> Chris Smith, 'J F Gibbins' (BArch investigation project, Melbourne University, unpaginated).

<sup>119</sup> M U Beasley, 'With Glint of Gold. Western Australia', in Trevor Howells [ed], *Towards the Dawn* (Sydney 1989), p 147.

<sup>120</sup> 'Albert William George Pitt' [anonymous undated typescript kindly supplied by Dr Donald Langmead].

<sup>121</sup> C B Mayes, *The Australian Builders' Price-Book* (2nd ed, Melbourne 1862), p 81.

material, and hair had been in use even longer. There seems no great difference in principle between hair, hemp, flax and sisal. Pitt himself, during the shortages of World War II, tried out various types of agave fibre, and finally turned to swamp grass, collected near Beachport. The first absolutely unequivocal reference to the use of fibre rather than fabric in reinforced plaster sheets occurs in 1929 when 'Griffinoid' plaster sheets are described as 'composed of finest quality plaster interwoven with short fibres and thoroughly dried by a special process, which guarantees maximum service'. These were manufactured, supplied and fixed by W R Phillips of Melbourne.<sup>122</sup>

According to Capon this fibrous plaster - based upon fibre rather than canvas - was unique to Australia, and only afterwards copied by the British and Americans. The fibre was at first hemp or sisal, though other material was used afterwards. All this seems slightly tenuous. In England Frederick Jones & Co, for example, in 1901 made not only 'fibrous plaster slabs' based on lath and canvas, but also 'Patent Silicate Cotton and Plaster Slabs' which were apparently homogeneous.<sup>123</sup> This would seem to relate to Schafer's 'stuccolin' and to predate true fibrous plaster in Australia, even if we do not regard cannabic composition sheets or Bielefeld's fibrous slab as relevant. But it is true that even after 1935 H B Newbold discussed fibrous plaster solely in terms of scrim or canvas reinforcing.<sup>124</sup>

In the United States prefabricated 'Aladdin' houses by 1920 were provided with 'Aladdin lath and plaster' which was 'an improved wood fibre patent plaster' and did away with 'the work of preparing plaster through the old fashioned method'. This 'fibre plaster' must have been a recent innovation, if we may judge from the fact that one illustration in the catalogue still shows conventional lathing, but it was probably still canvas based.<sup>125</sup> By the 1930s plaster blocks were being reinforced with 3% to 5% of wood fibre,<sup>126</sup> and in 1936 the United States Gypsum Company, in the extensive range of its products, mentioned a 'wood fiberplaster' in which finely shredded wood was mixed with the plaster powder. But still the company did not offer a fibrous plaster sheet.<sup>127</sup>

However, the problems of chronology and terminology in this area are insurmountable. In 1908 Mayes listed plain fibrous plaster panels for ceilings, plain panels with cover mouldings (presumably for walls), and various ornamental panels, cornices, cement flowers &c.<sup>128</sup> Grant & Cocks of Sydney claimed to be specialists, and would fix their 'plastic art ceilings and cornices' in any part of Australia.<sup>129</sup> By 1914 fibrous plaster slabs were available in plain, stippled and fancy design finishes,

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<sup>122</sup> *Journal of the Royal Victorian Institute of Architects*, September 1929, p vi.

<sup>123</sup> Sears, *Compendium* (1901), pp 77-8.

<sup>124</sup> H B Newbold, *Modern Practical Building* (4 vols, London, no date [?c1936], III, pp 278-9.

<sup>125</sup> *Aladdin Homes Catalog No 32* (3rd ed, Michigan, no date [1920]), pp 9, 13.

<sup>126</sup> Susan Escherich, 'Gypsum Block and Tile', in T C Jester [ed], *Twentieth-Century Building Materials* (Washington [DC] 1995), p 163, citing US Department of Commerce, National Bureau of Standards, *U.S. Government Master Specifications for Calcined Gypsum* [circular no 28] (U.S. Government Printing Office, 1935), pp 2-4.

<sup>127</sup> United States Gypsum Co, *A Catalog of Building Materials* (Chicago 1936), § A, pp 20-21.

<sup>128</sup> Mayes, *The Australian Builders Price-Book* (1908), p 160.

<sup>129</sup> Mayes, *The Australian Builders Price-Book* (1908), p xxii.

three feet [0.9 m] square, and King's fibrous plaster board (Diamond brand) in slightly smaller panels.<sup>130</sup>

In 1919 James Hardie established fibrous plaster works at North Melbourne and Redfern, and for some time their 'Hardino' sheets were based upon a hessian-like fabric of 'tough Java hemp' rather than a simple fibre.<sup>131</sup> The North Melbourne factory continued for only fourteen years,<sup>132</sup> but in 1920 the Redfern works were transferred to a new factory in Mandible Street, Alexandria, and this continued to operate until 1941.<sup>133</sup> Apart from plain sheets and cornices, Hardies manufactured 'Embosoid' textured sheets in three patterns, 'Rocco', 'Arctic' and 'Muranese'.<sup>134</sup> Also in 1919, however, 'Lottoid' was advertised locally in flat sheets, ornamental sheets, cornices, cover moulds and vents, and it was stated that the face was free from fibre, which seems to suggest that it was fibrous plaster in the modern sense. The vendor, Spriggs' Asbestolite Company of Sydney, referred to thirty-five years experience with the flat sheets, and this may indicate an overseas origin.<sup>135</sup> By the 1930s Picton Hopkins of Melbourne were manufacturing fibrous plaster sheets under the infelicitous brand name 'Fibroid'.<sup>136</sup>

Some indication of the Australian situation can be gained from the successive editions of Nangle's *Australian Building Practice*. In 1911 and 1925 even the fabric-based type was seen as a novelty:<sup>137</sup>

During recent years a very excellent improvement in plastering work for ceilings has been accomplished through the medium of what is known as 'fibrous plaster.' This consists of sheets of plaster made on a skeleton of scrim in the modeller's workshop. It is conveyed to the building in sheets, and is screwed or nailed to the joists.

Only in the 1944 edition, revised by Nangle's sons, do we find the statement that fibrous plaster 'is manufactured with plaster of Paris reinforced with sisal hemp'.<sup>138</sup> Ironically this was during World War II and at the very time at which sisal became unprocurable, at least in New Zealand, where H V Wallace & Co advertised that 'the fibre generally used' in their Walasco fibrous plaster had been frozen by regulation, but that an excellent substitute had been found.<sup>139</sup> In 1949 an advertisement by Picton, Hopkins & Sons spoke of the incorporation of 'hemp, hessian and lath

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<sup>130</sup> Mayes, *The Australian Builders Price Book* (1914), p 238.

<sup>131</sup> Advertisement reproduced in Joanna Capon, *Plaster Work* (Milsons Point [NSW] 1991), p 20.

<sup>132</sup> *The Story of James Hardie & Coy. Pty. Limited 1888 to 1966* (Sydney, no date [1966]), pp 11, 13.

<sup>133</sup> *The Story of James Hardie*, p 11.

<sup>134</sup> James Hardie & Coy. Ltd., *Catalogue for Hardie's Fibrous Plaster Sheets* (Sydney, no date [?c 1925]), passim.

<sup>135</sup> *Building*, XXIV, 145 (12 September 1919), p 44.

<sup>136</sup> Richardson, *Ramsay's Specifications*, I, p 112.

<sup>137</sup> James Nangle, *Australian Building Practice* (2nd ed, Sydney 1911), p 373; *ibid* (3rd ed, Sydney 1925), p 373.

<sup>138</sup> James Nangle [revised J E T & A P Nangle], *Australian Building Practice* (2nd ed, Sydney 1911), p 373; *ibid* (4th ed, Sydney 1944), p 402.

<sup>139</sup> *Building Progress* [Auckland], VIII, 1 (January 1943), p 7.

reinforcement', but this was apparently a reference to elaborately moulded work,<sup>140</sup> and cannot be taken to indicate what went into flat sheets.

Despite the increasing enthusiasm for sheer plaster surfaces, factory preformed shapes in fibrous plaster remained important. In New Zealand Walasco produced right-angled strips to fit into the corners of rooms, something which is not found in Australia, but significant because it obviated the need for up to two extra studs to provide fixing at corner junctions.<sup>141</sup> In Australia after the war Plastmold Products Pty Ltd specialised in elaborately moulded elements of sisal reinforced plaster including pelmets in the form of ruched curtains, moderne styled fireplace surrounds, and lighting fixtures consisting of circular and streamlined attachments to the ceiling, often with elements below them containing lights shining upwards, so that the room was lit by reflection.<sup>142</sup> The 'Gilsto' fireplace surrounds, apparently introduced in 1948 by J H Stokes of Birrong, New South Wales,<sup>143</sup> seem to have been similar. In Britain as late as 1950 Newbold's *Modern Practical Building* and Drury's *Architects' Reference Book* discussed fibrous plaster in terms mainly of decorative work rather than flat sheets, and still reinforced with scrim or canvas.<sup>144</sup>

#### ***h. plasterboard***

The idea of plasterboard, consisting of gypsum plaster sandwiched between sheets of paper, is said to have originated in an American patent taken out in 1894 by Augustine Sackett of New York,<sup>145</sup> and it was widely manufactured in the United States by 1906, when the company had two plants, one at Garbult, New York, and the other at Grand Rapids, Michigan.<sup>146</sup> It was made in sheets 32 x 36 inches [800 x 900 mm] and from 1/4 to 1/2 an inch [6.4 - 12.8 mm] thick, built up of five thin layers of gypsum sandwiched between six layers of soft unsized felt paper. By 1898 Sackett had reduced this to three layers of gypsum and four of paper, which was now produced as 'Sackett Board' by the Sackett wall Board Company's plant at Paurapoe [?], New Jersey.<sup>147</sup> A later American advertisement describes Sackett Board as being in precisely the same panel sizes, but now shows it as consisting of three layers of Gypsum, interleaved with two layers of wool felt, making a complete thickness of

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<sup>140</sup> F Wentworth & W L Richardson [eds], *Ramsay's Architectural and Engineering Catalogue* (Melbourne 1949), § 29/4.

<sup>141</sup> *Building Progress* [Auckland], II, 5 (May 1937: Wellington edition), p 6.

<sup>142</sup> *Ramsay's Catalogue* [1949], § 29/1; *Ramsay's Catalogue* [1954], § 29/4; *Australian Home Beautiful*, February 1951, p 47.

<sup>143</sup> Associated General Publications Pty Ltd, *Sixty Home Plans* (Sydney 1948 [1946]), p 26.

<sup>144</sup> H B Newbold [revised Edgar Lucas], *Modern Practical Building* (3rd ed, 4 vols, London 1950 [1934]), III, pp 282-3; Evelyn Drury et al [eds], *Architects', Builders' and Civil Engineers' Reference Book* (London 1950), p 110.

<sup>145</sup> U S Patent no 520,123, to Augustine Sackett, 22 May 1894, cited by K A Konrad & M A Tomlan, 'Gypsum Board', in T C Jester [ed], *Twentieth-Century Building Materials* (Washington [DC] 1995), p 269.

<sup>146</sup> Sweet's Catalogue [1906], pp 60-61; see also Pedro Guedes, *The Macmillan Encyclopedia of Architecture and Technological Change* (London 1979), p 236.

<sup>147</sup> Konrad & Tomlan, 'Gypsum Board', p 269.

either  $\frac{3}{8}$  inch [9.5 mm] or  $\frac{1}{4}$  inch [6.4 mm]. It was fixed with a 'Sackett nail', or large flat-headed clout.<sup>148</sup>

'Sackett Board', as sold by John E Tonks of Sydney in 1914, was described rather differently, as being made of wood fibre and gypsum plaster,<sup>149</sup> and in sheets of the same size, 32 x 36 x  $\frac{1}{4}$  inches. Marian Bowley asserts that plasterboard had little impact in England before the Great War,<sup>150</sup> and John Routley identifies the first British plant as that of British Plasterboard Limited, built at Wallasey, Cheshire, of 1917. This company was established by the Liverpool builders' merchants Ferguson & Harvey, and the board it produced, branded 'Thistle', was intended only as a baseboard.<sup>151</sup>

Sackett Board was intended only as a base for finished plasterwork, in effect a substitute for lathing (usually termed 'baseboard').<sup>152</sup> In 1907 Stephen Kelley founded the Samson Plaster Board Company, and soon after patented a manufacturing process for two-ply gypsum boards, which he made in the same size as Sackett's, but using cheap paper instead of felt paper. Both the Sackett and the Samson company were taken over by the United States Gypsum Company, which entered the market in own right in 1909. By about 1920 there were two other brands of gypsum board, 'American' and 'Adamant', which consisted of only a single layer of gypsum, between two layers of paper. They came in the same overall size as Sackett Board but only in the  $\frac{3}{8}$  inch [9.5 mm] thickness, and were likewise intended as a base for plastering.<sup>153</sup>

In 1916 John and Joseph Schumacher produced larger boards, faced with a sized paper to retard water penetration, in a width of 48 inches [1200 mm] and thickness of  $\frac{3}{8}$  inch [9.5 mm].<sup>154</sup> These can probably be identified with the 1916 gypsum boards of this time which were reportedly intended for the direct application of decorative finishes. 'Sheetrock' came in a  $\frac{3}{8}$  inch [9.5 mm] thickness and sizes of four feet by eight or nine feet [1.2 x 2.4 or 2.7 m], with a square edge so that the sheets butted together. 'Bestwall' was in similar sizes, but with a round edge.<sup>155</sup>

In 1920 Clarence Utzman, of the United States Gypsum Company, obtained a patent for a plaster wallboard with folded paper edges,<sup>156</sup> which was manufactured as 'Masterock', with the gypsum sandwiched not between paper but between two layers of 'heavy fibre board'. It was also designed for the direct application of decorative finishes. 'The square folded edges,' it was said, 'butt tightly together, forming a smooth, even surface which can be readily decorated in any fashion with wallpaper,

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<sup>148</sup> Waldo Bros. and Bond Company, *Building Materials and Construction Equipment* (Boston, no date [c 1920]), p 347.

<sup>149</sup> Mayes, *Price Book* (1914), p 238 & advertisements p 51. A further reference, p 28, to it containing 'lime cement' is possibly erroneous, as discussed above.

<sup>150</sup> Marian Bowley, *Innovations in Building Materials* (London 1960), p 120.

<sup>151</sup> John Routley [ed Harold Mattingley], *A Saga of British Industry* (London 1959), pp 3-4. See also Bowley, *Innovations in Building Materials*, p 330.

<sup>152</sup> Waldo Bros. and Bond Company, *Building Materials and Construction Equipment* (Boston, no date [c 1920]), p 347.

<sup>153</sup> Waldo Bros. and Bond, *Building Materials and Equipment*, p 347.

<sup>154</sup> Konrad & Tomlan, 'Gypsum Board', p 269.

<sup>155</sup> Waldo Bros and Bond, *Building Materials*, p 346.

<sup>156</sup> Konrad & Tomlan, 'Gypsum Board', p 269.

paint or calcimine [*sic*].<sup>157</sup> In 1936 the United States Gypsum Co was producing 'Sheetrock' plaster board from 1/4 to 1/2 inch [6 to 13 mm] thick, encased in tough paper with 'a close-grained, highly calendered surface of ivory colour', designed for the direct application of paint. The joints required *in situ* finishing using a strip either of perforated metal tape or of fabric, embedded in a jointing cement (but apparently proud of the sheet surface in either case).<sup>158</sup>

However plasterers' apprentices in the United States were still being taught in the 1930s that it was necessary to apply coats of wet plaster over wallboards,<sup>159</sup> and in addition to 'Sheetrock' the United States Gypsum Co was still making a 3/8 inch [10 mm] gypsum plaster board, 'Rocklath', as a base for 1/2 inch [13 mm] plastering.<sup>160</sup>

Only in 1929 did the British Plasterboard factory begin to produce 'Paramount' wallboard, intended as a final surface for decoration. Both the baseboard and the wallboard consisted of gypsum plaster bonded on each face to a fibrous paper.<sup>161</sup> This was a response to the importation of wallboards such as 'Gyproc', made by the Gypsum, Lime and Alabastine Co of Canada, and marketed by Honeywill & Stein, a subsidiary of Distillers Co. Sales were so satisfactory that in 1934 Distillers Co entered an agreement with the Canadian company to form Gyproc Products Ltd, and manufactured the material in Kent.<sup>162</sup>

The British-made plasterboards still competed against imports such as the Canadian 'MAF' gypsum plasterboard marketed by MacAndrew & Forbes Ltd,<sup>163</sup> and in fact by 1946 one writer found the plasterboards on the market in Britain too numerous to name.<sup>164</sup> They still seemed to have been overwhelmingly baseboards, for wallboard is hardly mentioned in Knight's *Builders' Materials*, even in the second edition of 1948.<sup>165</sup> Again in 1950 Drury's *Architects' Reference Book* discussed plasterboards solely as substitutes for lathing.<sup>166</sup>

On the Australian scene, plasterboard was available in 1914 (even before manufacture had begun in Britain) in sheets measuring 32 x 36 a 3/8 inches [813 x 914 x 9.5 mm], and was described as 'a compressed composition to be used as a substitute for lath and the first coat of plaster.'<sup>167</sup> It is doubtful whether it was much used in this way, for it was soon more commonly treated as a finished surface, with the joints concealed by cover straps as with so many other lining materials of the day. Nevertheless, in 1949

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<sup>157</sup> Chicago Millwork Supply Co, *Millwork and Building Material*(Chicago, no date [c 1925]), p 48.

<sup>158</sup> United States Gypsum Co, *A Catalog of Building Materials* (Chicago 1936), § B, pp 1-2.

<sup>159</sup> M A Tomlan, 'Building Modern America', in Thomas Jester [ed], *Twentieth-Century Building Materials* (Washington [DC] 1995), p 38.

<sup>160</sup> United States Gypsum Co, *Catalog*, § A, pp 2-3.

<sup>161</sup> Routley, *A Saga of British Industry* (London 1959), pp 3-4. See also Bowley, *Innovations in Building Materials*, p 330.

<sup>162</sup> Bowley, *Innovations in Building Materials*, pp 331-2.

<sup>163</sup> J E Sears & J E Sears [eds], *The Architects' Compendium and Annual Catalogue* (London 1936), p 456.

<sup>164</sup> Edmund Smith, 'Plastering', in F E Drury et al [eds], *Architects', Builders' and Civil Engineers' Technical Catalogue* (London 1946), p 80.

<sup>165</sup> B H & R G Knight, *Builders' Materials* (2nd ed, London 1948 [1939]), pp 137-140.

<sup>166</sup> Drury, *Architects' Reference Book*, pp 109-110.

<sup>167</sup> Mayes, *The Australian Builders Price Book* (1914), p 28.

Australian Plaster Industries were still making an underlay or baseboard, 'Victor Perforated Gypsum Lath'. This came in small sizes,  $\frac{3}{8}$  inch [10 mm] thick by no more than 54 inches [1.37 m] long, surfaced in 'heavy fibre sheet', and containing a grid of circular holes to provide bond.<sup>168</sup>

In 1919 Noyes Bros of Sydney were advertising 'Gypsboard' solely in terms of panelled effects. This material consisted of 'monolithic plaster sheets', and was an all-Australian product,<sup>169</sup> though how it might have differed from the American invention is by no means apparent. Elsewhere they asserted, somewhat confusingly, 'The tough snow-white Gypsboard Plaster Sheets comprise the best fibre that can be bought',<sup>170</sup> even though the material does not appear to have been a fibrous plaster. In the 1920s Wunderlichs in Sydney were advertising Ceilyte, 'the Australian plaster board' with a crack-proof genuine plaster surface.<sup>171</sup> In New Zealand 'Gibraltar' plasterboard came onto the market in 1927, but its source is unclear.<sup>172</sup>

The distinctive sheet and batten finish of such materials was to give way in the 1920s to smooth planar surfaces. Two brands available in South Australia in the 1920s were 'Plastergon' wall board (which sounds as if it might have been a true plasterboard) and 'Celibre' fibrous plaster board.<sup>173</sup> However, fibrous plaster was still used to create the wonderful prismatic ceiling of W B Griffin's Capitol Theatre in Melbourne, of 1927, and according to Peter Cuffley states other than South Australia turned to plasterboard much more slowly, and fibrous plaster remained competitive with 'Gyprock' and 'Victorboard' plasterboards as late as the 1950s.<sup>174</sup> This is consistent with the fact that in 1938, and even in 1951, Mayes was still listing plain fibrous plaster sheets and making no reference to plasterboard.<sup>175</sup> Likewise the Department of Labour and National Service publication, *Plastering*, in 1946, discussed fibrous plaster at length but made no reference to plasterboard.<sup>176</sup>

Be this as it may, 'Schumite' wallboard (presumably that of the Schumacher Brothers, see above) was advertised by D & W Chandler Ltd of Melbourne in 1931. It was a gypsum board faced in heavy paper, though the gypsum was 'reinforced' in some way.<sup>177</sup> In Western Australia the term 'plaster board' was being used in 1939 to refer to what were also described as fibrous plaster sheets, made of gypsum reinforced with vegetable fibre, and the material was said to have been in use for over thirty years.<sup>178</sup> Victor Gypsum Wallboard, made by Australian Plaster Industries, was to dominate

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<sup>168</sup> F Wentworth & W L Richardson [eds], *Ramsay's Architectural and Engineering Catalogue* (Melbourne 1949), § 29.2.

<sup>169</sup> *Building*, XXIV, 145 (12 September 1918), p 44.

<sup>170</sup> *Book of Australian Bungalows* (Sydney, no date [c 1920]), p 106.

<sup>171</sup> *Book of Australian Bungalows*, p 5.

<sup>172</sup> C F Cameron, 'State Housing and State Sponsored Housing in New Zealand' (MArch, University of Auckland 1970), p 91.

<sup>173</sup> *The South Australian Building & Allied Trades Directory and Handbook* (Adelaide 1926), pp 2, 23.

<sup>174</sup> Cuffley, *Australian Houses of the Forties and Fifties*, p 62.

<sup>175</sup> Mayes, *Australian Builders' Price Book* (1938), p 332; (1951), pp 383-4.

<sup>176</sup> *Plastering* [Commonwealth Department of Labour and National Service, technical publication no 32] (Melbourne 1946)

<sup>177</sup> *Ramsay's Architectural Catalogue* (1931), p 175.

<sup>178</sup> Royal Australian Institute of Architects W A Chapter, *Exhibition 1949 Catalogue* (Perth 1949), pp 40-1, 45.

the market after World War II. In 1949 it was available in two forms - totally uniform sheets of 'square edge board', suitable for use with cover moulds in the traditional way, and 'recessed edge board' with a shallow rebate to allow the joint to be covered with 'Victor Perfortape' and finishing cement, to produce a completely flush surface. It was said to be a 'relatively new type of wall construction' which had been introduced in America about twenty-five years previous, and rapidly gained favour since that time.<sup>179</sup>

Australia came to be a proportionately greater user of gypsum plaster than most other nations, and by the 1950s fibrous plaster was being used - according to Robin Boyd - for 90% of walls and 99% of ceilings. Boyd claimed that the fibrous plaster industry scarcely existed in other countries (which we might readily believe if it had been generally superseded by plasterboard).

### *i. structural plaster*

It is not clear when plaster was first used structurally, but by 1872 the Chicago Patent Fireproof Plaster Company was making hollow plaster blocks for use between iron joists in a manner similar to the various terra cotta systems which were promoted after the 1871 fire. It appears that the company also produced hollow wall blocks for partitions. The slabs ran horizontally, perhaps 450 mm high and a metre or more long, with voids running in the vertical direction.<sup>180</sup> These were used in the Palmer House Hotel, Chicago. There were soon to be competing products in the USA, beginning with the Mack Slab, discussed below. In 1903 the United States Gypsum Company began producing gypsum tiles at its plant at Genesee, New York.<sup>181</sup> Early in the twentieth century 'Pyrobar' gypsum blocks for partitions and furring were introduced in the United States, apparently rather similar to Mack slabs (below), in thicknesses of two to eight inches [50 to 200 mm], with cylindrical voids along the length, apparently produced by extrusion.<sup>182</sup> None of these is known to have reached Australia.

A product which did so was the 'Mack' slab, a plaster-based product which had been developed before 1901, mainly for use in partition walls, floors and ceilings. It seems to have been the invention of A & O Mack of Ludwigsburg, Germany,<sup>183</sup> and consisted of blocks made from calcined gypsum. The idea was imported into the United States in the 1890s,<sup>184</sup> and the slabs were tested by the Chicago Board of Underwriters in 1898, when it was being made by the Mackolite Fireproofing Company of that city.<sup>185</sup> They can almost certainly be identified with the blocks or slabs were reportedly made in both Germany and the United States, using reeds,

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<sup>179</sup> F Wentworth & W L Richardson [eds], *Ramsay's Architectural and Engineering Catalogue* (Melbourne 1949), § 22.1.

<sup>180</sup> *Land Owner*, 4 (1872), cited with illustration in Theodore Turak, *William le Baron Jenney: a Pioneer of Modern Architecture* (Ann Arbor [Michigan] 1986), pp 159-160.

<sup>181</sup> Escherich, 'Gypsum Block and Tile', pp 163-4.

<sup>182</sup> Waldo Bros and Bond, *Building Materials*, p 350.

<sup>183</sup> *Sweet's Catalogue* [1906], p 113.

<sup>184</sup> Susan Escherich, 'Gypsum Block and Tile', in T C Jester [ed], *Twentieth-Century Building Materials* (Washington [DC] 1995), pp 163-4.

<sup>185</sup> *Sweet's Catalogue* [1906], pp 113-6.

sawdust, fibre, wood wool or ashes as aggregate, and with tubular voids running through them.<sup>186</sup>

In the British version of the Mack slab, which was to reach Australia, mainly after World War I, the slabs were reinforced with hollow reeds, which created sealed air chambers and gave good sound insulation properties.<sup>187</sup> The partition slabs were available in 2 in, 2<sup>3</sup>/<sub>4</sub> in and 4 in [50 mm, 70 mm and 100 mm] thicknesses, and in 'almost any length'. They were laid on edge with plastered joints, and 'could be sawn and nailed like boards',<sup>188</sup> presumably in competition with materials like terra cotta 'lumber'. By 1905 the slabs were promoted at the Cheap Cottages Exhibition at Letchworth as a material for cottage building.<sup>189</sup> J A King & Co were the sole English manufacturers,<sup>190</sup> and they later came to better known as 'King's partition blocks'. In Britain there were also competing products. Robinson's 'stucco slab' measured 6 ft 0 ins by 1 ft 0 in by 2<sup>3</sup>/<sub>4</sub> in [1800 x 300 x 70 mm].<sup>191</sup> Jones & Co's Hercules Fire Proof Partitions are not stated to be of plaster, but seem to have been similar in character.<sup>192</sup> The Fireproof Plate Wall Co Ltd of Manchester produced slabs in thicknesses of 2, 2<sup>1</sup>/<sub>2</sub> and 3<sup>1</sup>/<sub>8</sub> inches [51, 64 & 80 mm], also apparently of plaster or something similar.<sup>193</sup> However, Mack slabs were the dominant material.

Mack slabs seem to have been known in Australia by the end of 1903,<sup>194</sup> when John Monash expressed an interest in acquiring the local agency,<sup>195</sup> but we do not hear of them being commercially available until 1910, when G O Hyde, still occupying a temporary office, was the New South Wales Director. Partition slabs were now advertised in four, five and six inch [100, 125 & 150 mm] thicknesses,<sup>196</sup> and by 1911 they were manufactured in both Sydney and Melbourne. The slabs were also advertised as a material for external walls,<sup>197</sup> though this never became a major part of the market. In 1914 Mayes listed the slabs in thicknesses more like those in England, with none of five or six inches:

type	thickness inches / mm	height inches / mm	length inches / m	weight lb/sq yd
solid	2 [50]	12 [300]	84 [2.1]	65

<sup>186</sup> Millar, *Plastering*, p 385.

<sup>187</sup> Millar, *Plastering*, p 380. A later text, without naming the brand, also writes of reeds as a common component of plaster partition blocks: W R Jaggard & F E Drury, *Architectural Building Construction* (4th ed, 3 vols, Cambridge 1945, 1946, 1947), II, p 186.

<sup>188</sup> J E Sears [ed], *The Contractors,' Merchants,' and Estate Managers' Compendium and Catalogue* (15th ed, London 1901), p 152.

<sup>189</sup> *Architectural Review*, XVIII (1905), pp 155-7, quoted in A D King, *The Bungalow* (London 1984), p 123.

<sup>190</sup> Sears, *Compendium* (1901), p 123.

<sup>191</sup> J T Rea, *How to Estimate: being the Analysis of Builders' Prices* (London 1904 [1902]), p xiii.

<sup>192</sup> Royal Institute of British Architects, *Town Planning Conference, London 10-15 October 1910. Transactions* (London 1911), advertisements p 3.

<sup>193</sup> Rea, *How to Estimate*, p xxiv.

<sup>194</sup> The index of the Monier records, held by John Thomas of Kew, Victoria, lists file 391, "Mack" Plaster 20 October 1903 - 8 April 1904.

<sup>195</sup> Roser, 'Concrete House in Victoria', p 18, reports that the file contains correspondence on the subject between Monash and a patent agent acting for King.

<sup>196</sup> *Building*, 22 December 1910, p 187.

<sup>197</sup> *Building*, 12 January 1911, p 24; 12 May 1911, p 54. See also R A Prevost, *Australian Bungalow and Cottage Home Designs* (Sydney 1912), advertisement, no page.

solid	2 <sup>1</sup> / <sub>2</sub> [63]	12 [300]	84 [2.1]	80
solid	2 <sup>3</sup> / <sub>4</sub> [70]	12 [300]	84 [2.1]	85
hollow	4 [100]	12 [300]	72 [1.8]	110
solid smooth face	2 <sup>1</sup> / <sub>2</sub> [63]	17 [432]	30 [0.75]	75-80

The smooth face slab required no finishing, and could be papered a few hours after erection.<sup>198</sup>

The patent was held by the Mack Company of York Street, Richmond (Victoria), and their Geelong agent, B H Edwards, completed a 1<sup>1</sup>/<sub>2</sub> storey house of Mack slabs early in 1911. It stood within the Harbor Estate,<sup>199</sup> on the Geelong Road opposite Drumcondra, all of which was razed in the 1960s.<sup>200</sup> The same house was used in nationally published advertisements, together with a view of construction in progress.<sup>201</sup> One illustration shows each slab with a series of cylindrical cores running through it in the lengthwise direction, and with the reinforcement of reeds, also running longitudinally.<sup>202</sup>

Some houses built of what seem to be Mack slabs - as they are described as being of plaster with straw, and extrusion holes - survive at 1-4 Parnell Road, Duntroon, ACT, and were built in 1912.<sup>203</sup> Some partitioning made of these slabs, or something like them, survives in the Commercial Travellers Association building at 318-324 Flinders Street, Melbourne, dating from 1912-13. Apart from the Mack slab house at Geelong, we know of five other examples, at least two of which are standing. Out of 59, 61 and 63 Kalimna Drive, Mornington, 61 has recently been demolished. No. 59 was the property of the Nicholson family and was built in 1916, though it is unclear whether it was built specifically for them. The other two were built at about the same date for the Inglis brothers, and two other Inglis brothers had Mack slab houses at The Rock, New South Wales. The latter two were still standing within fairly recent times.<sup>204</sup>

In England another plaster partition block was the 'H. & J.' made by Hodkin & Jones of Sheffield. These were 2<sup>1</sup>/<sub>2</sub> inches [64 mm] thick and 28 by probably 21 inches [711 x 533 mm] on the face, with two vertical cavities, and a tongue and groove end joint

<sup>198</sup> Mayes, *Australian Builders Price Book* (1914), op cit, p 239. Mayes refers to the material as cement concrete, which may have arisen from a misunderstanding, as by 1910 the English maker, J A King & Co, also produced 'King' pumice concrete partitions. These do not appear to have reached Australia, and the sizes given by Mayes confirm that it is Mack slabs to which he refers.

<sup>199</sup> *News of the Week* [Geelong], 13 April 1911, p 14, kindly brought to my attention by Lorraine Huddle, 1996. A photograph of the factory appears in the *Real Property Annual*, 1919, p 81, cited by Paul Roser, 'Concrete House in Victoria 1900-1940' (Graduate Diploma in Planning & Design, Melbourne University, 2000), p 18.

<sup>200</sup> Information from Peter Alsop, 1996.

<sup>201</sup> R A Prevost, *Australian Bungalow and Cottage Home Designs* (Sydney 1912), no page.

<sup>202</sup> *News of the Week* [Geelong], 13 April 1911, p 14.

<sup>203</sup> Information from Duncan Marshall, 2005, quoting Eric Martin and Associates, 'RMC Duntroon, ACT, Conservation & Management Plan for 13 Residences [unpublished report for the Defence Housing Authority], I, p 37,

<sup>204</sup> My information on these structures is almost entirely from Mr Harvey Nicholson, of 59 Kalimna Rise. Mrs Jill Morrow of Wagga Wagga has attempted on my behalf to find out whether they still exist, without a conclusive result.

within which a vertical steel rod could be placed.<sup>205</sup> There was nothing really similar in Australia. In Adelaide in the 1920s and 1930s Ron Wigg's Insulating Tile Co produced the 'Itco' insulating tile, a lightweight block up to eight inches [800 mm] thick, apparently used for partitions.<sup>206</sup> By 1933 Australian Gypsum Industries was producing 'VG' or Victor-Gypsum partition blocks, which were used in the Manchester Unity Building in Melbourne.<sup>207</sup> These were typically thirty inches long by twelve high [762 x 305 mm] and in thicknesses of two inches [51 mm] solid and three to eight inches [76 to 203 mm] hollow, with cores running horizontally, four to the height of a block.<sup>208</sup>

In Britain, Bellrock Gypsum Industries, assisted by the Building Research Station, had developed a load-bearing panel said to consist of a honeycomb plaster web faced on either side with a solid plaster slab.<sup>209</sup> The Australian researchers D V Isaacs and J W Drysdale reported on it in 1949, describing the interior as a 'honeycomb core of hessian and gypsum'. They believed that it would be useful in Australia for internal partitions, where it could be used without studding.<sup>210</sup> By 1954 V.I.A. Limited was making a panel of this sort in Australia, but the honeycomb was said to be made of 'hard rolled fibre board' and the two faces of wallboard rather than plaster.<sup>211</sup> The plaster-faced type was still being developed.

By 1955 the Glasgow builder John Lawrence, who appears to have been the proprietor of Bellrock, had also patented a process to make the plaster weatherproof, had licensed the construction in France, Egypt, Iraq and two African countries, and had begun negotiations in Australia and New Zealand.<sup>212</sup> In 1957 Australian Plaster Industries of Melbourne proposed to manufacture it for the first time in Australia, in thicknesses of two to six inches [50-150 mm].<sup>213</sup> Meanwhile, by 1956 the material had been used in nearly ten thousand houses in Scotland, and in schools all over Great Britain,<sup>214</sup> and by the 1960s it was made in two versions, a plain plaster faced one for internal use, and one treated with waterproof bitumen emulsion for exterior work.<sup>215</sup>

After World War II an apparently plaster-based material called 'Gyplith' was available in Britain from Gyproc Products. It came in flat slabs which, to judge from an illustration, might be about 600 x 1200 mm in area and 50 or 100 mm in thickness, and seemingly contained some fibrous material such as straw. They were used as a floor base, with a screed on top; as self-supporting walling between vertical

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<sup>205</sup> *Laxton's Price Book for Architects, Engineers, Builders and Contractors* (London 1904), advertisements p xv.

<sup>206</sup> Information from Carolyn Wigg, 1991.

<sup>207</sup> Royal Victorian Institute of Architects, *Journal*, XXXI, 3 (July 1933), advertisement p xxv.

<sup>208</sup> *Ramsay's Architectural Catalogue* (1931), pp 62-3. See also D W Tulloch, *Details of Australian Building Construction* (Melbourne, no date [c 1933]), p 88.

<sup>209</sup> Bowley, *Innovations in Building Materials*, p 342.

<sup>210</sup> D V Isaacs & J W Drysdale, *Building Technique and Building Research* (Sydney 1949), p 39 & fig 4.

<sup>211</sup> *Ramsay's Catalogue* [1954], §25/1.

<sup>212</sup> *Cross-Section*, no 37 (1 November 1955), p 2.

<sup>213</sup> *Cross-Section*, no 52 (1 February 1957), p 3.

<sup>214</sup> Bowley, *Innovations in Building Materials*, p 342.

<sup>215</sup> William Kinniburgh, *Dictionary of Building Materials* (London 1966), p 39.

structural members; and as roofing, when laid between steel members.<sup>216</sup> Another and apparently similar material was 'Marlith', in slabs two inches [50 mm] thick, used for partitions.<sup>217</sup>

In Australia after World War II Australian Plaster Industries produced Victor T. and G. Partition Blocks, consisting of three layers of half inch plasterboard, staggered slightly to create a tongue and groove vertical joint. The thickness was 1½ inches [38 mm], and the edges were recessed so that a taped and filled joint could be used to create a flush surface. These panels were used for internal partitions, and eliminated the need for structural timber, but it was recommended that they be installed on top of a timber floor plate, which contained a rebate on the underside to carry any necessary wiring, and to the top of which they were secured by timber fillets on either side. There was a smaller plate at the ceiling junction, and cornices or moulds on either side held the plaster panel in place.<sup>218</sup> By 1950 load-bearing blocks of anhydrite gypsum plaster were available in Britain in a face size of twenty-four by twelve inches [600 x 300 mm], and in four thickness from two to four inches [50-100 mm]. They were particularly stable, and could be sawn, but they were used only for internal non-loadbearing partitions.<sup>219</sup>

In Australia the CSIRO worked on the idea of load-bearing plaster walls, but was pre-empted in 1953 by Tressellian Moritz, who took out a patent in 1945-7 for improvements in building construction.<sup>220</sup> Moritz was a fibrous plaster manufacturer at Glossop, 240 km from Adelaide. John Bright of the CSIRO then helped Moritz and his partner in the production of an all plaster house. The walls were reinforced with steel mesh and were cast on flat steel tables, with window and door frames incorporated. By late 1953 Moritz had produced more than 150 plaster houses for various country areas, and was making one per fortnight for the South Australian Housing Trust. They required an external veneer.<sup>221</sup> They were quite widely used in the drier parts of Victoria and the Murray Valley, and late in the 1940s the possibility was investigated of weatherproofing them for use in more humid locations.<sup>222</sup> In 1954 Fred Ingham & Co of Adelaide introduced 'Gypseal', which is referred to as a wallboard, but seems to have been a self-supporting partition element, a slab measuring 9 ft 8 in by 1 ft 7 in by 3¾ in [2946 x 482 x 95 mm] 'hollowed for piping'.<sup>223</sup>

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<sup>216</sup> H B Newbold, *Modern Practical Building* (2nd ed, 4 vols, London 1946), I, figs 219, 220, 222, 224.

<sup>217</sup> Newbold, *Modern Practical Building* (1946), I, fig 221.

<sup>218</sup> F Wentworth & W L Richardson [eds], *Ramsay's Architectural and Engineering Catalogue* (Melbourne 1949), § 22.1.

<sup>219</sup> H B Newbold [revised Edgar Lucas], *Modern Practical Building* (3rd ed, 4 vols, London 1950 [1934]), II, pp 106.

<sup>220</sup> T Moritz, patent no 126,134, application of 23 April 1945, accepted 24 November 1947, 'Improvements in and relating to building construction', cited by Bridget Jolly, 'Solomit in Australia and its European Context' (PhD submission, University of South Australia, 1998), p 286.

<sup>221</sup> *Cross-Section*, no 37 (1 November 1955), p 2; Robin Boyd, 'Australia Invents the Plaster House', *Age*, 9 November 1953.

<sup>222</sup> Jolly, 'Solomit in Australia', p 286, ref CSIRO, *Annual Report*, 30 June 1949, Parliamentary Papers no 88-F.4916, p 78; Ian Langlands, 'Research to improve Australian Building Practice. Work of the Division of Building Research. C.S.I.R.O.', *Commonwealth Engineer*, XLII, 2 August 1954, p 23.

<sup>223</sup> *Cross-Section*, no 18 (1 April 1954), p 1.

In 1954 the Housing Commission of Victoria's architects designed a two bedroom house of solid plaster slab construction, as well as a block of flats in a combination of plaster and brick construction, and it was proposed to build a prototype of the house in 1954-5.<sup>224</sup> By this time two Victorians, Jack Mathers of Mildura and George Castley of Oakleigh had also produced plaster houses of their own, and were preparing for mass production; a plaster house had been built at Newcastle, New South Wales, and a plaster wall factory was about to be built in Western Australia. The slab thickness, at least in Victoria, was 2<sup>1</sup>/<sub>4</sub> inches [57 mm] and the material was still being used only for the partitions and inner leaves of brick veneer buildings, rather than for the whole of the walling.<sup>225</sup>

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<sup>224</sup> Housing Commission of Victoria, *Sixteenth Annual Report ... for the period 1st July, 1953, to 30th June, 1954* (Melbourne 1955), p 13.

<sup>225</sup> *Cross-Section*, no 37 (1 November 1955), p 2; Robin Boyd, 'Australia Invents the Plaster House', *Age*, 9 November 1953.