

## 9.07 *The Septic Tank*

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- c. the true septic tank**
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### *a. prehistory*

The idea of bacteriolytic purification of sewage seems to have caught the imagination of many improvers in the nineteenth century well before a fully effective system was finally evolved. In France the 'fosse Mouras, la vidangeuse automatique' [the Mouras pit, or automatic scavenger] - effectively a septic tank - is supposed to have been built in about 1860 by Louis M Mouras and his friend the Abbé Moigno of Vesoul. However, this was not patented until September 1881,<sup>1</sup> so that the claim must be viewed with some scepticism. Meanwhile in Melbourne it was reported in 1861 that Drs Tracey and Featherston [*?sic*] of the Lying-In Hospital, Carlton, had for some time been operating what they described as 'an inoffensive system for the disposal of sewage.' This has since been claimed to be a septic tank,<sup>2</sup> but has not been recognised in overseas literature.

In Brisbane the architect Andrea Stombuco invented 'a new kind of closet' in 1871, installed it in his Royal Oak Hotel, and tested it for two years. He then conducted a public demonstration at which, to establish its efficacy, he 'drank a glass of the [effluent] liquid with apparent gusto'. The Board of Health remained unconvinced, and in October fined him for keeping an unauthorised closet, and declared its overflow a menace. Another consideration, according to Watson and McKay, was the fact that it required more water than was readily available at the time in Brisbane, where cesspits were beginning to be phased out in favour of the new earth closet system. In 1883-4 Stombuco's closet was once again considered by the Board of Health, but once again it was rejected.<sup>3</sup>

The principle of the septic tank is generally understood to be quite different from that of the cesspit. The cesspit is simply a receptacle and must be emptied at intervals, whereas the septic tank is a treatment system which breaks down the contents and discharges a harmless liquid. But in reality the distinction is not quite so clear. Cesspits regularly overflowed and/or leaked, so that they were not self-contained. The septic tank retains a proportion of untreatable sediment and has to be cleaned out

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<sup>1</sup> J H T Winneberger, *Septic Tank Systems* (Stoneham MA [?] 1984), cited by Roberts.

<sup>2</sup> 'An Early Septic Tank', *Health Bulletin*, 1925-1936, p 646; 'Septic Tanks', *ibid*, p 1264, quoted by Tim Roberts, BBldg essay, 1991.

<sup>3</sup> Donald Watson & Judith McKay, *Queensland Architects of the 19th Century* (Brisbane 1994), p 181.

at intervals, while the liquid it discharges may be more or less germ-free but is still very high in nutrients and likely to support undesirable growth of various sorts. As late as 1912 Gilbert Thomson writes as if there is no sharp distinction between the two systems.<sup>4</sup>

### *b. bacteriolytic systems*

The modern tradition of biological treatment of sewage dates from the Scott-Moncrieff system of 1891,<sup>5</sup> in which anaerobic bacteria were used to liquefy the organic matter, and then aerobic bacteria to nitrify and mineralise the products. There then followed the Dibdin or Sutton system; the septic tank system, which was devised in 1895 by Donald Cameron, the City Surveyor of Exeter; Colonel Ducat's system; and the Oxygen Sewage Purification or Kaye-Parry system.<sup>6</sup> It is not always easy to tell which system is meant in the Australian context, and it is appropriate to group them together for the purposes of discussion. The name 'septic tank' was first used by for the version which Cameron patented in 1895, and in 1896 A N Talbot brought it to America.<sup>7</sup> It seems clear enough that overseas references to 'septic tanks' generally mean major public installations, not domestic ones. The Septic Tank Co Ltd of London had by 1902 installed a number of them - at Itchen, Yeovil, West Bridgford, Barrhead and elsewhere. One, however, was for an individual institution, the Gloucester Infectious Diseases Hospital, another for 'Osborne', the royal residence on the Isle of Wight, and a third for an unidentified country house.<sup>8</sup>

It has been claimed that the 'first commercial use of the septic tank in Australia' was (at some unspecified date) at Rookwood Benevolent Asylum, and that this was followed by uses in the Sydney suburbs of North Sydney and Chatswood.<sup>9</sup> This, however, is probably not a reference to the septic tank as we now know it, but to the Scott-Moncrieff system, which is known to have been tested at the Botany Bay Sewage Farm in 1898,<sup>10</sup> and to have been used in North Sydney. The North Sydney Sewerage System, constructed by the central government, was transferred in 1899 to the Metropolitan Water, Sewerage and Drainage Board. There was a treatment plant at Willoughby or Long Bay with precipitating tanks, one of which was converted by the Board in 1900 to the Scott-Moncrieff system. It appears that in 1901 all the tanks were converted into open 'septic tanks' and then, following complaints of the

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<sup>4</sup> Gilbert Thomson, *Modern Sanitary Engineering. Part I: House Drainage* (London 1912), pp 248-250.

<sup>5</sup> Great Britain, patent no 14,191, to W D Scott-Moncrieff, 22 August 1891, basically dealing with filtering; also no 17,006, 23 September 1892 & 19,247, 26 October 1892, both dealing more extensively with a filter bed system.

<sup>6</sup> B F Fletcher & H P Fletcher, *The English Home* (2nd ed, London 1911 [1910]), pp 170-172. For an early account of the Scott-Moncrieff system see Henry Robinson, *Sewerage and Sewage Disposal* (London 1896), pp 175-182.

<sup>7</sup> H E Babbitt, *Sewerage and Sewage Treatment* (Massachusetts 1922), p 292, cited by Roberts.

<sup>8</sup> The Septic Tank Co Ltd, *The Septic Tank System: Views of Installation* (London, no date [c 1902]), cited in Charles Wood, *Nineteenth Century Photography* [catalogue 114] (Cambridge [Massachusetts] 2003), pp 69-70.

<sup>9</sup> Shar Jones, *Cleanliness is next to Godliness* (Elizabeth Bay [NSW] 1984), p 12.

<sup>10</sup> F J J Henry, *The Water Supply and Sewerage of Sydney* (Sydney 1939), p 173.

nuisance, were covered in reinforced concrete in 1903.<sup>11</sup> Further septic tanks at Mosman, built by the Public Works Department, were transferred to the Board in 1904.<sup>12</sup>

### *c. the true septic tank*

The septic tank on the individual or domestic scale was to become ubiquitous in city fringe and some country areas. It was mentioned in a discursive way in the *Australian Sanitary Inspector's Text Book* of 1901,<sup>13</sup> with no indication that it was in local use, and likewise in a paper on the septic tank given by W Parker at a conference in May 1901 of those interested in the proposed national capital for Australia.<sup>14</sup> However, at the end of 1900 an offensive cesspit in a South Australian hospital had been covered and allowed to operate as a septic tank, with apparent success.<sup>15</sup> It was natural that the idea should be taken up first in those cities with no reticulated sewerage system - that is, other than Sydney and Melbourne - and then in country areas. In the next few years a number of purpose-built tanks were installed in South Australia, and an account of the system was published in about 1906.<sup>16</sup>

A claim that a septic tank was installed at 'Rio Vista, Mildura, when completed in 1891,<sup>17</sup> must be dismissed. However a septic tank was used at 'Ettrick' homestead near Camperdown, Victoria, in 1900-1,<sup>18</sup> and in 1902-3 Burnewang homestead, near Elmore, Victoria, had all the sewage

taken by underground pipes about 300 feet down the eastern slope of the hill (away from the river), and there passes into what is termed a "dark" tank - that is, impervious to air and light - where a certain black microbe which cannot stand air and light sets busily to work. After remaining a certain time here, the sewage passes into a second tank over a pebbly channel, which aerates the water, and there a microbe of another colour starts business, after which the escaping sewage assumes the form of comparatively pure water.<sup>19</sup>

This seems to be one of the earliest references to an aerating tank to follow the septic tank, as will be further discussed below.

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<sup>11</sup> Henry, *Water Supply and Sewerage*, pp 194-5.

<sup>12</sup> Henry, *Water Supply and Sewerage*, p 196.

<sup>13</sup> J L Bruce & T M Kendall, *The Australian Sanitary Inspector's Text Book* (Sydney 1901), p 297.

<sup>14</sup> W Parker, 'The Septic Tank System of Sewage Treatment', in *Proceedings at the Congress of Engineers, Architects, Surveyors, and others interested in the building of the Federal Capital of Australia* (Melbourne 1901), pp 38-42.

<sup>15</sup> W R Smith, *The Bacteriolytic Tank System in South Australia* (Adelaide 1927), pp 12-13.

<sup>16</sup> Smith, *The Bacteriolytic Tank System*, p 3, refers to the earliest account in South Australia being a three page print issued twenty years earlier, but it becomes clear on p 17 that this was published in 1906 and was in fact the first edition of Smith's pamphlet.

<sup>17</sup> Andrew C Ward & Associates, *"Rio Vista" Conservation Analysis* (no place 1988), p 31, based upon an oral source of the 1950s.

<sup>18</sup> Robert Haddon, 'Australian Planning and Construction', in G A T Middleton [ed], *Modern Buildings* (6 vols, London, no date [c 1910]), V, p 150.

<sup>19</sup> *Building, Engineering and Mining Journal*, 14 September 1903, p 155.

The first septic tanks listed in the records of J W Pender's extensive practice in the Hunter Valley were those at 'Illilliwa', Bolwarra, and at the Sisters of St Joseph Convent, Lochinvar, in January and May 1904.<sup>20</sup> In fact by 1904 the septic tank was said to have been 'adopted extensively' in New South Wales, and was 'about to be installed' in Hobart. In that year it was used in the new Korumburra Hotel in Gippsland, Victoria, by the architects H W & F B Tompkins. All water closets and lavatories, it was proudly announced, would have 'flushing cisterns and fittings similar to those in use by the Metropolitan Board of Works' connected by underground drains to a septic tank and filter beds.<sup>21</sup> By 1906 Wormwald Bros & Wears of Melbourne were advertising as consulting engineers for sanitary systems, including septic tanks.<sup>22</sup> In 1908 Robert Boan of the Victorian Railways Laboratory conducted his own experiments, apparently based mainly upon the 'hydrolytic' tank developed in England and installed at Hampton Court in about 1905. However it does not appear that Boan introduced any really distinctive innovation.<sup>23</sup> Septic tanks were increasingly used in Victorian country areas, but the system was not recognised under the *Health Act* until 1919.<sup>24</sup>

In Perth a septic tank and filter were successfully tested at Government House in 1901, and in 1903 Hugh Oldham, Engineer for sewerage, put forward schemes for a septic treatment system for the City of Fremantle - which clearly must have been on one or more of the other principles, not that of the septic tank proper. The *Metropolitan Water Supply and Sewerage Act* was passed in the same year and plans begun for a sewerage system for Perth.<sup>25</sup> Meanwhile architects were installing individual tanks on private property, without the benefit of any regulatory control. When the owners of the Weld Club and Forrest Chambers, in the city, sought to install tanks, the City Council was stimulated to hurriedly prepare a standard plan and regulations.<sup>26</sup>

In 1904 a sewerage system with septic tanks and percolating filters was constructed at the Railway Workshops, Midland Junction,<sup>27</sup> and it was also decided in that year to install septic tanks at the Fremantle Prison.<sup>28</sup> In 1905 the architects George Temple Poole and Michael Cavanagh put forward a scheme based on septic tanks as the

<sup>20</sup> Barry Maitland, *The Pender Index* (Maitland [New South Wales] 1999), svv.

<sup>21</sup> *Gippsland Illustrated 1904* (Melbourne 1904), p 10; also repeated in James Smith [ed], *Cyclopedia of Victoria* (3 vols, Melbourne, 1903, 1904, 1905), III, pp 603-4.

<sup>22</sup> *Sands & McDougall's Melbourne, Suburban, and Country Directory for 1906* (Melbourne 1906), p 1590.

<sup>23</sup> Robert Boan, 'The Purification of Sewage', *Journal of the Royal Victorian Institute of Architects* XII, November 1914, pp 198-219.

<sup>24</sup> Tim Roberts, BBldg essay, 1991.

<sup>25</sup> Metropolitan Water Supply, Sewerage, and Drainage Department, *Commemorative Volume* (Perth 1925), pp 69-70. See also Ian Kelly 'The Development of Housing in Perth (1890-1915)' (MArch, Curtin University 1991), p 189, quoting the *West Australian Mining, Building and Engineering Journal*, 5 September 1903, p 10.

<sup>26</sup> Kelly, 'Development of Housing in Perth', p 189, quoting the Perth City Council Works Committee minutes (1904-7), p 373 (12 April 1904) & p 378 (28 April 1904).

<sup>27</sup> Perth. Metropolitan Water Supply, *Commemorative Volume*, p 70.

<sup>28</sup> References supplied by Michal Bosworth from the data base on Fremantle Gaol. BL ACC554/47 CSO, PWD file 816/1904, 20 February 1904.

solution to Perth's sewerage problem,<sup>29</sup> and during the year the *West Australian Mining, Building and Engineering Journal* published a number of articles on the general subject.<sup>30</sup> Ultimately, however, on the advice of J Davies of the New South Wales Public Works Department, a decision was made in 1905 in favour of a fully reticulated sewerage scheme.<sup>31</sup>

#### *d. design and manufacture*

Septic tank design embraced some variations which seem unfamiliar today, one being the use of banks of rocks or pebbles, and the other a separate unit called an 'aerator'. The tanks made by Richard Taylor Ltd of Sydney and by Gummow, Forrest & Co - which became the State Monier Pipe & Reinforced Concrete Works - had a large chamber for liquid sewerage, but instead of a baffle and a further compartment, a screen wall with apertures leading into a smaller cell filled with rocks. The theory behind this is unclear, but it seems akin to D'Ebro's tank filled with coke.<sup>32</sup> The State Monier Pipe & Reinforced Concrete Works was later taken over by the J.B. Reinforced Cement Co.<sup>33</sup>

Elsewhere there were soon many other types. But septic tanks were not restricted to patented or proprietary types, and soon the Australian Cement Manufacturers' Association was promoting simple designs to the general public.<sup>34</sup> In Alice Springs the first septic tank was that installed at the Inland Mission's hospital, Adelaide House, completed in 1926.<sup>35</sup> By now the Hume Pipe Company was making septic tanks, which were quoted in Brisbane for £10 and upwards, complete.<sup>36</sup>

The septic tank was no longer a matter of individual patents and manufacturers, but one of commonly understood principle, and in 1933 the Public Health Department of Victoria issued drawings for two types of tank. One was for treating all 'foul drainage' from a household of up to ten people. It had a large chamber and a small one, divided by a baffle wall up to water level, and a scum board at one end of the large chamber, to prevent scum from flowing over into the smaller one. The other tank was a much smaller one which could be used for farmhouses with large areas of land available, to treat water closet drainage only, and it was much simpler, with a

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<sup>29</sup> *West Australian Mining, Building and Engineering Journal*, 15 July 1905, p 11, quoted Kelly, op cit, p 190.

<sup>30</sup> John Kemp [Brisbane City Engineer], 'The Collection and Disposal of Sewage and House Refuse', *West Australian Mining, Building and Engineering Journal*, 16 September 1905, p 18; Arthur Morry [of the Queensland Department of Works], 'Biological Treatment of Sewage', *ibid*, 28 October 1905, p 21.

<sup>31</sup> Metropolitan Water Supply, *Commemorative Volume*, p 70, and Kelly, 'Development of Housing', p 190.

<sup>32</sup> C E Mayes, *The Australian Builders & Contractors' Price Book* (8th ed, Sydney 1914), advertisements p 16; and pp 325-6.

<sup>33</sup> Mayes, *Australian Builders Price Book* (9th ed, 1927), pp 395-6.

<sup>34</sup> *Concrete Troughs, Tanks and Wells* (pamphlet no 5, Sydney & Melbourne, no date), pp 21-4.

<sup>35</sup> S V Szokolay & M Docherty, 'Passive Cooling: Performance of an Historical Building (St Lucia, Queensland, 1985), p 7, quoting Graeme Bucknall, *A Place for the People - the Story of Adelaide House* (1982).

<sup>36</sup> *Architectural and Building Journal of Queensland*, 10 July 1926, p 87.

single chamber and scum board. In either case it was stressed that a quantity of solids remained in the tank, and must be removed every few years.<sup>37</sup> In 1945 the Commonwealth Department of Labour and National Service issued designs of a similar description (if not identical).<sup>38</sup>

The Commonwealth's publication gives useful insights into the then current thinking. The tank was not required to be hermetically sealed, because the scum provided all the necessary cover, and in any case there must be provision for the escape of gas. A heavier layer of scum was not an indication of greater efficiency, and eight or nine inches [200-230 mm] was to be preferred. Dung worms could be used to reduce the thickness if necessary. Kitchen and other domestic drainage could be treated effectively, contrary to common belief in Victoria, South Australia and Western Australia. And, also contrary to common belief, a piece of stale meat should not be put in to start the tank working (if anything some sludge from an old tank should be used).<sup>39</sup> The perils of poorly designed or maintained septic systems became apparent in 1955 when it was reported that thirty houses were to be moved in the South Australian Housing Trust's subdivision of Draper, because they had made rendered uninhabitable by the rising water table resulting from septic tank effluent.<sup>40</sup>

#### *e. the aerator*

The desirability of further breaking down the effluent with aerobic bacteria must have been recognised at a very early stage. We have seen that an aerating tank was installed at 'Burnewang' in 1902-3. In 1903 the architect C A D'Ebro spoke as if from long experience, recommending

for the ordinary residence of about ten to fifteen occupants, an air-tight septic tank of about 10 ft. by 4 ft. by 4 ft. deep [3 x 1.2 x 1.2 m], with trapped inlet and outlet, the sewerage being distributed by means of a perforated corrugated iron over coke filter bed.<sup>41</sup>

This seems to refer to a separate coke filter bed, rather than to the distribution of the effluent, for the latter was carried to 'trenched and planted areas'. It is possible that D'Ebro was using these tanks as early as 1888, when he completed the Melbourne house 'Moorakyne', for a 'coke-filled cesspit' was recorded on the property when the first survey was done for sewerage purposes by the Melbourne & Metropolitan Board of Works in 1907.

The Richard Taylor / Gummow, Forrest septic tanks made in Sydney, as we have seen, incorporated a cell filled with rocks. Rocks also filled an entirely separate unit,

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<sup>37</sup> Victoria, Department of Public Health, *Septic Tank System for Farms and Isolated Dwellings* [brochure with drawings] (Melbourne 1937).

<sup>38</sup> Australia. Department of Labour and National Service, *Sanitary Plumbing and Water Supply* (Melbourne 1945), pp 127, 128.

<sup>39</sup> Department of Labour, *Sanitary Plumbing*, p 129.

<sup>40</sup> *Cross-Section*, no 34 (1 August 1955), p 2.

<sup>41</sup> C A D'Ebro, 'Design of Australian Country Houses', *Journal of the Royal Victorian Institute of Architects*, I, November 1903, p 141.

called the 'aerator', which was regarded as less essential than the septic tank itself, and here the theory is clear. The effluent treated by the anaerobic bacteria in the septic tank built up in a gelatinous coating around the rocks in the aerator, and was further broken down by aerobic bacteria. An aerator illustrated by the company was slightly larger than the septic tank itself, ventilated by a shaft and cowl at the top, and totally filled with rocks but for a small area below a false floor at the bottom. The entering effluent was dispersed across the top surface of the rocks, trickled down amongst them, ultimately entered the void at the bottom, and was drained off.<sup>42</sup> The 'Excelsior' system of the Excelsior reinforced Concrete and Engineering Co, Sydney, seems to have been very similar, though the aerator is here referred to as a 'bacteria bed'.<sup>43</sup> The Department of Labour and National Service publication of 1945 describes a 'trickling filter'.<sup>44</sup>

### *f. the non-septic tank*

In about 1920 a non-septic or oxidising tank appeared in Australia. It was the invention of Matthew Montgomerie Neilson, who variously described himself as a doctor of microbiology from Turin,<sup>45</sup> and as a professor of hygiene. He argued that the anaerobic or septic system produced substances inimical to the microbes which broke break the matter down, and that sewage so treated was harder rather than easier to oxidise, and he therefore processed it directly in an oxidising tank.<sup>46</sup>

His system seems to have been first used in New South Wales, for Neilson claimed in 1922 that the Victorian Sewerage Board, after a careful inspection in New South Wales, had declared it 'the simplest, smallest, least expensive, most efficient and free of all odours'.<sup>47</sup> The New South Wales users cited in his advertisement were the government railways, the Gladstone and Kenmore asylums, and a thousand 'homes'. In Victoria the Public Works Department and the State Savings Bank were claimed to have used the system, as was the Colac Dairying Co, and the consulting engineer A K T Sambell reported to the Mildura Borough Council that it was practically certain to be adopted by town sewerage disposal authorities. The City of Bendigo did so, after Gordon Moore, Chief Engineer of the Sewerage Authority, investigated systems in Victoria and New South Wales, and found that in 250 houses surveyed the absence of odour was remarkable. The City Council used the effluent to irrigate tomatoes, other plants, and an area of pasture.<sup>48</sup> In Queensland the system was used for convents at Herberton and Townsville, and Anglican schools at Charters Towers, Townsville and

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<sup>42</sup> C E Mayes, *The Australian Builders & Contractors' Price Book* (8th ed, Sydney 1914), advertisements p 16; and pp 325-6.

<sup>43</sup> Mayes, *Australian Builders Price Book* (8th ed, 1914), advertisements p 3; and pp 323-4.

<sup>44</sup> Department of Labour, *Sanitary Plumbing*, p 130.

<sup>45</sup> *Architectural and Building Journal of Queensland*, 28 September 1924, p 49. References to this journal have been kindly supplied by Sandi Robb, who has discovered that in 1924 a Montgomerie Neilson system was installed in an office building at Townsville.

<sup>46</sup> *Architectural and Building Journal of Queensland*, 7 August 1924, pp 40-41.

<sup>47</sup> *Building*, 12 October 1922, p 144.

<sup>48</sup> *Architectural and Building Journal of Queensland*, 7 August 1924, pp 40-41.

Herberton. In New Zealand it was claimed to constitute the complete city scheme of Eastbourne.<sup>49</sup>

An example at 'Cunningham Plains', New South Wales, bears an elaborate circular brand:

[outer ring:  
HYGIENIC SEWAGE DISPOSAL EXPERTS  
]  
[middle ring:  
MONTGOMERIE NELSON & CO SYDNEY  
]  
[inner ring:  
87 PHILLIP ST  
]

Another surviving Montgomerie Neilson tank from the 87 Phillip Street address, has been reported at 'Wynstay', Mount Wilson, New South Wales.<sup>50</sup>

A tank at 'Eeyeuk', Victoria, originates from Victoria, for it shows at ground level as two concrete slabs like beds placed end-to-end, each bearing a cast plate branded:<sup>51</sup>

[outer ring:  
BOX 1499 GPO / MELBOURNE  
]  
[second ring:  
EDMUNDS BROS SOLE AGENTS / VIC & TAS  
]  
[third ring:  
MONTGOMERIE NEILSON / SYDNEY  
]  
[innermost ring:  
NON-SEPTIC OXIDISING / SERVICE DISPOSAL  
]

The reference to oxidising, which did not appear at Cunningham Plains, seems subsequently to have become standard.

The Edmunds Brothers, who acted as agents, appear to have been [?F] W Edmunds, architect and engineer, and [?E] T Edmunds, engineer,<sup>52</sup> but by 1927 Edmunds Bros were marketing what was put forward as their own 'Edmunds Sewage Oxidation System'.<sup>53</sup>

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<sup>49</sup> *Architectural and Building Journal of Queensland*, 7 August 1924, pp 40-41.

<sup>50</sup> Information from Irene Wynne, 2004.

<sup>51</sup> Inspected July 1992. This was formerly believed to date from about 1908, but that seems impossible.

<sup>52</sup> *Architectural and Building Journal of Queensland*, 28 September 1924, p 49.

<sup>53</sup> C E Mayes, *The Australian Builders & Contractors' Price Book* (9th ed, Sydney 1927), p 395.