

Paper Manufacturing in Victoria, from European Settlement to Federation

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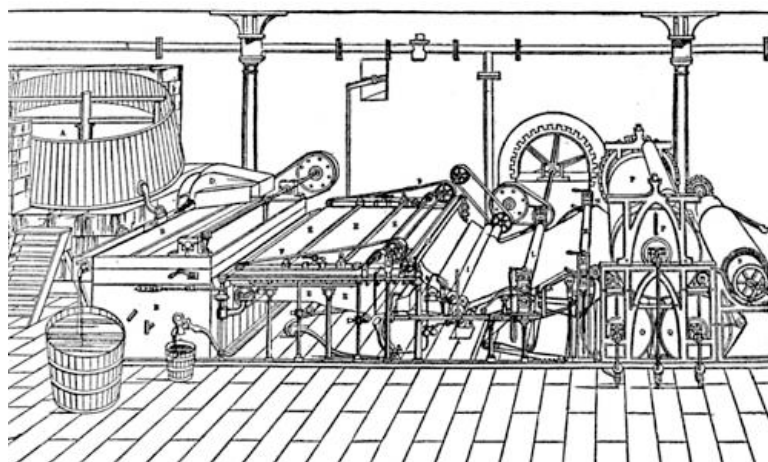
Paper manufacturing comes to the Colonies

Hand papermakers were among the convicts transported to the British colonies of New South Wales and Van Diemen's Land. They had rioted against the loss of jobs resulting from the increasing mechanisation of manufacturing in England in the early 19th century.



*Hand mill in production
Creative Commons*

At that time, hand paper mills were producing superior laid writing papers, while new machine mills produced low-priced book, news, wrapping, and wall paper. However, the number of paper machines was increasing rapidly, at the same time as the quantity of rags was decreasing, and paper mills underwent enormous changes.



*An early Fourdrinier papermaking machine
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In 1831, in Buckinghamshire, England, workers attacked the recently installed machinery at several paper mills along a three-mile stretch of river between Loudwater and Chepping Wycombe. Paper mills were also attacked at Colthrop in Berkshire, and Lyng and Taverham in Norfolk. Arrests took place. As a result some men were hanged, others were imprisoned, and more were transported to the British colonies in Australia.

As the 1830s drew to a close, the production of handmade paper in England came to an end. Mechanised manufacture became established. Innovation focused on increasing the size and output of machines, and alternative pulps, mainly wood and grasses, allowed production to increase. Machines produced smooth sheets that were judged to be of better quality than those made by hand. The market soon became flooded with machine-made writing paper, and the remaining hand mills were forced to introduce machines or go out of business.

Colonial Australia's growth coincided with England's industrial expansion. As early as 1818, the first mill known to have produced paper in Australia was established near Sydney, NSW. Alexander Romanov-Hughes tells us that "The *Sydney Gazette* of 18 April, 1818 carried an advertisement stating that Messrs. Warren and Duncan had erected a paper mill a short distance east of the New Road to Botany Bay. Their mill was powered by a water-wheel." The advertisement also stated that they were "desirous of purchasing linen and cotton rags from the public for which a satisfactory price would be paid." Two adjacent paper mills were also established, but it seems all three had closed by 1823.

A supplement to the *Sydney Gazette*, 29 July, 1820, was printed on paper attributed to one of the three mills. Romanov-Hughes quotes Dr Ian Wilson, a present-day expert in paper science, who, in analysing the paper on which the supplement was printed, described it as "unsophisticated laid paper" with water drops and bad sheet formation, comprised of "mainly rag with some hemp shives and some colour fibres."

Convict papermakers seemed to take little part in the development of the paper manufacturing industry in the colonies, even after they were pardoned. Further plans to establish new paper mills in NSW came to nothing. There remained an increasing demand for paper, and to import paper from England was costly. The shortage of paper was highlighted in the *Australian*, 20 August, 1840. A report suggested that a handsome profit could be made by anyone prepared to manufacture printing and course paper. To overcome the difficulty of procuring sufficient rags, the report recommended that "maize may be manufactured into excellent paper."

Rushes growing on the nearby Georges River bank may have been used in the paper mill built by James Atkinson on the Collingwood Estate, at Liverpool, near Sydney, in 1856. This mill was a forerunner to one of the earliest large-scale industrial ventures in Australia. On land subdivided from the original Collingwood Estate, the Collingwood Paper Mill commenced in 1868. Details of the development are noted in the files of the Liverpool Museum. This was the largest paper mill in Australia at the time, with up-to-the-minute equipment sent from Great Britain that was able to produce 20 tonnes of paper per week. At last, here was a paper mill that prospered.

Master papermakers were brought from Italy to share their expertise. The mill employed 115 men, women and children. Rag pickers in Sydney were employed to collect raw material, including rags, paper, canvas, woolpacks, rope and straw. Stringy bark, Casuarina pulp, reeds and the Gynea lily from the banks of the Georges River were also used experimentally. The mill operated day and night, every day of the year, processing the raw material in huge boilers. Their paper was said to be "superior to all others with the exception of one English firm" and won five first prizes at International Exhibitions. An edition of the *Illustrated Sydney News* in 1872 told readers: "We consider this manufactory one of the most, if not the most, important in a young colony such as this."

Over time, with changing ownership, the Collingwood Paper Mill became known as the Liverpool Paper Mill. It closed in 1906.



*Collingwood Paper Mill, Liverpool, 1874
Liverpool and District Historical Society*

In the 1850s, as the colony of NSW was finally developing a viable paper manufacturing industry, Victorian capitalists were attempting to establish paper mills in the newly-formed southern colony.

Paper manufacturing in the Colony of Victoria

The Gold Rush of 1852 brought people and prosperity to the newly formed Colony of Victoria. Gold-seekers from around the world began pouring in. The population grew rapidly. Demand for goods and services soared.



*Canvas town, Melbourne, 1852
Temporary accommodation for the thousands who poured into Melbourne each week during the gold rush
State Library of Victoria*

Paper was a commodity in short supply. A local paper manufacturing venture was proposed. On 13 September, 1853, an advertisement appeared in the *Argus*: “A thorough practical Papermaker is desirous of meeting with a capitalist to join him in establishing a paper manufactory near Melbourne; apply to Jones and Co., 36A Elizabeth Street.” However, investigators who professed to have knowledge of the requirements of paper manufacturing gave conflicting estimates of the costs and possible income of a local mill. It was decided not to proceed. At about the same time, an attempt was made in Geelong to establish a paper mill. The cost of establishing this project was a barrier and the idea was abandoned. These tentative beginnings failed.

As people returned to Melbourne from the gold fields, the government of Victoria was keen to promote economic innovation. Government bonuses and subsidies were offered to firms, tariffs were implemented, and manufacturing became the biggest sector of the Melbourne economy. With this came an increasing demand for printed material and packaging which made the local manufacture of paper inevitable.

To garner ways forward for the colony, in 1860, a Government sponsored essay competition was instigated. An essay discussing the potential of the papermaking industry was one of the prize winners. A copy of this essay is in the archives of the Royal Society and is reproduced on the website of Alexander Romanov-Hughes.

The writer begins with an evaluation of the cost of imported paper to the colony:

In the year 1858 we imported paper, in the form of stationery and paper-hangings, to the value of about £200,000. During the same year we exported 516 tons of rags, which was probably not one half the quantity of rags that might annually be obtained here, because, in the first place, it is not generally known that rags are purchased in the colony, and, in the second place, the price given is so trifling as compared with their market value at home that few would care to save them for sale. As long as rags are purchased for exportation the price given will be very small; were paper-mills to be established here a larger price would be offered, and we should not then be in the habit of seeing cast off wearing apparel among our numerous rubbish heaps, or in the back yards and right-of-ways of our city and towns.

It is remarkable that at the same time as paper was being imported, rags were being exported.



*Sorting rags for the manufacture of paper
Gutenberg*

The writer goes on to discuss the cost of paper production. The impact of machinery on lowering the cost of labour is shown to be significant:

Up to the commencement of the present century paper was made entirely by hand, when the labour was cost about 16 shillings per cwt.; the cost is now about 1 shilling per cwt.

Machine production has further cost efficiencies:

Independent of the great superiority of machine over hand-made paper, manufacturers are not troubled with combination of workmen forming strikes, which was one of the serious drawbacks to the manufacturer of hand-made paper, another drawback being the large amount of waste, generally about 20 per cent., whereas by machinery it is a mere nothing.

In addition, the ability to control the thinness, width and length of machine-made paper is put forward an advantage:

Even in 1834 tissue paper was used in the potteries 1,200 yards long; this length of paper, or in fact any great length, had never been made by hand labour.

To overcome any shortage in the supply of rags, the writer next discusses the potential to source plentiful, local raw materials within Victoria. Plant materials are named as proven substitutes. The stems and leaves of the sword-rush, and the roots, stems and leaves of the Australian marshmallow can be obtained without difficulty. Maize and flax can be easily grown in Victoria. Further afield, the cotton tree, as grown north of the River Murray, is a possibility. In addition, the newly-discovered ‘paper plant’, indigenous to Wisconsin, North America, is identified as a plant that would have little difficulty in acclimatizing to Victoria and would be a valuable source of fibre.

Without being specific, the writer adds there are “several trees and plants indigenous to the colony, the bark of which might be converted into the coarser, if not the finer, kinds of paper.” In this, the writer may have in mind the bark of some acacias, casuarinas, eucalypts and melaleucas.

The writer reaches the conclusion:

We have, therefore, abundant sources of material suitable for the manufacture of all kinds of paper, and, as I have before shown, since 1834 it has been made in England with machinery so perfect as to require a very small amount of manual labour to produce miles or tons of paper. Even at the present rate of wages, with imported machinery propelled either by the Yan Yean water or the Yarra Falls, paper might yet be made in Melbourne as cheap as that imported.

The need was obvious. In the colony, uses for paper were increasing. In the notes to the prize-winning essay, is the brief statement that newly-patented “bitumenised paper pipes are now under production in Melbourne”. Today, these pipes have been found to have been used on the goldfields. A report by the Royal Society, published in the *Argus*, 27 August, 1860, gives a description of their manufacturing process. “A roll of paper is passed through a reservoir of molten bitumen and then coiled tightly around a mandrel to form a tube.” When hardened, the tube was said to be remarkably strong and durable, while being so much cheaper and lighter than iron pipes. Innovations such as this required a cost-effective and reliable source of paper.

1860 was a turning point in the introduction of paper manufacturing in Victoria. The colony could no longer depend on imported paper. Investigations into the suitability of locally sourced fibres for the production of all types of papers became a preoccupation of Victorian scientists and industrialists alike.

Securing raw materials for Victorian paper manufacturing

Thirty sheets of handmade paper, each prepared from a different Victorian plant fibre, were on display at the Intercolonial Exhibition, held in the Great Hall built on a site behind the State Library's Queens Hall in Swanston Street, Melbourne, in 1866. The sheets were made by Mr Christian Hoffman, under the direction of Baron Ferdinand von Mueller, Victorian Government Botanist and Director of the Royal Botanical Gardens. Throughout the early 1860s von Mueller had devoted attention to ways to secure local raw materials for paper manufacturing.



*The Intercolonial Exhibition: interior of the rotunda
State Library of Victoria*

A paper manufacturing industry in Victoria was overdue and rag collection strategies and substitutes for rags formed part of public discussion. Paper manufacturing machines were available, water supplies had been identified, but as rags as raw materials were becoming increasingly scarce, science needed to find substitute vegetable products for use as paper fibre.

Experiments on exclusively Australian plant materials had been limited. As one of Australia's most prominent 19th century scientists, von Mueller had the interest and ability to inquire into the adaptability of vegetable substances for paper manufacture. In his catalogue entry for the Intercolonial Exhibition he tells us that in his small laboratory, attached to the Royal Botanical Gardens, he supervised the making of sheets of unmixed fibre, pressed and dried "without action of bleaching or glutinising substances thereon." He selected only those plants that could be obtained in great abundance in Victoria, for this experimentation.



*Baron Ferdinand von Mueller
Public Domain*

The Intercolonial Exhibition showcased manufacturing, mineral, agricultural and timber resources of Victoria, New South Wales, Tasmania, South Australia, Queensland, Western Australia, New Zealand, Mauritius, Netherlands-India and New Caledonia. In the 'Vegetable Products' section of the Exhibition catalogue, von Mueller identifies each of the Victorian fibres used to make his samples and evaluates their suitability for the manufacture of different types of papers. I quote from von Mueller's catalogue entry:

Paper from Barks

1. *Eucalyptus Obliqua*: The *Stringybark Eucalypt* ... The paper prepared from the bark of this tree is not merely suited for packing, but also for printing, and even writing. It may also be employed for mill and paste boards. The pulp bleaches readily. I regard it as the most important material drawn on this occasion into use ... The whole thick stratum of the bark was employed. It yields readily to mechanical appliances on account of its lax and loose texture, and is also easily acted on by caustic soda for conversion into pulp.
2. *Eucalyptus Rostrata*: The *Red Gumtree* The paper prepared from the bark of this tree proves much coarser than that of the *Eucalyptus obliqua*; the pulp may be either used as admixture to that of packing paper and pasteboards, or in the composition, or perhaps as sole ingredient, for blotting and filtering paper.
3. *Eucalyptus Amygdalina*: One of the so-called *Peppermint-trees* ... The inner bark is adapted for the preparation of all kinds of coarser paper.
4. *Eucalyptus Globulus*: The well-known *Blue Gumtree* ... Paper prepared from the bark of this tree answers for packing and perhaps for printing.
5. *Eucalyptus Goniocalyx*: One of the *White Gum-trees*, called in some districts the *Spotted Gumtree* ... The bark yields a good packing paper, but hardly material for any good writing paper.
6. *Eucalyptus Corymbosa*: The *Bloodwood-tree* ... The paper from the bark of this Eucalypt is remarkable for its great firmness. It makes thus a very strong wrapping paper.
7. *Eucalyptus Leucoxylon*: This tree passes in various districts under varied names, for instance ... the *Mountain Ash* and *Ironbark-tree* ... The bark can be converted into rough packing paper.
8. *Eucalyptus Longifolia*: The *Woollybutt* ... The fibre of the bark again adapted for packing paper.
9. *Eucalyptus Stuartiana*: One of the *White Gumtrees* ... The bark of this often very big tree furnishes again good material for packing paper, and like others, for pasteboard.
10. *Acacia penninervis*: ... The bark of this acacia was chosen merely to demonstrate, that also from the bark of very many species of this great genus a rough kind of packing paper can be produced.
11. *Melaleuca ericifolia*: The so-called *Swamp-Teatree* ... The friable lamellar bark can be converted into an excellent blotting paper—perhaps, also, filtering paper. It is worthy of record that many species of this genus yield a very similar bark, formed of innumerable membranous layers.

Paper from Foliage

12. *Casuarina quadrivalvis*: The *Drooping Sheoak* ... The stringy foliage formed by the cylindrical concrescence of the branchlets with the leaves can be converted into an excellent pulp for packing, and even printing paper and millboard. The mechanical contrivances for preparing the pulp are of particular ease.

13. *Casuarina leptoclada*: The *Erect Sheoak* ... The foliage in its use is akin to that of the former species. ... none of the species has been employed before for paper manufacture.

Paper from Grasses, Rushes and Allied Plants

14. *Scirpus maritimus*: The *Soltmarsh Clubrush* ... It seems like the following previously not yet tried, or at all events not yet extensively used for paper manufacture, for which it is singularly well adapted, being, like most rushes, so readily converted into pulp. The amount of bleaching material for all these rushes is trifling. ... Apparently the paper is firm enough to stand the impressions of type.

15. *Scirpus lacustris*: The *Lake Clubrush* ... The paper from it is remarkably good, and hence well adapted at least for printing and tissue paper, but probably also for writing.

16. *Cyperus lucidus*: The *Shining Gallingale* ... shown to be adapted both for printing, tissue, and writing paper. All these rush-like plants bleach with great facility.

17. *Cyperus vaginatus*: The *Sheated Gatingale* ... Its fibre is extraordinarily tough, and accordingly can be formed into a very tenacious paper, which, moreover, proves one of great excellence.

18. *Heleocharis sphacelata*: The *Stout Spikerush* ... It yields a paper as good for printing as for writing and tissue.

19. *Heleocharis acuta*: The *Slender Spikerush* ... has seemingly never yet been converted into paper. The local experiments here show this and many other cyperaceous plants exquisitely adapted for good printing and tissue paper, and a by no means very inferior writing paper. Better appliances will necessarily improve on the quality of the paper.

20. *Lepidosperma gladiatum*: The *Sword-Rush* ... It was, nine years ago, subjected by Mr. Tolmer, of Adelaide, to successful tests for paper-fabrication. The article produced from it is of strong texture, and inasmuch as the plant can be collected in enormous quantities on ground not arable, it should find its way deservedly into factories with the many other kinds of material now pointed out. ... It grinds largely into pulp, like many other rushes.

21. *Juncus vaginatus*: The *Sheated Rush* ... worth collecting as material for printing, tissue, and likely also fair writing paper. The pulp is of equability.

22. *Xerotes longifolia*: The *Toothed Dry-Rush* ... can be employed both for printing and writing paper. It is, however, scarcely so readily collected as many of the other plants just referred to. It has the recommendation of great tenacity for it. Several allied species will yield similar material

23. *Dichelachne crinita*: The *Horsetail-Grass* ... yields a tenacious paper, especially fit to be used for a thin packing or wrapping paper. Whilst, under disadvantages, working with small quantities of the pulp, the operator found it not needful to separate fragments of the *arista*, *glumæ*, &c., which appear as an admixture; but as in this instance it was not the aim to procure an elegant paper, no such provisions which machinery provides were adopted to separate the interspersed particles. It is not unlikely to make fair printing and the less costly kinds of writing and tissue paper.

24. *Stipa semibarbata*: ... The paper from this grass is very substantial, though not so strong as that of the preceding kind. On these two grasses only experiments were made to demonstrate their adaptability for the purpose in view. There are several other stipæ and besides grasses of other genera, which may finally be introduced with these into factories.

25. *Xanthorrhæa minor*: This stemless liliaceous plant is of the particular genus which produces the different grass-trees of Australia ... The broad rigid tufts approach each other to the exclusion or gradual suffocation of most other plants of the spot. The harsh foliage ... is shown to be easily converted into an excellent printing and also good writing paper; the percentage of pulp is large. This experiment teaches us also, that the wiry leaves of the different grass-trees may all be collected for paper mills, because all have a similar tissue.

26. *Typha augustifolia*, The *Bulrush* or *Reedmace* ... The pulp of the weighty foliage is easily to be pressed into good printing, tissue, and an acceptable writing paper. So far as I have been able to ascertain, the plant has previously not received any attention in paper factories.

27. *Phormium tenax*: The *New Zealand Flax-Lily* Paper has been placed in the Exhibition from material grown in Victoria. The readiness with which the large richly fibrous leaves can be turned into pulp for a very substantial paper, entitles the plant not alone to our consideration, but also the fact that it may be permanently established with the greatest ease ... it is to be hoped that a local mill will ere long utilise so excellent a material. The paper here obtained from *Phormium* is the strongest of all.

28. *Confervaceous Algæ*, with *Oedogonium* and other allied freshwater weeds ... The paper obtained from these *Algæ* would serve well, on account of its strength, for packing. The application for the purpose appears to be a new one.

29. *Musa Banksii*: ... yields a fair paper for almost all purposes, according to the methods employed in reducing the fibre of the leaves and stalks to pulp ... The Banksian banana here operated on was grown in Victoria. The bleaching process, however, is not an easy one. Banana leaves yield approximately 40 per cent of fibre for pulp. The treatment to which these fibres were subjected has been the same as that by which the esparto—or sparta—grass (*Lygeum Sparteæ*) is reduced to pulp. They were immersed in a solution of caustic soda, obtained from quicklime and common carbonate of soda, varying in strength according to the requirement of the fibre, but always inexpensive. In operating on Victorian raw fibres, it may be of advantage to know that the Mediterranean esparto, which contains about 56 per cent, ligneous fibre, needs application of a caustic liquid, prepared from one-eighth of soda in proportion to the grass. The process of boiling is extended over six or eight hours, whereby oil, albumen, resin, gum, and starch are abstracted.

Von Mueller concluded his catalogue entry: “As substitutes for rags, all the materials indicated here deserve preference over many of the articles elsewhere tried or employed.” His results offered much needed input into the question at hand.

The prize-winning essay of 1860 had prompted discussion on ways to secure sufficient raw materials to maintain a viable paper manufacturing industry in Victoria. The *Argus* and the *Australian* newspapers published the views of interested citizens. A correspondent in the *Argus*, 14 February, 1860, argued that scientific research was needed to find local raw materials to substitute for rags. This was exactly von Mueller’s undertaking. An alternative view, expressed in a letter to the Editor on 1 July, 1861, was to increase the supply of rags. The writer suggested the goldfields would be a ready source of rags because clothing did not last long, due to the nature of the work there. The writer then went on to suggest an interesting method of collecting rags: a rag bag in every household should be mandated. A rag department at the Melbourne Hospital should be established, and rags should be delivered there to be sold to create revenue for the hospital. However, the prevailing view expressed in the letters and articles that were published over ensuing years was that alternative, plant-based raw materials were the way forward.

Following von Mueller’s exhibit at the Intercolonial Exhibition, the *Australasian*, 15 December, 1866, drew attention to the importance of his findings, anticipating that steps would quickly be taken to open up this new source of wealth. To make this happen, the following creative course of action was proposed:

Families should be induced to settle in the neighbourhoods where fibrous plants are most abundant, that they should grow their own grain, potatoes, and vegetables, and keep goats and a few cows, to support themselves while obtaining the materials for paper mills here as well as abroad.

The new source of wealth was not extensively exploited. Each of the plants successfully trialled by von Mueller was widely available in Victoria, however, plant fibres were only used as a supplement to rags in the manufacture of paper, in the local mills that were to follow.

In 1863, there had been a failed attempt to secure land for a paper mill near the Queen Street Bridge. At about the same time, capitalist Thomas Kenny took prudent steps to found Victoria's first viable paper mill. To begin with, Kenny visited Europe to acquaint himself with the business of papermaking and obtained a lease on Dight's Mill and a piece of ground at Dight's Falls on the Yarra River.



Dight's Mill, Yarra Yarra Falls, 1863
State Library of Victoria

Kenny then put in place plans to add to existing buildings and construct races. In the middle of 1865, he imported Scottish machinery that could produce paper seventy-two inches wide; recruited a Scottish engineer to set up the machinery; and employed an experienced papermaker from Ireland. Unfortunately, before he could fulfil his goal he died in July 1866, which gave Samuel Ramsden, a well-known Melbourne business man, the opportunity to buy Kenny's business, plant and machinery.

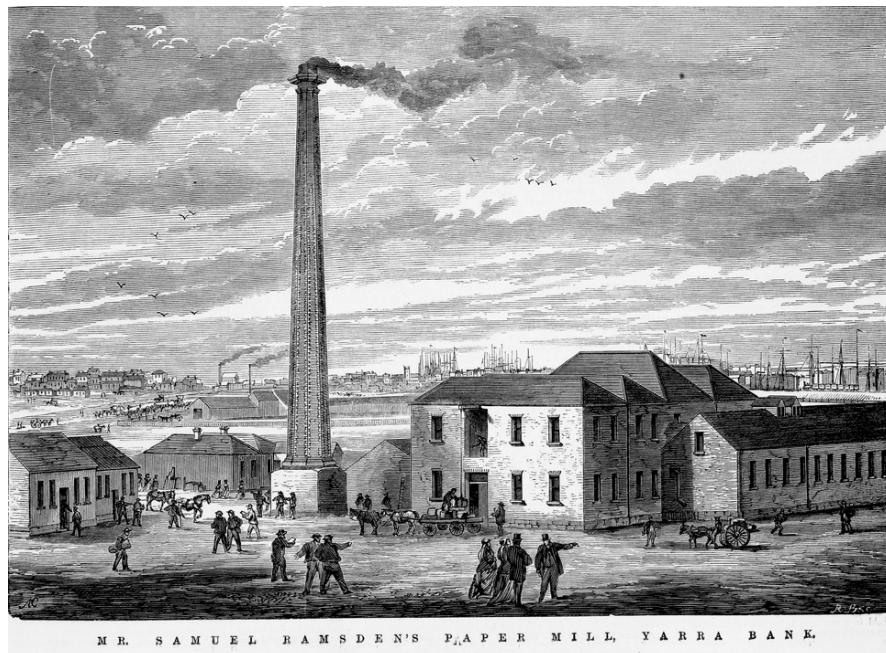
The birth of Victorian paper manufacture

“Within a few days the manufacture of paper will be commenced at Mr. Ramsden's mill” announced the *Argus*, Wednesday, 29 April, 1868. The event captured the imagination of the press and the public, for here at last was an enterprise destined to succeed. Samuel Ramsden, “a man of competent means and of energetic business habits,” had purchased the machinery that Thomas Kenny had imported, and employed Scottish engineer Alexander Steel and Irish papermaker Nathaniel Kerr, whom Kenny had brought to Melbourne, to set up and run his own mill on the River Yarra opposite Flinders Street Railway Station, below Prince's Bridge.



*Samuel Ramsden
AMCOR Archives*

Caught up in the spirit of anticipation, “for the benefit of those not privileged to look on at the birth of the Victorian paper manufacture,” the *Argus* provided a detailed description of Ramsden’s mill. The writer described the buildings and machinery and outlined the process of manufacture, the wish being that Ramsden’s “spirited enterprise” be liberally rewarded.



*Mr. Samuel Ramsden's Paper Mill, Yarra Bank
State Library of Victoria*

The writer tells us that Ramsden was experimenting with vegetable materials:

As is well known, linen and cotton rags are the material out of which paper is made; but of late the world’s supply has been running short, and many efforts have been made to find a suitable substitute - only with indifferent success, however. Paper can be made of almost any kind of vegetable or woody fibre, and earthy matters have even been used when thickness of substance was required rather than quality. But the use of the latter is little better than

adulteration and the straws and other vegetable materials that have been used have proved so costly to prepare that there has been little gained by them. Experiments are now being made at Mr. Ramsden's mill with New Zealand flax, and with sundry Australian grasses, with a view to testing their capabilities as materials for paper, and the hope is entertained that one excellent substitute for rags has already been discovered; but rags will be the main dependence, and of these ten or twelve tons a week will be required. So far there is no reason to fear that the supply will fall short. Mr. Ramsden has a depot in Latrobe-street, where rags are received from various parts of the country, and purchased from the gatherers. The price given is about £3 per ton for old bags, &c., and up to £8 for good linen and cotton rags.

The writer then goes on to describe the rag sorting process at Ramsden's mill:

Although the process of manufacture has not yet commenced at this factory, we shall describe it as if in progress ... Beginning at the beginning, then, we find bales of miscellaneous rags delivered on the floor of an upstairs room, and taken in hand by a small army of female workers, who sort them into different parcels, according to their quality. For the present, only two kinds of paper will be made at Mr. Ramsden's mill - "news" for which there is a demand in the colony far beyond the mill's power to supply, and wrapping paper, which will be made out of the rags received which are too rough for "news". There are thus only two parcels among which the raw material received at Mr. Ramsden's mill has to be distributed. Besides sorting the rags, the hands employed in this department have to look them over carefully, and remove all such foreign bodies as buttons, eyelet-holes, &c., and particularly all scraps of indiarubber. During the past few years the last-named substance has been employed in the manufacture of those elastic bands which enter so largely into the work of the dressmaker and milliner, and coming to the paper-maker in due course, this indiarubber has been the occasion of much trouble, anxiety, and cost. Not only is it extremely difficult to separate from the linen or cotton with which it has been associated, but when it escapes the vigilance of the manufacturer it produces very unpleasant consequences later on. In this room the rags are also cut into convenient sizes. Bits of scythe-blades about fifteen inches long are fixed into tables or benches and the large pieces of rag are rubbed against these and ultimately cut against their faces until reduced to the required dimensions.

The subsequent explanation of the manufacturing process is too lengthy to quote here, but provides interesting reading at TROVE, the *Argus*, Wednesday, 29 April, 1868, pages 5 and 6. The detailed description includes cutting; boiling; maceration; bleaching; dyeing; sizing and straining. The explanation concludes:

We have now arrived at the most important operation of all - namely the conversion of the milk-like substance whose progress we have been following into a web of paper and long as it took to find out how to effect this, the process is exceedingly simple when seen, and as beautiful as it is simple. From that shaking table the pulp flows over on to an endless web of brass wire gauze, of 3,600 squares to the inch, which moves slowly along over brass rollers, the water gradually trickling away through the interstices in the web. By and by the pulp is deposited in the form of a thin film, when, passing over two boxes in which a partial vacuum is created, the remaining water is sucked out of it. At this stage the "dandy roller" comes into play, and gives the paper what is called its "water-mark." In olden times this was a matter of some importance, and the paper was impressed with marks or symbols, such as "foolscap," "pot," &c., from which particular makes still derive their names. Now, few marks are used

except the maker's name, and not always that. The "couchers" are two felt-covered rollers, one of mahogany and the other of copper, which revolve towards each other, and passing between which the half-made paper is compressed. These rollers are in contact, and their pressure can be regulated at the will of the paper-maker. Being further pressed between other rollers, the paper, now a kind of tender web, passes on to drying cylinders. These are three feet in diameter and five in number, and are heated by means of steam, becoming hotter and hotter as they advance in the order of the series. The paper is kept in contact with their surface by means of guide rollers and an endless web of felt, which travels round the cylinders and carries the web of paper along with it. It is here that good workmen are most wanted. If through any accident the web of paper should break during the process of manufacture, only skilled hands can put the broken end to the machine again. It is here also the indiarubber creates a difficulty. If the smallest speck of it reaches the drying cylinders it melts, spreads out, and causing the web to adhere almost certainly occasions a fracture.

Three highly polished iron rollers, pressing upon each other with their own weight, and revolving in the same direction, form the "cullander," and in passing round and between these the paper acquires as much glaze as printing papers require, and is then rolled on to a cylinder in a finished condition. Nothing remains but to cut it into sheets, and pack it up for sale

Finally, readers of the *Argus* were encouraged to witness the operation of the new mill: "We may say that Mr. Ramsden's paper-mill will well repay the trouble of a visit, and that the proprietor and his managers afford every reasonable facility for viewing the works."

On 4 May, 1868, Melbourne's *Evening Star* printed an edition of 100 copies on the first hundred sheets of a brown wrapping paper produced at Ramsden's mill. Four months later, the *Ballarat Star*, 19 August, was printed on paper from Ramsden's mill. Again, an article therein described the process of manufacture and the materials used, and recorded that Samuel Ramsden gave assurance he had access to an ample supply of rags: "I opened a store in La Trobe Street some months since for the purchase of rags &c. and now there is quite a little army of old men and boys employed collecting the material." He went on to identify the materials he used in manufacture:

In every description of paper three kinds of material are used – rags first and in largest quantity; old sugar bags and a certain kind of rush growing plentifully on every Australian swamp. The sugar bags made of reeds are really wonderful in toughness and fibre when steamed and cleaned.

It seems that plant fibres never did become the exclusive raw material utilised in Ramsden's mill. However, with a secure supply of raw materials and continuous quality improvement, the market expanded. Soon a tariff placed on imported wrapping paper meant that Ramsden's mill was unable to meet demand.

The opportunity existed for others to meet the shortfall in supply. In 1872, a second Victorian paper mill was built by Samuel Fieldhouse on land adjoining Ramsden's mill. However, by 1874 Fieldhouse was insolvent and his mill was up for auction. Samuel Ramsden purchased the papermaking machine together with the mill buildings, thereby growing his business. When Ramsden died in 1877 the adjoining mills passed to his son George who ran them until 1882.

The site of Ramsden's paper mill was once identified by a plaque on the pavement, roughly outside the entrance to The Langham Hotel, at what we now know as Southbank. However, it was removed during renovations and has not been replaced. The plaque reads that paper was manufactured on the site for 100 years, until 27 April, 1968.



*Site of Victoria's first paper mill, 1868 - 1968
AMCOR Archives*

The end of an era for paper manufacturing in Victoria

At the same time as George Ramsden assumed control of Samuel Ramsden's mills on the south bank of the Yarra in 1877, another Victorian paper mill was under construction on the banks of the Barwon River at Fyansford, near Geelong.



*Fyansford Mill, c 1876
Fred Kruger
National Gallery of Victoria*

With prominent Geelong businessmen as backers, the Barwon Paper Mill, said to be the largest and best mill in the Southern hemisphere, came into operation in August, 1878. The mill began with 40 employees: 20 men, 17 women and three boys. Brown wrapping paper made from old sugar bags was first to be manufactured. Baskets made with the first ream of paper produced at the mill were among articles for sale at a charity bazaar held around the time of the opening. The mill soon expanded its range of papers: printing and writing papers, newsprint and carpet felt were among them.

Like Ramsden's mills, the Fyansford mill used rags as the main source of fibre for paper production. In announcing the opening of the mill, the *Geelong Advertiser*, 19 March, 1878, described the rag-house:

... a pretentious building about 90 feet x 30 feet, and of considerable interior height. It is lighted by twenty-two windows, has an asphalt pavement, and is well ventilated. It is here that the pickers-up of unconsidered trifles in the shape of rags will, through their merchant, deposit what they have begged, borrowed, bought, or - well, found! The building will, if necessary, accommodate 100 women, whose business it will be to separate the woollens, cottons, and linens. When they have performed their task, their piles will be taken in trucks by a gangway to an adjoining building called the rag-cutting, willowing, and dusting house.

The rag-house is again described by 'The Vagabond', in the *Age*, 22 June, 1889. In recounting his visit to the mill, he writes:

Paper is the cleanest thing in the world, but the initial process of its manufacture is not very cleanly. Dirt is but matter in the wrong place, and the foulest of rags are converted into the daintiest of note paper for the loveliest of their sex. The bales of rags which we see in the sorting room might contain the germs of much disease, but the girls who are sorting here are healthy enough. Although there is dust and dirt about, these girls still look smart, with an attempt at fashion in their attire.



*Rag sorting: paper mills Fyansford c1880
J.H.Harvey
State Library of Victoria*

At the time of the Vagabond's visit, the number of employees at the Fyansford mill had reached 70 to 80 and he observes that the sexes are "about equally divided". The role of women in production extended beyond the rag house: "The last stage in a paper factory is the cutting room, where the paper is cut into lengths, and sorted by young girls, who reject every dirty or speckled sheet."



Examining sheets at Fyansford c1880

J.H.Harvey

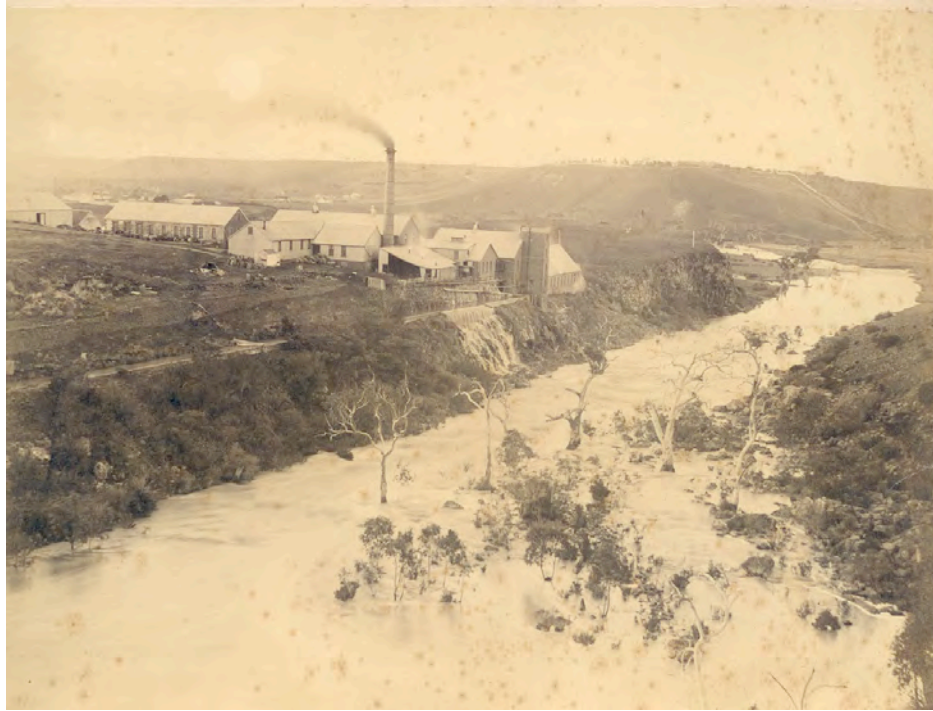
State Library of Victoria

We are indebted to the women working in the rag house for they left us with a tangible reminder of their critical role in the paper manufacturing process at the Fyansford mill. Before rags could be pulped, any attachments to the cloth needed to be removed. As we learned in the case of Samuel Ramsden's earlier mill, indiarubber, buttons and fastenings posed a threat to continuous paper production. Amazingly, at Fyansford, hundreds of thousands of buttons and fastenings survive as testament to the assiduous efforts of the women who sorted the rags. The detached buttons and fastenings were dumped at the periphery of the mill, and today form Button Hill. Button Hill, on private land abutting Upper Paper Mills Road, Highton, is listed on the Victorian Heritage Database. It is classified as of high regional significance. The buttons and fastenings, made of bone, ceramic and glass, were deposited between 1877 and 1923, when paper production at Fyansford ceased.

The mill buildings themselves, on Lower Paper Mill Road, are also listed on the Victorian Heritage Database. The complex is judged to be significant for its role in the development of the Australian paper-making industry, and is one of the most significant surviving examples of a 19th century industrial complex in Australia. To quote the database:

This industrial complex, which was constructed mainly during the late 1870s and which comprises the original mill buildings, manager's house (1878), a row of six workers' cottages (1878), a stone water race with impeller, tower and stone weir, has both state architectural and historical significance sufficient for its inclusion on the historic buildings register.

It is also classified by the National Trust and is on the Register of the National Estate. Today, the complex is being developed as an arts and cultural precinct.



Barwon Paper Mill, with the Barwon River in flood, late 1880s

<http://justlovehistory.com>

Source: Wynd collection

While the Barwon Paper Mill steadily increased its production, George Ramsden in South Melbourne saw his family company face difficulties. By 1882, Ramsden's mills had been sold. They were acquired by English born William Brookes and Scottish born Archibald Currie, ambitious financiers who invested £37, 000 in the South Melbourne mills and had visions of greater efficiencies. In 1895, the Fyansford mill was acquired by Brookes and Currie, who by then also had an interest in the other Victorian paper mill at Broadford.



*Broadford Paper Mills
State Library of Victoria*

A paper mill had been built at Broadford, in central Victoria, in 1889. The mill was founded by James Macdougall of the printing and stationery firm of Sands & McDougall. Being in the midst of Victoria's wheat fields, here was a mill that used local vegetable fibre as its main raw material, supplemented with sails and rigging from ships that brought people and goods to Melbourne. The main product at the mill was strawboard, used for book covers and cardboard boxes. In the early days, the Broadford mill was recognised as the only strawboard mill in the British Empire. Today, one of twelve straw boilers used in the making of paper pulp at the Broadford mill in the 1890s is a feature in the historic park at Broadford.



*The straw boiler at Broadford
Broadford and District Historical Society*

Brookes and Currie had succeeded in amalgamating Victoria's three operating paper mills at South Melbourne, Fyansford and Broadford. The new entity became Australian Paper Mills Co Ltd (APM), in 1895. By the early 1900s, at the same time as Federation united the colonies, the successful operation of the amalgamated company meant APM was in a position to look to expanding beyond Victoria. From that point, paper manufacturing was no longer the province of individual, local businessmen. Victorian paper manufacturing had begun its evolution to the complex, global industry we know today.

Sources

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Other sources were: Black Sheep Search, Swing Riots and Rioters, http://www.swingriotsriotersblacksheepsearch.com/index.php?p=1_6_The-Riots; the New Zealand Electronic Text Collection, Pamphlet Collection of Sir Robert Stout: Volume 6, Creative Commons License, <http://nzetc.victoria.ac.nz/tm/scholarly/tei-Stout06-t17-body-dl-d16.html>; Australasian Historical Archaeology 29:24-32I, Peter Davie, Susan Lawrence and Jodi Turnbull; and *The History of Geelong and Corio Bay, 1990*, W. R. Brownhill.

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