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the VENEER AND WOOD INDUSTRY OF QUEENSLAND



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The
Veneer and Plywood
Industry
of
Queensland



Sub-Department of Forestry, Department of
under the authority of the Hon. P. Pease,
L.A., Secretary for Public Lands.

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Board Room of the National Society of Operative Printers and Assistants, London, England.
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Foreword by the Hon. P. Pease, M.L.A., Minister for Lands.

This small book is issued to enable those who are interested in veneer and plywood to gain some idea of the extent of this industry in Queensland and its resources in beautifully figured woods and high-class utility softwoods.

More than twenty timbers in all shades of ornate colour and variety of figuring are available within the State for veneer and plywood purposes of all kinds, while the efficiency of the factories is such that the humblest cottage can be made beautiful by the use of choice veneered panels at low cost.

Such a natural advantage as this, coupled with the variety of native hardwoods of unexcelled durability eminently suitable for exterior sheetings and polished internal floorings may well make home builders in other lands envious of their friends in Queensland.

In addition to work provided for timber and transport workers, the Queensland Veneer and Plywood Industry in 1933 provided direct employment for 448 hands in its factories.

Although the Industry is only eighteen years old in this State, the capital invested has already grown to £370,000, and Queensland factories are now capable of supplying more than the present demand of the whole of the Australian States and New Zealand.

P. PEASE,
Minister for Lands.

Brisbane, 6th December, 1933.

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The Veneer and Plywood Industry of Queensland

VENEER AND ITS HISTORY

What is Veneer?

According to modern usage veneer is simply a thin sheet or layer of wood which has been cut from a larger flitch or log.

At one time wood veneer was used only for the purpose of decoration, and was defined as a thin layer of a more beautiful or valuable timber for overlaying an inferior one, but the present-day prevailing use of glued-up veneers of plain type for constructional purposes demands a broader view. Veneer has outgrown its earlier purely artistic uses, and now occupies in addition a very important place in everyday business.

Plywood.

This name is given to two or more layers of veneer glued or cemented together face to face.

The number of layers (or plies) in plywood is usually odd, varying from 3 to 13, according to the work required, with the direction of the grain in each successive layer at right angles.

Corestock is a particular plain figured line of plywood which may have a core constructed of sawn timber or veneer. It is supplied to the cabinet and furniture trade for veneering with any desired timber. Corestock is made in all thicknesses from three-sixteenths of an inch upwards.

Plywood with sawn timber core is referred to as solid core construction.

VENEERING THROUGH THE AGES.

The art of veneering with beautiful woods has been known to civilisation for more than three thousand years, dating back to the times of the Pharaohs in ancient Egypt.

Earliest Records.

Excavations of the tombs of ancient Egyptian rulers have revealed many wonderful examples of veneered furniture.

Many of these pieces, still in excellent condition, include caskets, chairs, and beds exquisitely carved and in elaborate designs. One of the most interesting exhibits in the Cairo Museum is a bed, the headboard of which is plywood built with veneered panels and lavishly inlaid with jewels, gems, ivory, and gold.

Although little is known of the methods of cutting the veneers and the nature of the glues used for fixing these to the solid work, sculptures at Thebes in Upper Egypt clearly depict workmen in the act of laying veneer on furniture, using glue which was heated on a fire and applied with a brush.

The timbers used were chiefly Ebony, Sycamore, and species of Acacia, and probably also Rosewood and Teak. With the exception of the Sycamore, Tamarisk, Acacias, and Palms, Egypt possessed few decorative woods, and other types had to be imported from India.

From records recovered from the ruins of ancient Biblical cities, it is proved that the art of veneering was also later practised in Babylonia and Assyria.

In Greece also, sculptures and paintings of furniture found at Athens indicate that although the fashions differed greatly from those of Egypt, veneering was also employed by the Greeks for decorative purposes, but to a lesser degree.

In Ancient Rome the fashion of highly ornamental furniture was very strongly developed, and the choicest and most costly pieces were the tables which were veneered with rare woods. The Romans loved the beautiful effects of crosscut veneers for their table tops.

Middle Ages (A.D. 476-1453).

It is a significant fact that from the earliest Egyptian times, whenever the social and economic conditions of civilised nations encouraged the study of arts and crafts, the use of veneer came greatly into prominence.



Veneer Logs in Hoop Pine Scrub, South Queensland.

Through the entire medieval period, a period of chaotic unrest, practically the only trace of veneering is seen in the style known as Byzantine, which centred about Constantinople.

In Byzantine furniture inlaid woods were employed, and ivory, both carved and inlaid, was much in use.

One of the most interesting relics of the Middle Ages is the "Chair of St. Peter," richly veneered and inlaid with ivory and gold, which is preserved in the Vatican at Rome. Before the Egyptian discoveries this was regarded as one of the oldest examples of wooden furniture in existence.

The return of the Crusaders from the Holy Land introduced the Gothic form of architecture and decoration into Western Europe, and this was popular in the 13th, 14th, and 15th centuries. In Gothic style, inspiration for ornament was taken from the life of the forest, but in furniture the general effect was of massive strength, unrelieved by veneer decoration.

The Renaissance.

The early Renaissance period commenced in the 15th century, when furniture showed a marked change of style, the massive carved Oak and Chestnut furniture of the Gothic giving place to extensively veneered pieces.

Italian Renaissance schools contributed wonderful skill in veneered work, following the styles of their Roman predecessors two thousand years before. In museums throughout Europe are many priceless creations in the realm of furniture, many of them of veneer construction.

Similar advances in craftsmanship took place in France in the 16th century, and the Italian modes of ornamentation were introduced.

In England, the Renaissance movement had its beginnings during the more stable conditions obtaining during the reign of Henry VIII., but it was not, however, until the reign of Queen Elizabeth that furniture, reflecting the spirit of the times, was made more attractive. The use of inlay was continued, and this form of veneer also began to be used for wall panelling. From this early beginning the modern fashion of using veneer in the form of plywood for panelling the walls and ceilings of the best rooms in houses has developed.

Later French Furniture.

Marquetry and other forms of veneering became increasingly popular in later French furniture, and during the reign of Louis XIV. a supremacy in matters of style and taste was attained, which has continued to the present day.

The most famous and magnificent piece of veneered furniture ever built is the "Bureau du Roi," which is still preserved in the Palace of the Louvre at Paris.

It is a cylinder desk of plywood construction throughout, the prototype of the modern "roll-tops." In the art of veneering, it is considered to be the "last word" with decorations in beautiful marquetry.

Napoleon was instrumental in again changing the fashions of furniture.

Styles of these times, known as Empire furniture, embraced those of both Italy and Egypt, to which countries Napoleon's wars led him.

Veneer and plywood were extensively employed by Empire craftsmen, the finest Mahogany crotch veneers being favoured to obtain rich and varied effects in the panels of doors and in drawer fronts. Napoleon's "Bureau de Campagne," built of plywood throughout, accompanied the Emperor during twenty years of military service to all parts of Europe. Despite its history, it stands to-day in almost flawless condition.

Early Veneering in England.

The Jacobean period began in the time of Henry VIII., and reached the height of its development during the reign of Charles I., by which time the predominance of solid construction began to give way to the greater use of plywood.

During the Queen Anne period following the use of figured Walnut for veneering became general and reached a state of great perfection.

In the Georgian period, extending through the reign of George III., furniture followed the designs of a number of master craftsmen—Chippendale, Adam, Hepplewhite, and Sheraton, after whom the various styles were named.

An outstanding feature of this period was the general use of veneer and plywood. Mahogany veneers showing beautiful crotch figuring were much favoured.

VENEERING IN THE NINETEENTH CENTURY AND PRESENT DAY.

The art of veneering suffered a marked decline during the early part of this period, but towards the close of the century the natural beauty of wood was again appreciated and veneers were again employed.

To-day the necessity of matching veneers for the purpose of adding to the beauty of wood surfaces is freely accepted by the trade. Manufacturers of furniture are convinced that plywood construction is scientifically sound. Prejudice against plywood construction in a small minority is being rapidly overcome by information made available by reliable authorities.

In modern furniture of the better types, Walnut and Mahogany are among the most popular woods, with designs based on the famous "Period" furniture of the 18th century in England, when veneer and plywood were generally adopted.

In addition to furniture veneers of rare and beautiful woods are now prominent in wall-panellings, door-facings, and ceilings to match the furniture in the better-class buildings, giving ample proof that the principle of plywood construction is everywhere accepted.

The great advantages of plywood in making possible a surface of superior grain and selected figure correctly balanced, in addition to greater strength, immunity to warping, and lighter construction, are being more and more appreciated. These advantages, coupled with a relatively low cost, have resulted in the present utilization of plywood in more industries than ever before in the history of civilisation.

No longer are beautiful veneered furniture and panelling to be regarded as luxuries attainable only by princes of the land, for, with the aid of modern machinery, veneer with all its advantages is now within the means of every citizen.



Peeling Hoop Pine Logs on Rotary Lathe.



Part I

History of Veneer and Plywood Factories in Queensland

The first manufacture of plywood in Queensland was commenced in the early days of the Great War, when Mr. J. McG. Williams commenced business in Stanley street, South Brisbane. Queensland Hoop Pine (*Araucaria cunninghamii*) was the timber selected, and the main product was three-sixteenths of an inch thick 3-ply in sheets 6 feet long by 3 feet wide from veneers cut on a rotary-lathe.

Later, the works were shifted to Deshon street, Woolloongabba, South Brisbane, where the output was increased to approximately 250,000 square feet of plywood per week.



Log Dump in Hoop Pine Scrub, South Queensland.

Deshon Wood Veneer and 3-Ply Mills—Canadian Plywood Company, Limited.

The factory was then known as the *Deshon Wood Veneer and 3-Ply Wood Mills*, under which business was carried on until 1920. In January, 1922, the name was changed to the Canadian Plywood Company, Limited.



General View of a Brisbane Plywood Factory.

D. G. Brims and Sons Proprietary Limited.

In 1916 Messrs. D. G. Brims and Sons, of Milton, Brisbane, disposed of their joinery machinery and constructed a plywood mill at Railway Terrace, in the same suburb.

As a result of the rapid expansion of the business, in 1929 the whole of the two plants then situated at Milton was removed and remodelled at Yeerongpilly, Brisbane, with a capacity of 12,000,000 feet of inch plywood per annum.

In 1930 the company introduced veneer wirebound packing containers, and the necessary machinery for this was put into operation under the name of the 4-One Box Company of Australia (Queensland). This made it possible to manufacture from Queensland softwoods a better and cheaper container than was previously possible.

In addition to the box and veneer plants, the company's activities include general sawmilling for the production of all classes of sawn timber.

A recent development in the company's activities is the manufacture of casein glues.

The 3-Ply Wood Company, Limited—Queensland Plywood Development Company, Limited.

After D. G. Brims and Sons, the late Mr. Thomas C. Booth next entered the trade as managing director of the 3-Ply Wood Company, Limited, registered in June, 1917, and commenced manufacturing plywood from Hoop Pine at Wellington road, South Brisbane. The assets of the company were sold in 1923 to the Queensland Plywood Development Company, Limited, which ceased business some years ago. Mr. Booth rendered valuable service to the industry in the investigation of Queensland timbers for veneer purposes.

The National Plywood Company Proprietary Limited.

The National Plywood Company Proprietary, Limited, at Ipswich road, South Brisbane, was one of the earliest manufacturers of plywood in Queensland, and took a very active part in the industry. The company manufactured Hoop Pine plywood as far back as August, 1920, and since that date conducted a moderate business in plywood manufactured from Hoop Pine, Maple, and Silky Oak. The works are well equipped to produce approximately 3,000,000 square feet of plywood per annum, which in normal times would provide for the employment of from twenty to thirty men.

Interstate Plywood Company, Proprietary Limited.

Quite recently the company decided to lease its undertaking to a new company, entitled "The Interstate Plywood Company Proprietary, Limited," but operations ceased soon after.

Standard Plywood Company Proprietary Limited.

The Standard Plywood Company first manufactured Hoop Pine plywood at Newmarket road, Windsor, in January, 1921, employing forty hands.

Standply Timber Company, Proprietary Limited.

In April, 1927, a larger company, under the name of the Standply Timber Company, was formed, and the plant was removed to Canungra and installed in the sawmill originally built by the old company of Lahey's Limited.

The Canungra works commenced production in January, 1928, and new machinery has since been installed to improve the plant.

At the present time sixty hands are employed in the manufacture of plywood to the extent of approximately 4,000,000 square feet on a three-sixteenths of an inch basis.

The principal plywood sold is Hoop Pine, but the company has now extended its operations to other timbers, including Silky Oak, Queensland Maple, Walnut Bean, Red Tulip Oak, Satin Sycamore, and Silver Ash.

Kinbombi Plywood Company, Limited—Manumbar Timber Company, Proprietary Limited.

In April, 1924, the manufacture of Hoop and Bunya Pine plywood was commenced by the Kinbombi Plywood Company, Limited, at Kinbombi. About two years later, the works of this company were bought by the Manumbar Timber Company Proprietary, Limited.

The factory, which employs twenty-five hands, produces all lines of plywood up to $\frac{5}{8}$ -inch thick has a normal average output equal to 3,500,000 square feet of three-sixteenths of an inch thick plywood.

The Oxley Plywood Company, Proprietary Limited.

Two further plywood companies were registered in 1925, both in Brisbane. The Oxley Plywood Company, Limited, was registered in July, and the manufacture of Hoop Pine plywood was commenced in the following year at the works at Yeerongpilly. All thicknesses of Hoop Pine plywood are now made by this company, in addition to plywood of Silky Oak, Red Tulip Oak, and other North Queensland veneer woods.



Ply Logs on the way to the Mill.



Hauling Pine Logs, Imbil, South Queensland.

Austral Plywoods Proprietary Limited.

Austral Plywoods, Limited, was registered on the 25th September, 1927, at Wilson Street, Penryn, and production of Tropical Plywood was commenced immediately.

From the first, employment was given at the works for thirty hands, but with a rapid growing business, this number was increased to the present staff of 100.

Calculated upon the basis of three-sixteenths of an inch thick plywood, the present normal output is 5,000,000 square feet of birchwood per annum.

Plywood is manufactured from a number of Queensland timbers, including Hoop Pine, Sassafras, Rose Walnut, Sugar Pine, and Queensland Pine, and Walnut.

Special selling lines are provided by the Fancywoods Department in the form of panels in figured timbers, for all of which the veneers are rotary-sliced and matched.

Newmarket Plywood Company Limited.

The Newmarket Plywood Company, Limited, commenced business at Newmarket, Brisbane, in December, 1927, the principal selling line being Hoop Pine plywood. This company is still active in the industry.

Queensland Plywood Company.

In August of the following year, the Queensland Plywood Company commenced operations in Deshon street, Woolloongabba, but was dissolved in 1929.

Cairns Timber Limited.

Cairns Timber, Limited, one of the oldest existing sawmilling companies in North Queensland, dating back over twenty-three years, installed the first vertical veneer slicing machine in Queensland in 1930. A new industry, that of the production of high-class veneers of the most beautiful of our North Queensland timbers, was thus established. The veneers are mostly shipped abroad.

Hancock and Gore Proprietary Limited.

Messrs. Hancock and Gore, Limited, long established in the sawmilling and joinery business at Ipswich road, commenced making rotary-cut veneers for wire-bound box-making late in November, 1930, and in May, 1931, entered the plywood trade.

Some 7,500,000 square feet, three-sixteenths of an inch basis, of both veneers and plywood are represented in the normal average output of the factory, which now gives employment to fifty hands.

Hoop Pine plywood of all thicknesses is manufactured, and fancy plywoods are also catered for.

Brisbane Sawmills Proprietary Limited.

This company is a recent entrant into the plywood business. Hoop Pine is the principal species handled, but the plant is now handling door stock in figured Walnut. The factory is equipped with machines, seasoning kiln, and other facilities for the production of high-grade products.

Victory Plywood Company.

This company commenced plywood manufacture in January, 1931, but ceased business at the end of the same year.

Brown and Broad Newstead Homes Limited.

Manufacture of plywood in large quantities has now been commenced by this company at Newstead, Brisbane. Up-to-date machinery enables the production of large-sized sheets of various thicknesses.



Queensland Pine Veneer Boxes for Queensland Butter.

THE UTILIZATION OF NATIVE TIMBERS.

Much research work has been carried out by the Queensland plywood manufacturers in conjunction with the Queensland Forest Service to ascertain which species of native trees can be utilised in this industry. Prominent amongst those who assisted in this work are the late Mr. Thomas Booth, of the 3-Plywood Company, Limited, Mr. Marcus Brims, of D. G. Brims and Sons, and in later years, Mr. R. H. Bentley, of Austral Plywoods Company.

The first plywood mills used Hoop Pine (*Araucaria cunninghamii*) and Bunya Pine (*Araucaria bidwillii*) almost exclusively. The high price of these pines, which were firmly established on the timber market for building purposes and joinery, encouraged the search for cheaper unmarketed species suitable for the same work.

Official records of the Queensland Forest Service show that the first inquiries for timbers other than pine suitable for slice or rotary veneering was received in July, 1917.

Red Cedar and Maple Silkwood were reported to be good, while Miva Mahogany (Red Bean) and Black Bean had been tried in Melbourne and found wanting in some respects.

It is of particular interest to record that the then Director of Forests (Mr. N. W. Jolly) advised that: "Black Walnut (now known as Queensland Walnut) is worthy of special consideration . . ." It is understood that this information was passed on to Melbourne, in which city the first Walnut plywood was manufactured and marketed.

Queensland Walnut was thus introduced to the veneer market over ten years prior to the rush of orders to America in the years 1928 and 1929.

While Maple Silkwood and Red Cedar are still regarded as suitable veneer timbers, although the latter is seldom now used, Black Bean and Miva Mahogany were never used to any great extent in the industry. Messrs. Beale and Company, Limited, Sydney, have made some excellent figured veneers from Black Bean, but the log is very irregular.

Logs of the Southern variety of Crowsfoot Elm, Candlenut Siris, and Blush Cudgerie were also sent to Melbourne, but no business resulted at the time.

Recently some three-sixteenths of an inch 3-ply of Candlenut Siris was manufactured by the Newmarket Plywood Company, and apart from an unusually soft surface, the plywood proved quite serviceable.

Crowsfoot Elm from Southern Queensland and Blush Cudgerie have never been used since on account of excessive hardness and brittleness in the former, and undue woollyness and gumming properties in the latter.

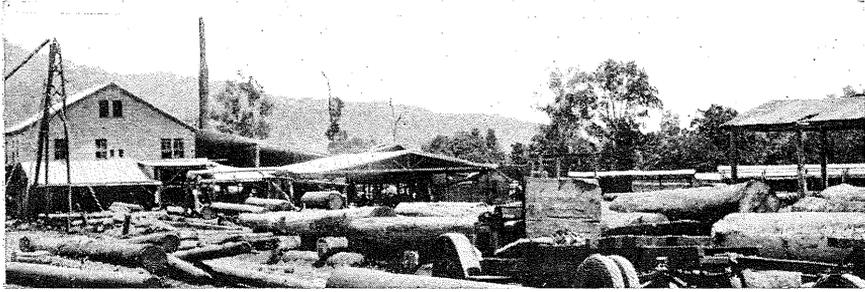
Official files record the issue of instructions in May, 1918, to the forest officer at Imbil to forward logs of a number of unused scrub timbers to Messrs. D. G. Brims, Limited, Milton, for experimental purposes. New timbers included in this experiment were Silver Quandong, Ivorywood, Rose Marara, Pink Satinash or Water Gum. All were reported upon as unsatisfactory at the time for rotary work, but Silver Quandong and Pink Satinash have since been used on occasion for cores in cheaper plywoods. Rose Marara was too hard. Ivorywood has recently been found suitable for sliced veneers for fancy panels.

During 1918 and 1919 a large number of native timbers were tried by the 3-Plywood Company, Limited, including Brown Bollywood, Blush Walnut, White Walnut, White Kurrajong and Brown Figwood, Yellowwood Ash, Southern Silver Ash, Grey Persimmon, and Silky Hornbeam as new experiments.

Of these, only Brown Bollywood, Yellowwood, and Southern Silver Ash gave satisfactory results, and these have since been used in the industry in small quantities.

A close botanical relative of Southern Silver Ash, occurring in North Queensland, also known as Silver Ash, is now very extensively used in Brisbane for the manufacture of high-grade plywood.

September, 1922, marks the beginning of experiments to make plywood from Satinay. The first test was made by Messrs. D. G. Brims and Sons, at Milton, who successfully peeled by the rotary process a large log of this species secured especially by the Forest Service from Fraser Island. The wood was rather hard for this process, being more severe on the knives than most timbers. The veneers were made into standard sheets, which although plain in figure, proved to be the strongest plywood ever manufactured in Queensland. Further work on this timber was carried out by the Veneer Company, of Kyogle, New South Wales, in 1930, using a rotary-slicing machine on well-boiled quartered log flitches. The resulting plywood was very strong, and possessed a handsome ripple figure lending itself to matching. It was found that the logs must not be over-mature, nor left to dry before veneering, if good results are to be obtained.



Logs Awaiting Peeling at a Country Plywood Factory.

The first effort to use Queensland Walnut for plywood in Queensland was made in September, 1923, when logs of this wood, together with Canary Ash, were secured by the Forest Service for rotary-veneering by Messrs. D. G. Brims and Sons, Milton. Logs of Red Cedar and Tulip Cedar were also included in the tests, which were highly successful. Plywood panelling manufactured nine years ago from these logs may now be seen in the Forest Products Showroom. Although exposed to severe air conditions, including temperatures which ranged from 46 deg. F. in the winter of 1929 to 106 deg. F. in February of the same year, with relative humidities varying from 15 per cent. in hot weather with westerly winds to 100 per cent. for a short period during the heavy rains of February, 1931, these plywoods, without any protection by varnish or polish, are still in flawless condition.

Maple Silkwood and Silky Oak were already well known as suitable woods for rotary plywood, and were largely used for internal panelling.

A further veneer timber was introduced in September, 1924, when a trial log of Red Tulip Oak (*Tarrietia argyrodendron* var. *peralata*) was secured from Forestry Reserves in North Queensland. The timber was not favoured at the time, but further rotary veneering of this wood some years later gave good results.

Blush Tulip Oak (*Tarrietia actinophylla*) from the Eungella Range, west of Mackay, tried at the same time, was not a success because of its brittleness, and has not since been used.

Although Red Tulip Oak was not exploited to any great extent when the first veneers were made, in recent years a considerable market for this product has been built up in Brisbane for wall-panelling of modern style houses.

As late as 1930 new timbers for plywood manufacture were still being introduced. Good results were secured with Red Silkwood, while Rose Alder and Satin Sycamore were also found suitable. Rose Walnut made a strong, even-textured plywood, very similar in general appearance to Maple Silkwood. White Hazelwood, Red Siris, Ivorywood, and Tulip Plum proved suitable for use in small quantities for quarter-sliced veneers for fancy panels.

The Rose and Grey Satinashes were successfully plied in June, 1930. The resulting plywood was very strong and of good quality, but the cost of the logs from the Mackay district did not then permit of commercial marketing.

Export of Logs for Veneering.

By the end of 1926, as a result of numerous small samples of plywood of Queensland timbers having been distributed by the Forest Products Showrooms to timber agents in all parts of the world, in addition to sheets sent to the British Empire Exhibition in 1924, inquiries for these timbers began to come in. These mainly originated in the United States, and the timbers most in demand were Queensland Walnut, Silky Oak, and Maple Silkwood.

Large numbers of logs and stumps of these timbers were later shipped to America and Europe from Cairns and Brisbane. This trade reached its peak in 1929, but business has since fallen off considerably owing to the world depression.

Queensland Walnut did not become so popular in Australia for plywood in the rotary-cut form, but the production of quarter-sliced veneers by Messrs. Beale and Company, Limited, Sydney, and later by the Cairns Timber, Limited, greatly stimulated the sale of this beautiful wood.

QUEENSLAND FACTORIES, THEIR OUTPUT AND MARKETS.

In the State of Queensland eleven of the nineteen veneer and plywood plants now operating within the Commonwealth are situated. Of those outside this State, four factories are situated in New South Wales, three in Victoria, and one in Tasmania.

During the year 1932 the Queensland industry employed 448 hands in its factories, while the total amount of capital invested amounted to £312,000.

A detailed survey of the operations of the various manufacturers showed that the total plywood production for the calendar year 1932 was over 30,000,000 square feet, calculated as three-sixteenths of an inch thick plywood. In addition, Cairns Timber, Limited, sliced 5,000,000 square feet of figured veneers.

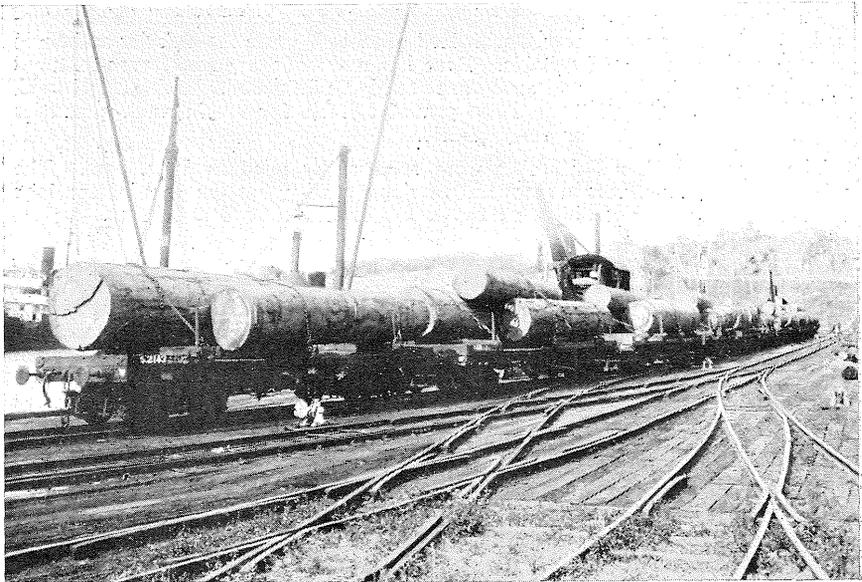
Two further Queensland companies—Messrs. Brown and Broad Proprietary, Limited, and Messrs. Brisbane Sawmills Proprietary, Limited—have since commenced plywood manufacture, and Queensland factories are now capable of supplying over 50,000,000 square feet of three-sixteenths of an inch thick plywood per annum.

It is estimated that over 80 per cent. of the total Australian production of plywood is manufactured in Queensland.

The Queensland Veneer and Plywood Companies now operating are:—

Company.	Situation of Works.
1. Austral Plywoods Pty., Ltd.	.. Tennyson, South Brisbane
2. D. G. Brims and Sons Pty., Ltd.	.. Yeerongpilly, South Brisbane
3. Brisbane Sawmills Pty., Ltd.	.. Windsor, Brisbane
4. Brown and Broad Newstead Homes, Ltd.	.. Newstead, Brisbane
5. Cairns Timbers, Ltd.	.. Cairns, North Queensland
6. Hancock and Gore, Ltd.	.. Ipswich road, South Brisbane
7. Manumbar Timber Co. Pty., Ltd.	.. Manumbar
8. National Plywood Co. Pty., Ltd.	.. Ipswich road, South Brisbane
9. Newmarket Plywood Co. Pty., Ltd.	.. Newmarket, Brisbane
10. The Oxley Plywood Co. Pty., Ltd.	.. Yeerongpilly, South Brisbane
11. Standply Timber Co. Pty., Ltd.	.. Canungra

Full information regarding the above companies and their products may be had on application to the General Secretary of the Plywood Manufacturers' Association of Australia, 129 Creek street, Brisbane.



Kauri Pine Logs from Cooktown, North Queensland.

MARKETS AND MARKETING.

Queensland plywoods are sold in all the Australian States and in New Zealand, while recently a limited market has been supplied in England. Veneers are shipped overseas to America and Great Britain.

The greatest demand comes from Victoria, followed by New South Wales, South Australia, Queensland, Western Australia, New Zealand, and Tasmania, in this order.

Over 90 per cent. of the plywood made in Queensland is sold to other States and to New Zealand.

The much greater consumption of plywood per capita in other States may be attributed mainly to the scarcity of pine sheeting available there and the low transport costs of plywood, in addition to the fact that the greater industrial activity in the larger capitals tends to increase the use of plywood in buildings and for other purposes. The low cost also contributes largely.

During the early days of the industry, the plywood trade was almost entirely interstate, with great variations in business. The price received for plywood was at first very high, three-sixteenths of an inch 3-ply, the chief line, reaching the maximum price of 37s. 6d. per 100 square feet ex mill in 1920.

Last year's price of three-sixteenths of an inch plywood, 11s. 6d. to 12s. 6d., was the lowest on record. This low price was largely due to increased efficiency in production, together with keen competition between manufacturers.

A recent development which has taken place in the plywood industry is the export trade which has been developed with Great Britain. Since August, 1932, all shipments have been made under Forest Service certificates after each sheet has been passed to the specifications of the Queensland Pine Plywood Export Association and approved by the agents in Great Britain.

Plywood three-sixteenths of an inch and $\frac{1}{4}$ inch in thickness represented 75 per cent. of the total shipments.

Reports from England indicate that this plywood, which is of a high grade, is finding favour with architects, who find it of great service for all kinds of interior work. The firm surface and even texture of the face veneers, combined with their adaptability for staining to richer colours, are special advantages.



PROVIDING FUTURE SUPPLIES FOR THE PLYWOOD INDUSTRY.
Seventeen-year-old Kauri Pine Plantation, North Queensland.



Manufacturing Boxes from Hoop Pine Veneer in a Brisbane Factory.

Box Construction.

The great saving in timber in the use of thick rotary-cut veneers for box construction has only recently become fully appreciated in this State, and a very large business in the construction of Queensland Pine wire-bound butter and other boxes has already been worked up.

Messrs. D. G. Brims and Sons were the pioneers of this trade, production being commenced in April, 1931. A new company, known as the 4-One Box Company of Australia, now handles this work in conjunction with the parent plywood factory at Yeerongpilly. The output is absorbed by Queensland and other Australian States.

Messrs. Hancock and Gore, Limited, commenced the manufacture of wire-bound rotary-cut veneer boxes of Hoop Pine on a large scale in November, 1931, at their works at Ipswich road.

The Queensland export trade in butter alone requires over 1,250,000 boxes per annum, while the total normal butter consumption within the State requires a further 250,000 boxes.

Competition, Imports and Exports.

In addition to the factories in the Southern States, the chief competitors of the Queensland plywood manufacturers on the Australian market are the United States of America with Oregon and American Sugar Pine, Japan with Japanese Oak, with the Netherlands, Germany, and Baltic provinces with cheap Birch and Alder.

IMPORTS.—In recent years the percentage of plywood imports into Australia by sources of origin and average values have been:—

	1928-29.	1929-30.	1930-31.	1931-32.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
United States of America	42	40	14	·2
Japan	30	26	25	81
Netherlands	9	10	..	..
Russia	4	8	47	7
Canada	3	1	..	·3
France	2	2	..	..
Germany	2	7	2	..
China .. .. .	..	..	11	..
Other	8	6	1	11·5
Average value per 100 sq. ft. ..	30s. 10d.	29s. 2d.	16s. 10d.	13s. 11d.
Total Imports in millions of sq. ft.	11·1	10·6	1·3	·3

During the same period, plywood imported was absorbed by the Australian States in the following proportions:—

	1928-29.	1929-30.	1930-31.	1931-32.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
New South Wales	62	58	89	33
Victoria	28	33	8	53
Queensland	1	1	5	1
South Australia	3	4	..	11
West Australia	6	4	2	2
Tasmania .. .. .	..	..	5	..

With respect to veneers, the total quantity imported and percentages from various countries have been:—

	1928-29.	1929-30.	1930-31.	1931-32.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
United Kingdom	44	29	14	13
France	13	13	14	11
Germany	2	2	..	..
Italy .. .. .	..	11	..	..
Russia	3	..	..	..
United States of America	38	42	67	72
Other .. .. .	..	3	5	4
Total Value	£31,300	£22,400	£9,100	£12,040

Practically the whole of the veneers imported are taken by New South Wales and Victoria, the former State purchasing about two-thirds of the total. South Australia and Western Australia together buy only 2 to 3 per cent, while Queensland has not required any imported veneers during the past four years.

EXPORTS.—Plywoods and veneers exported overseas by Queensland to various countries from 1929 were as under:—

	1929-30.	1930-31.	1931-32.	1932-33 (6 Months.)
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
United Kingdom	100	58	21	90
New Zealand .. .. .	..	22	..	..
United States of America .. .. .	..	19	78	..
China .. .. .	..	..	1	8
Other .. .. .	..	1	..	2
Total Value	£432	£3,780	£8,493	£1,030

PLYWOOD SUBSTITUTES IN QUEENSLAND.

Information supplied by the State Advances Corporation through the courtesy of the former Under Secretary for Works (the late Mr. A. H. Smith) shows that prior to 1929 imported building boards were securing a strong place in the construction of Queensland homes, approximately one-third of which are built under the Corporation's supervision. Towards the end of 1929, however, the Corporation took special action to bring under the notice of its clients the particular values of Queensland Timbers, with the result that a number of very beautiful plywoods suitable for panelling were readily accepted.



From recent information received from the same source, it is learned that approximately 42 per cent. of dwellings recently erected by the Corporation in the metropolitan area have the vestibule and front room or dining-room panelled with plywoods, of which slice-cut Queensland Walnut and Silky Oak and rotary-cut Red Tulip Oak are the most popular.



Sliced Queensland Walnut Veneers being Shipped Overseas from Cairns.



Part II

Veneers and Plywood and their Manufacture in Queensland

In its search for logs suitable for veneer production, the plywood industry makes exacting demand of the forests.

For plywood purposes, the trees selected must yield large diameter, straight, cylindrical logs with as little taper as possible, sound throughout, and free from knots. In Hoop Pine, girths of 6 feet to 9 feet are most common, but the North Queensland cabinet timbers grow much larger, and girths 2 feet greater are demanded.

For rotary-cutting, logs should have a minimum girth of 48 inches at the small end.

When the logs are to be slice-veneered, sound boles of large size possessing figured wood are selected. Trees containing the best figured wood are judged by the age of the tree, shape of the bole, and the irregularity of the bark, which may show ruffle marks or other unusual markings related to the figured wood beneath.

Determination of figured wood in standing trees is difficult and often uncertain, the best grading being that which is done at the log ramp, where a 2-inch thick half section can be cut from the end of any log. Quartering or splitting this section in the radial plane with reference to the log will reveal immediately the presence of figured wood suitable for quarter-slicing.

For rotary-peeling, logs which show strongly-contrasting growth rings, as in Walnut, ring pores, as in Red Cedar, or concentric bands of soft tissue (wood parenchyma), as in Satin Sycamore, in addition to an eccentric heart, give the best figured plywood. These features are best seen in the dressed end sections.

After the trees are felled, barking and sawing into log lengths suitable for transport are carried out. In the case of Hoop Pine, the bark is removed in the forest, but all of the North Queensland veneer woods, including Maple Silkwood and Silky Oak, are left with the bark intact as a protection against insect attack and excessive drying. The ends of these logs are also protected by the application of crude petroleum jelly, applied hot in liquid form with a brush as soon as possible after the cross-cutting of the main trunk has exposed a fresh surface.

To facilitate handling, stumps when required are left on the lower or "butt" log until the railway or wharf is reached.

The loads taken by road wagons and lorries vary greatly according to the conditions of the roads, which are mainly dependent on the weather. After heavy rains the roads are often unfit for log traffic, and in North Queensland logging-operations are mostly suspended during the wet season.

Logging during the drier winter months of the year makes the danger of borer infestation almost negligible. Writing on "Pinhole Borers of the Walnut Bean" in North Queensland, Mr. J. Harold Smith, M.Sc., of the Entomological Branch of the Queensland Department of Agriculture and Stock, advised that logging should, if practicable, be completed during the winter months. All logs should be left with the bark intact as a protection against borer infestation, and be removed from the scrub and placed in the open as soon as possible after falling. Covering the log ends with some repellent substance to prevent end infestation was also recommended.

In Southern Queensland, the exposure of Hoop Pine logs during the hot humid weather during the wet months from December to March greatly increases the danger of infection by the blue staining fungus.

Plywood grade logs because of their quality command the highest prices, followed by Grades A, B, and C, commonly used for sawmilling purposes.

machine that the best figuring is secured. Veneers one-twenty-eighth of an inch in thickness, in widths from 6 to 18 inches, and in lengths up to 13 feet 6 inches, may be cut on this machine.

Half-Rotary Slicing.

Sliced veneers, showing the beautiful figuring due to quarter cutting, are obtained by Messrs. Austral Plywoods, Limited, Brisbane, by means of the half-rotary slicing process. Figured logs are first quartered on a vertical breaking-down saw, and the quarter segments are then fixed horizontally in the lathe, with the lathe logs securely fixed at the ends in a corner nearest the sapwood. The quarter log is then rotated eccentrically, and the veneer sheets are sliced from the heart toward the sapwood.

At each cut the knife thus exposes the true radial or quarter section of the log in the middle of the veneer sheet, diverting slightly from this at either edge. As in the case of rotary peeling, the cutting blade moves towards the lathe centres the thickness of the veneer required at each revolution, and the radius of the cutting circle is correspondingly decreased (see illustrations, page 26).

By this method, highly-figured veneers of Walnut, Maple Silkwood, and Silky Oak are secured for the manufacture of matched plywood panels. All veneers from the same flitch are kept together in order of cutting during subsequent drying to facilitate storing and matching.

Half-Round or Stay Log Process.

This method is commonly used in America for the cutting of stumps and crotches, which are sawn in halves and trimmed before being placed in the machine. By means of the eccentric motion of the stay log, to which the flitch is bolted in the lathe, rotary veneering can be carried out with a much greater cutting circle (see illustration, page 29). This allows veneers of greater widths than the radius of the flitch to be cut, while figuring of different types can be provided for by changing the method of attaching the flitch to the stay log. The much greater radius of the cut is a further advantage over the rotary slicing process.

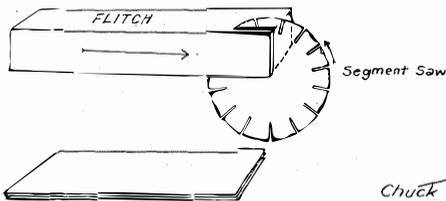
For logs such as Walnut, in which the most handsome figuring occurs on the radial section, "back cutting" gives the most pleasing striped effects. For woods which are more attractive on the tangential or back section, such as Red Tulip Oak, the true half-round process in which the heart side is bolted to the stay log and the cut more or less follows the growth rings, gives the best results.

With stumps, it is usually necessary to carefully study the nature of the figuring in the enlarged base before deciding upon the angle and location of the flat surface to be attached to the stay log.

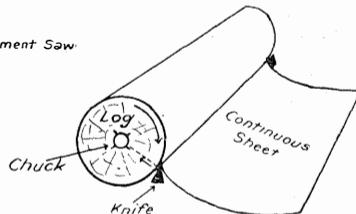
The surface to be bolted to the lathe must first be sawn parallel to the heart cut.

Crotches give the best figured veneers when "back cut" (see illustration, page 30).

Methods of Cutting Veneers Showing Movements of Timber and Cutting Blades



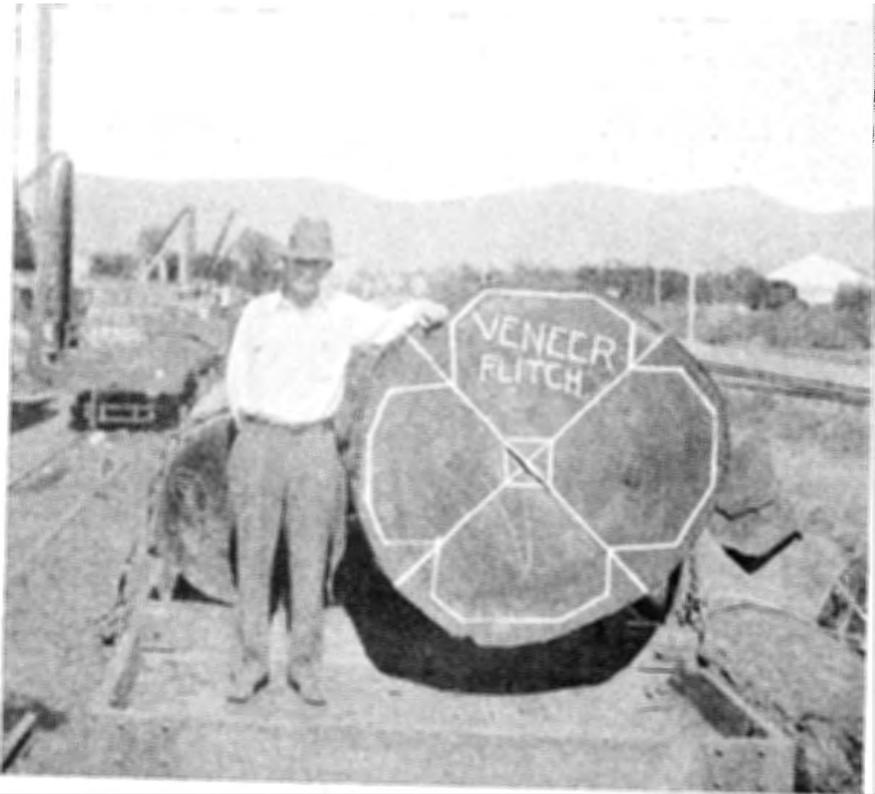
1. Veneer Sawing.



2. Rotary Peeling.



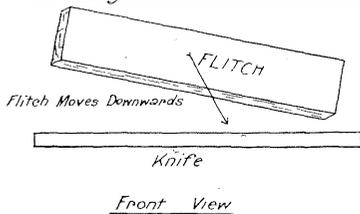
Rotary Lathe in Operation.



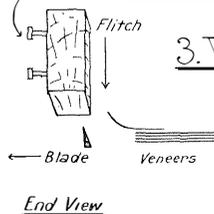
Queensland Walnut Log Marked for Sawing into Flitches for Quarter-slicing.

Methods of Cutting Veneers

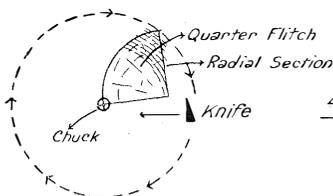
Showing Movements of Timber



Bolts to Frame and Cutting Blades



3. Vertical Slicing



4 Rotary Slicing

Advantages and Disadvantages of Cutting Methods.

The chief advantage of the use of the veneer saw is the absence of stresses in the veneer sheets during cutting. The wood fibres are simply called upon to support the actual weight of the sheets on edge, and are not distorted in any way. The use of the veneer saw is advisable for cutting highly-figured "burl" or "butt" veneers, which are largely cross-grained and liable to fracture if bent. The loss of timber in sawdust, which usually amounts to at least one-sixteenth of an inch for each veneer cut, and the thickness of the veneer which can rarely be cut under one-twentieth of an inch, are its great disadvantages.

Rotary peeling is of particular value for obtaining wide continuous lengths of thin veneer with little waste. In woods which lack toughness, the stresses due to the straightening of the veneer as it comes from the log tend to cause minute checking on the under side of the sheet. This is least troublesome when cutting thin veneers from large logs and the radius of the cutting circle is wide.

With veneers cut on a slicer, the only stress placed on the sheet is the slight bending away from the knife, which, except in the case of very cross-grained wood, has no injurious effect. Slicing enables any section of the wood to be veneered in consecutive planes for the full width of the flitch, so that the best possible figure can be secured. Rotary peeling allows only the "back cut" figure to be shown, which is unattractive in some woods. The slicer allows a much greater number of similar veneers per inch to be cut than in the case of the veneer saw, and is thus much more economical in valuable wood.

Veneers cut from as close as one-thirtieth of an inch apart show identical figuring which allows of perfect matching. This is impossible with veneers cut some distance apart.

CUTTING FOR FIGURE.

The selection and cutting of timber to obtain the best figured veneers is an art in which the degree of success attained by the craftsman depends upon his knowledge of the structure of the woods used.

In Queensland veneer woods the chief features from which figured wood result are—

- (1) **UNDULATING OR INTERLOCKED FIBRES**, with corresponding diversion of the vessels or pores, as in Maple, Silkwood, and Satinay. This undulation or interlocking of the fibres is almost always most obvious on the radial or quarter section.
- (2) **PROMINENT GROWTH RINGS**, due either to sharp variations of the depth of colour as in Walnut and Tulip Plum or large pores in concentric rings on the cross section as in Red Cedar.

- (3) **LARGE MEDULLARY RAYS** radiating from the log centre towards the bark as in Silky Oak, and to a lesser extent Red Tulip Oak and White Hazelwood.
- (4) **SOFT TISSUE OR WOOD PARENCHYMA**, showing in well-defined concentric bands on the end section as in Red Tulip and Satin Sycamore, or surrounding the pores singly or in groups as seen in Black Bean and Red Siris. (See illustrations, Sketches 1 to 4, page 28.)

Some timbers show more than one of these features, and it is then necessary to decide which gives the most desirable figure. Before cutting veneers from any timber for the first time, it is a good plan to cut a 3-inch thick section from the end of a log and dress the cross-section with a plane. This will show the presence of prominent growth rings, large rays, or well-defined soft tissue. The block is then split across the centre, which exposes the quarter or radial section. When dressed, the size and effect of the rays can be seen. Lastly, the block is "backed off" or split at right angles to the radial section, and again dressed to compare it with the quartered face.

The "backed off" or tangential section corresponds with that obtained in veneer by rotary peeling, while the quarter or radial section may be obtained by quarter-slicing. Veneers cut to show all sections from the radial to the tangential sections can be secured by the use of a slicer or semi-rotary machine by cutting and inserting the flitches to suit. In the latter case the true radial section is obtained only at one portion of the veneer, slight diversion from this taking place at either side. In quarter-slicing woods with large rays such as Silky Oak, the rays run as parallel bars right across the sheet.

Among Queensland veneer woods, the best figure is obtained by rotary peeling the Pines, Red Tulip Oak, Satin Sycamore, Silver Ash, Rose Walnut, Black Bean, Rose Alder, and Red and Tulip Cedar, while quarter slicing gives the best effect in Queensland Walnut, Maple Silkwood, Satinay, Silky Oak, and White Hazelwood.

Sound bumps or eccentric growth improves the figure in the rotary process. Peeling logs with the ends slightly off centre in the lathe also exaggerates the natural figuring, but increases the waste in narrow width veneers.

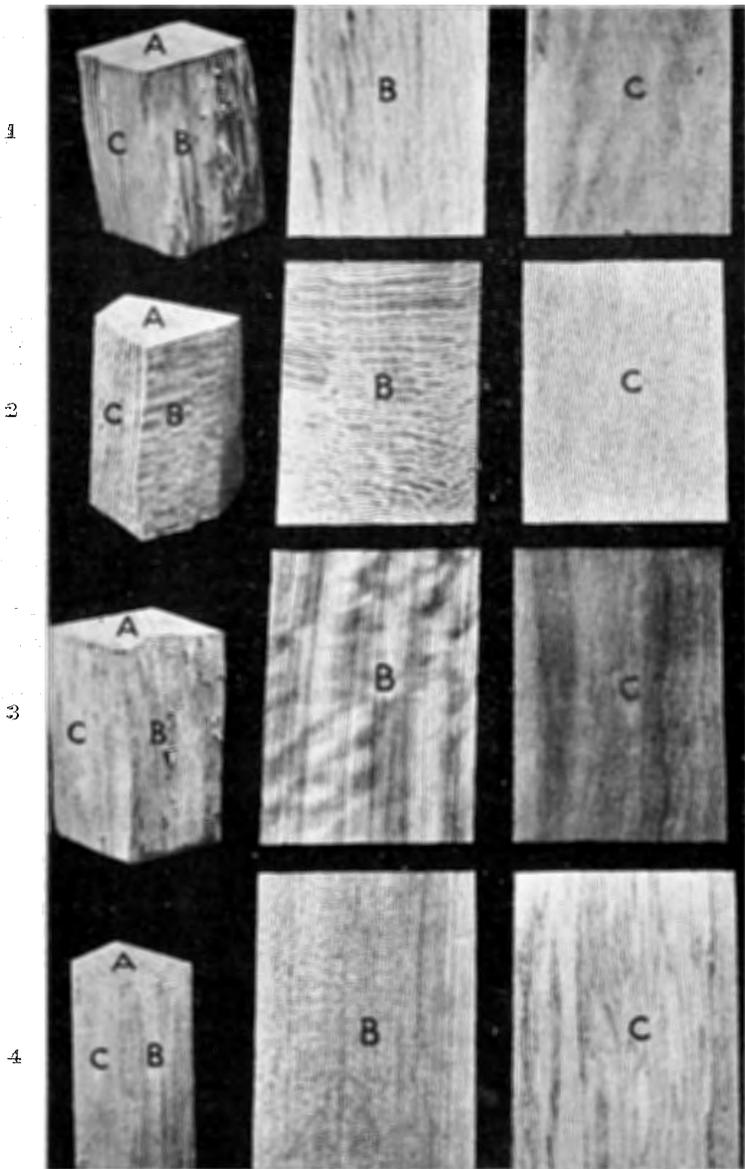
Veneers leaving the cutting machines are carried on conveyor chains or trucks to the guillotine, where they are trimmed to usable widths. Sound rotary-peeled veneers are usually cut into sheets for 6 feet by 3 feet standard face and back veneers, while smaller narrower widths are cut into 3-foot lengths for cores or cross banding as required.

Small waste pieces find their way into strawberry trays or are used to raise steam.

The trimmed pieces are next taken to the air-seasoning racks or to kilns for drying before being glued together to form plywood.



Veneer-slicer in Operation, Cairns, North Queensland.



1. *Queensland Satinay*—
 - A. *Cross Section*—Rays invisible; *Growth Rings* indistinct.
 - B. *Radial Section*—Rays not prominent; Figure due to interlocked *Fibres*.
 - C. *Tangential Section*—Figure not prominent.
2. *Silky Oak*—
 - A. *Cross Section*—Rays large; *Growth Rings* visible.
 - B. *Radial Section*—Figure due to sides of large *Rays*.
 - C. *Tangential Section*—Mottling due to *Ray* ends.
3. *Queensland Walnut*—
 - A. *Cross Section*—Rays invisible; *Growth Rings* prominent.
 - B. *Radial Section*—Striped figure due to prominent *Growth Rings* and waves to interlocked *Fibres*.
 - C. *Tangential Section*—Figure due to *Growth Rings*.
4. *Red Tulip Oak*—
 - A. *Cross Section*—Rays indistinct; *Growth Rings* prominent.
 - B. *Radial Section*—Mottled "Silver" Grain due to exposure of sides of *Rays*.
 - C. *Tangential Section*—Figure due to prominent concentric *Soft Tissue Bands*.

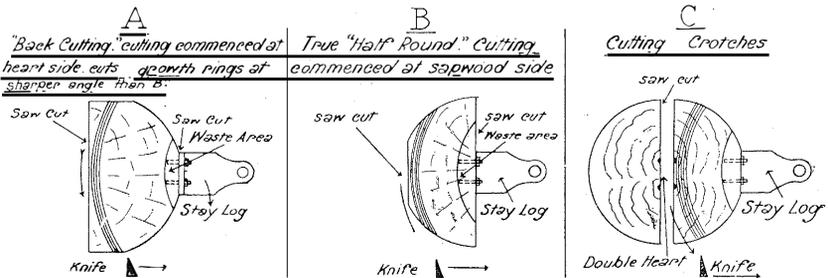


Queensland Walnut and Maple Stumps for Shipment Overseas.

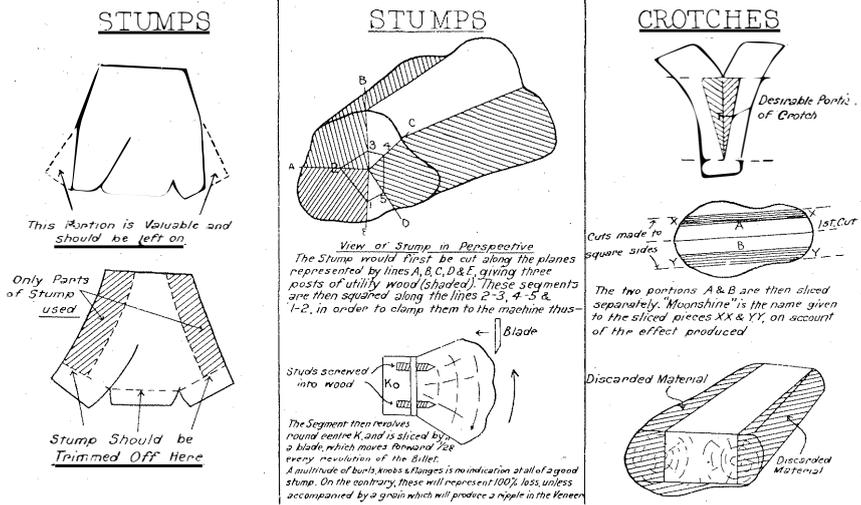


5 Stay Log or Half Round Slicing of Stumps & Crotches

Veneers are cut in the same manner as in Rotary Cutting, but the much larger diameter of the cut gives a better figure for woods in which the growth rings are prominent, by crossing instead of following them.



METHOD OF VENEERING STUMPS AND CROTCHES.



Drying of Veneer.

In Queensland some veneers are dried in covered racks in the drying-yards, where a good air circulation is available. Under good drying conditions, two to three days' air drying are allowed for veneers under $\frac{1}{8}$ in. in thickness before finishing off in the kiln. Several manufacturers have installed steam-heated kilns to replace or supplement the air-seasoning racks and speed up drying during unfavourable weather (see illustrations, pages 31 and 32).

Roller conveyor driers are very efficient in the drying of wide sheets of face veneers. These are fed in at one end and are conveyed by the rollers or chains through varying degrees of temperature until the final state of dryness is obtained. The rollers conduct the heat by direct contact to the surfaces of the veneer, and also press the sheets flat in the drying process. In some designs hot plates are used to apply heat and press out the veneers. Heating-pipes close to the veneers give high temperatures for rapid drying. Within the kiln fans are used to circulate the air and discharge excess moisture.

Veneer kilns employing conditioned air are mostly of the progressive tunnel type, in which the veneers are stripped on trucks and moved progressively from the cool to the warm end of the kiln. Maximum temperatures from 80 to 140 deg. F. are usually employed. The air is heated by steam coils and forced through the veneers from end to end of the tunnel by a large fan.

Veneers are usually dried to a final moisture content of 4 to 6 per cent. in from two to four hours, according to thickness.

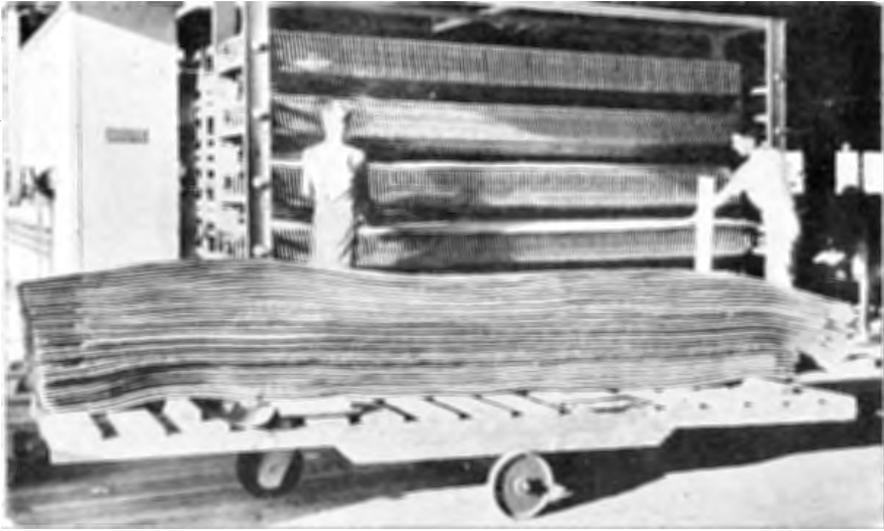
High-Grade Veneers.

DRYING.—For the drying of valuable sliced veneers, amply ventilated drying-rooms are employed, in which a warm and moderately humid atmosphere is maintained. Temperatures ranging from 90 deg. to 100 deg. F., with relative humidities from 60 per cent. to 70 per cent., have been found to give good results without too great discomfort to the workmen. Low humidities result in warped veneers.

From the slicer, the veneers varying in width from 6 to 12 inches and upward are kept in bundles, corresponding to each flitch cut, and numbered and laid consecutively. The racks consist of vertical "fingers," between which two to three veneers are placed on edge.

A reduction in moisture content to 10 to 15 per cent. is sufficient to prevent mould growth, without being dry enough to be brittle.

Most veneers are dried to a final moisture content of 6 to 7 per cent. before gluing, but this state of dryness renders highly-figured butt or crotch veneers rather brittle. To prevent fracture during pressing, these are often worked at a moisture content of 12 per cent.



Veneer Drying Kiln in Operation, Cairns, North Queensland.

Sampling and Storage.

If not required immediately for gluing, the dried veneers are removed from the racks and graded and measured before being replaced in sequence in their respective bundles, which are then marked with the flitch and log number and total superficial area of veneer.

Sample veneers are taken from the top, centre, and bottom of each bundle for the inspection of buyers, and the remainder are then stored pending sale or manufacture.

Veneers of figured woods, often in narrow widths from 6 to 12 inches, because of their greater value, are usually dried and stored separately after drying in a special department where they are graded, matched for figuring, and jointed together into full-size sheets by means of adhesive paper ribbons. This process is known as taping.

The veneers are selected as to the size and quality to form face, back, or centre plies, and trimmed to the size required, allowing approximately 1 inch greater in length and width than the final size of the sheet required.

Glueing.

Glue is applied by means of rapidly revolving rollers to one side of the face and back veneers and both sides of the central veneer or veneers. Each successive sheet, after having glue applied, is laid with the grain at right angles to the sheet under it, face and back veneers having the grain parallel. In this way plywoods of from $\frac{3}{8}$ inch to thirteen-sixteenths of an inch in thickness are built up, using from three to seven plies of veneer. Sheets of all sizes from 6 feet by 3 feet to 8 feet by 4 feet are made (see illustrations, page 34).

The plywood sheets are then placed in the press in batches and subjected to pressures of 80 to 200 pounds per square inch of surface area, according to the glue used. The presses are mostly hydraulic, and are capable of exerting a total load of about 150 tons over an area of about 20 square feet. So that the press can be operated for the next batch, the pressure exerted on the sheets is taken up by a number of screw retainer clamps between steel "I" beams, the press is then released and the batch is taken out and placed on one side to allow the glue to set (see illustration, page 33). Six hours is regarded as the minimum time required.

After release from the portable retainer presses, the plywood sheets are conveyed on trucks to open sheds, where they are stacked with wooden strips between each sheet for drying.

The glues used in Queensland consist principally of moisture-resistant casein types, and are specially made at the factories in a room situated above the plywood glueing-room. Different manufacturers prefer slightly varying formulæ.



Drying Veneers in Steam-heated Kiln.

Matching.

The art of jointing veneers of figured woods to give the most pleasing symmetrical patterns in figuring is known as matching.

If sheets of figured veneer are taken at random, cut to sizes required, and jointed to form faces for larger panels, the result is unattractive in appearance because of unbalanced designs. Matching places similar patterns in figuring together to form larger balanced patterns. This is only possible because of the exact similarity in figuring in successive thin veneers cut from figured flitches.

This work is carried out by expert craftsmen whose first consideration for the best panels is the choice of suitable figured veneers, and the manner in which these can be cut and brought together to produce the most artistic results.

Figured veneers are stored in bundles in the exact sequence of cutting, all the sheets from one flitch being kept together. From these, it is then possible to manufacture a number of matched panels showing similar figuring. The most beautiful effects are obtained from butt, stump, and crotch veneers. An excellent example of this work in Queensland Maple is to be seen in the swing doors of the headquarters of the National Society of Operative Printers and Assistants, London, shown in illustration, page 33). Veneers with striped figuring as in Queensland Walnut are used for matching to obtain geometrical designs. The faces of matched panels usually consist of two or four pieces of similarly figured veneer taken from adjacent situations in the same bundle. When the best method of matching has been decided upon, these are cut to rectangular shapes of suitable size to make up the panels. Cutting is done by means of a guillotine, and great care is taken to secure neat joints at corners.

Once the match is decided upon, any number of similar veneers from four to sixteen may be cut together.

During cutting the top and bottom veneers are protected against tearing by means of a sheet of cardboard or low-grade veneer.

In two-piece centre matching, one of the two adjacent veneers is turned over to one side and placed edge to edge with its neighbour, so that the meeting sides will be in the centre of the panel. This gives a symmetrical effect.

If two more pieces of similar pattern are placed in the same way above the first pair and then turned over endways on the bottom edge and butted against the first pair, top edge to bottom edge, a complete balanced matching of the four pieces will be secured. This is known as four-piece matching.

When the four veneers have been correctly fitted they are taped together to form the face veneer for a panel.

To obtain the best effects in long panels, with veneers showing striped figuring, as in quarter-sliced Walnut, Maple Silkwood, and Silky Oak, it is usual to joint separately two pairs of veneers, and place one pair over the other, as described above, and then turn the top sheet over on its edge and joint along the meeting sides, which are thus in the centre of the panel. Four strips, each finishing 9 inches in width and 6 feet long, thus form a standard 6 feet by 3 feet sheet with three joints, suitable for wall-panelling.

If the striped or ripple figuring runs across the strips more or less diagonally, the result will be what is termed a "herringbone" matching. Veneers of Queensland Satinay are particularly suited for this work when quarter-sliced.

Four-piece matched panels of stump and crotch veneers are very popular for use in furniture, pianos, and for the highest grades of wall-panelling.

Construction.

The commonest form of 3-ply three-sixteenths of an inch in thickness, may be constructed with the face and back balanced in sheets of veneer three-sixty-fourths of an inch in thickness, with a three-thirty-seconds of an inch thick core laid with the grain at right angles to the faces.

Plywood $\frac{1}{4}$ inch thick usually has a core $\frac{1}{8}$ inch thick, with a face and back one-sixteenth of an inch thick. Some makers prefer to make all these plies of the same thickness.



The Glueing-Process. Glue-spreader and Hydraulic Press in Operation.

In 5-ply the face and back are made one-sixteenth of an inch thick, with cross bands laid at right angles of the same thickness and glued to the core, the grain of which is parallel to the face. In the best work the cross band under the face is laid in one piece, while the back is commonly pieced. Plain timber of the same species as the faces are used for cross-banding. In all cases the faces and crossings must be equal to the backs and crossings in thickness and strength.

Cores may be of solid wood or of 3-ply, making seven plies in all.

Plywood panels $\frac{5}{8}$ inch thick may consist of two faces and cross bands each one-sixteenth of an inch thick, glued to a core of three $\frac{1}{8}$ -inch plies or solid timber.

Solid Cores.

When plywoods are manufactured with solid timber cores, it is usual to confine these to one species of timber in any one core to avoid uneven stresses. Hoop Pine is preferred for this work in Queensland. The core is usually made from narrow boards not exceeding 4 inches in width of the desired thickness, edge jointed to form the required dimensions of the panel before the face and back veneers and cross-bandings are glued in the press.

It is essential to have all the component pieces dried to a uniformly low moisture content when glued.



Hoop Pine Logs at Plywood Factory.

Drying of Plywood.

The drying-sheds for glued-up plywood are constructed to maintain efficient air ventilation with warm temperatures and moderately high humidities.

Panels of valuable cabinet-woods and Hoop Pine panels, $\frac{3}{8}$ inch thick and upward, on leaving the drying-rooms are usually put through a drying-roller for two to three days, according to thickness, to ensure thorough dryness.

Together with thinner plain plywoods from the drying-rooms, these panels are then cut to the required sheet size between parallel circular saws, and afterwards sanded smooth on one or both sides as required, ready for packing for despatch. Sanding machines consist of a number of rollers, around which emery sheets in three grades of coarseness are fastened, rotating at high speed in a massive frame. The plywood sheets passing through these rollers become progressively smoother as the coarseness of the sanding rollers diminishes. Modern machines are capable of sanding 200 to 250 sheets per hour.



Manufactured Plywood Bundled for Despatch.

Part III

The Utilisation of Veneers and Plywood

Throughout the world the use of veneers and plywood has increased enormously during the past two decades, and many fields have been discovered where these valuable products can be used to advantage. In Australia, the popularity of plywood has made great strides since 1915, and is daily increasing.

Although now well known in all the Australian States, plywood and veneer have far from reached their maximum utilisation in Australian industry in the fields of both plain and figured timber.

There are still some who are prejudiced against plywood construction. These advocate the use of "solid wood" through lack of knowledge of the properties of plywood, but the evidence of every day successful use of plywood is rapidly dispelling any doubts as to its value. Correctly manufactured, and its essential values properly understood and applied, there is no doubt that the use of plywood will be greatly extended.

Advantages of Plywood Construction.

This superiority may be summarised in the following facts:—

- (1) **STRENGTH.**—Plywood panels made from a number of veneers glued at right angles to each other are stiffer and tougher than solid boards of the same thickness. Wood is about twenty times stronger along the grain than it is across the grain, and the crossing of the grain in adjacent veneers in plywood gives to this its superior toughness.
- (2) **RELIABILITY.**—The balanced construction of plywood panels equalises the stresses in the panel and prevents warping due to unbalanced internal stresses in solid work. In solid panels the movement across the grain is appreciable, but in plywood adjacent plies with grain at right angles pull against each other and prevent movement.
- (3) **ECONOMY IN FIGURED WOOD.**—The cutting of thin veneers for face plies is more economical in the use of figured wood, allowing the whole of this to be used for decorative purposes, while cheaper material can be used for the unseen interior veneers.
- (4) **USE OF CROSS-GRAINED WOOD.**—Without support, thin solid panels of highly-figured cross-grained wood are too weak for satisfactory service. Plywood construction makes possible the use of the most highly-figured and fragile wood in the thinnest veneers, with ample strength in the panels.
- (5) **MATCHING OF FIGURE.**—Thin veneers cut consecutively from figured timber show identical figuring, and allow the perfect matching of face veneers in decorative plywood panels. This is impossible with solid timber.
- (6) **CURVED SURFACES.**—Curved surfaces, showing figured wood, may be built up by the use of veneers glued together and pressed into forms of the shape required.

USES OF PLYWOOD.

Wall Panelling.

BUILDING PURPOSES.—In Queensland more plywood is used in the building trade than in any other industry. In modern residences plywood is extensively used for wall-panellings. For the best rooms figured plywood panellings of high-grade cabinet timbers are preferred. At the present time rotary-cut Red Tulip Oak and Silky Oak and sliced Silky Oak, Queensland Walnut, and Maple Silkwood are most popular. With the exception of Silky Oak, which gives better effects when lightly stained, wall-panellings are usually finished in natural colours by oiling with raw linseed oil to bring up the figure, followed by wax or french polishing.

To obtain the most pleasing appearance, moulded cover strips of figured cabinet-woods, such as Satinay, Red Tulip Oak, and Silky Oak are commonly used, with panels 18 to 24 inches in width. Skirting boards and art rails are made of the same woods to match. Stained Hoop Pine cover strips are sometimes used.

In panelling with plywood, standard 3-ply sheets three-sixteenths of an inch thick, 6 feet long and 3 feet wide, are most popular, the sheets being placed on end along the wall, and divided by cover strips at the side joints, or in addition down the



Plywood Panelling of Red Tulip Oak in a Brisbane Residence,

centre as desired. The panelling is surmounted by an art or china rail, above which 3-foot wide sheets of plain plywood may be used in the frieze to reach to the cornice mould against the ceiling. With the various mouldings used, this completes the standard wall height of 10 feet 6 inches. A typical panelled room is shown in illustration, page 36.

When walls are papered, plain plywoods may be used as a base for the paper, while low-grade plywood is used as a base for texture work for interior decoration.

Through the courtesy of the Manager of the State Advances Corporation, the following report compiled by the Interviewing Draftsman with reference to the quantity of plywood used in Workers' Dwellings, has been made available. The State Advances Corporation controls the building of approximately one-third of the houses built in Queensland, and the figures clearly demonstrate the present increasing popularity of plywood:—

“The following shows the classes of plywoods and percentage of each specified to be used as panelling in Workers' Dwellings in the Greater Brisbane area during the year 1932, and during January and February of 1933:—

	Per cent.
Sliced Silky Oak	41
Rotary Red Tulip Oak	38
Rotary Silky Oak	9
Rotary Walnut	5
Rotary Pine	4
Sliced Maple	2
Sliced Walnut	1
	—
	100

“A factor of considerable interest to the timber trade and a direct result of the using of plywoods of various designations is the utilisation of similar timbers as cover strips and rails to form the plywood into a panelled effect. Furthermore, in many cases the whole of the joinery—doors, archways, &c.—also the mouldings of the panelled rooms are of identical timbers, or of such timbers as may be in harmony with the plywood used. This is an outcome of the desire to match the walls with the furniture, which is intended to be of a distinctive or period type.

“In panelled rooms it also is the custom to have the floors laid with special hardwoods in keeping with the panelling.

“These floors are brought up to a high degree of finish by various processes of polishing.

“It will be of interest to the manufacturers of plywood to know that 56 per cent. of Workers' Dwellings clients in the Greater Brisbane area during the year 1932 elected to have one or more rooms of their dwelling finished in panelling or plaster work, as illustrated in the following table.

“This shows that 44 per cent. of the clients were satisfied to have the linings and partitions of all their rooms sheeted merely with T.G. and V.J. pine.

“The following table sets out the various methods used for the finishings of rooms in the dwellings referred to above:—

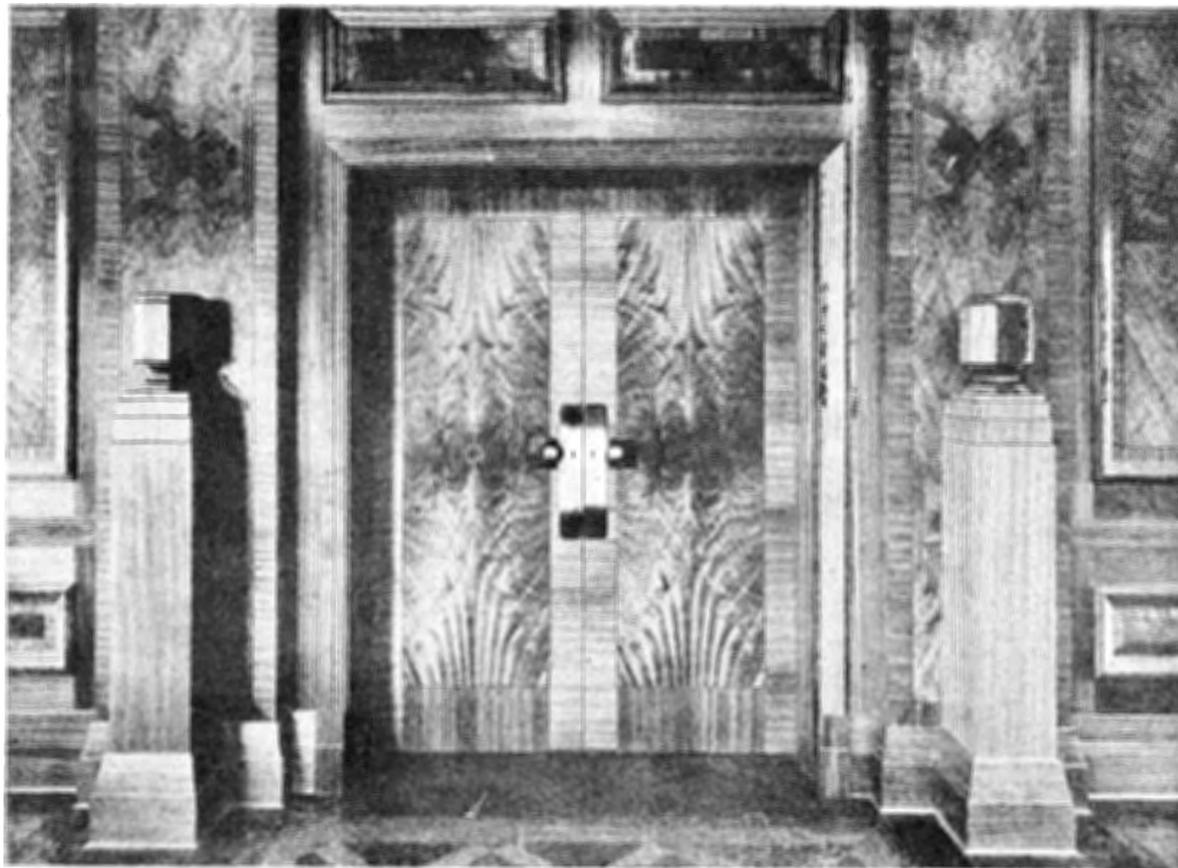
(a) PLYWOOD panelling in one or more rooms in conjunction with fibrous plaster	64
(b) PLYWOOD panelling in one or more rooms in conjunction with fibro cement and V. Jointed Pine	17
(c) Panelling of fibro cement to all rooms	6
(d) FIBROUS PLASTER linings and partitions to all rooms	20
(e) T. and G. and V.J. Pine linings and partitions to all rooms	84

Total houses erected in the Greater Brisbane area (1932) 191

“FUTURE USE.—It is indicated from the foregoing that plywood will become increasingly in favour, particularly so when the present world depression has lifted.

“With more favourable economic conditions prevailing more young people will build their own homes and use a greater proportion of plywoods, especially those of the more beautifully figured varieties.”

The Corporation advises that not one house mentioned above contained plywood used in ceilings, and only twelve contained tongued and grooved and V-jointed Hoop Pine boards for this purpose. The remaining houses were ceiled with fibro cement, and, to a lesser extent, fibrous plaster, with ten-test in one instance.



DOOR AND WALL PANELLING OF FIGURED QUEENSLAND MAPLE.
Entrance to Board Room of the National Society of Operative Printers and Assistants, London, England.
[Photo. by courtesy Betty Joel, Limited, London.]

The Interviewing Draftsman further advises—

“There is a perceptible tendency at the present time to reintroduce the arranging of interior walls into three divisions, a style which was in vogue in the early days of Queensland.

“This consisted of the dado, the panel, and the frieze. The dado was approximately 3 feet high, above which was the panel which terminated at a point about 18 inches from the ceiling.

“If this style again comes into favour, the quantity of plywood used will be increased by a further 25 per cent.”

Ceilings.

Architects state that plywood has not always given the best results in ceilings, particularly in very hot, dry districts.

Manufacturers claim that if it is desired to take advantage of the handsome figure afforded by plywoods for ceiling decoration by using only first-grade plywood and suitably protecting this on the roof side by means of oiling or painting, and by the provision of efficient air circulation above the ceiling, excellent results will be secured. It is essential that both sides of plywood sheets be subjected to similar conditions to avoid uneven stresses and consequent warping in service.

Considering the present reduced incomes of workers, it is encouraging to see the large percentage of home builders who at the time of building have taken advantage of available figured Queensland plywoods to improve the appearance of the interiors of their homes. No doubt more houses already erected will be improved by the addition of plywood panelling when circumstances permit, and the quality of the materials become better known.

Plywood is also largely used for internal door panels and for cupboards and shelving.

In addition to houses, plywood is used extensively in shop and office fittings, for counter fronts, window display racks, partitions, shelving, showcases, and sides of filing cabinets. Hoop Pine 3-ply is often utilised for garage linings.

As panelling, figured plywood is extensively used for wall-panelling of public buildings, both in Australia and abroad. Illustrations, pages 2, 38, and 42, show the use of figured panellings of Queensland Maple, Walnut, and Silky Oak in London buildings.

In Western Queensland, in areas where timber is scarce and transport costs high, station homesteads and outbuildings are constructed largely of galvanised iron. Many of the buildings are unceiled and unlined, and these become almost unbearably hot during the summer months. The greater use of plywood, which is cheap and inexpensive to transport, would do much to alleviate these conditions.

Furniture.

Very large quantities of plywood and veneer are used in the manufacture of furniture. High-class figured veneers of timbers, such as Walnut Bean and Black Bean, are employed for overlaying solid construction in cheaper woods to give an attractive finish to “art moderne” types. The finest crotch and butt veneers are used on drawer fronts and table tops.

Three-plywood of Hoop Pine is largely used for the backing of mirrors and wardrobes, medicine cabinets, drawer bottoms, chair backs, and seats. It is preferred for templets, and is occasionally used for shelving.

Built-up panels in 5 or 7 ply, usually thirteen-sixteenths inches in thickness, with face veneers of highly-figured sliced Walnut, Maple Silkwood, and Black Bean, have become popular in Queensland in recent years for wardrobe and lough-boy doors and ends, drawer fronts, bedstead ends, sideboard tops and doors, and the tops of dining and card tables.

Similar beautiful panels are used for sewing machine tops, wireless cabinets, and piano cases. Where 5-ply is used, the core is usually constructed of solid timber as a base to which the cross-bandings and face veneers are glued.

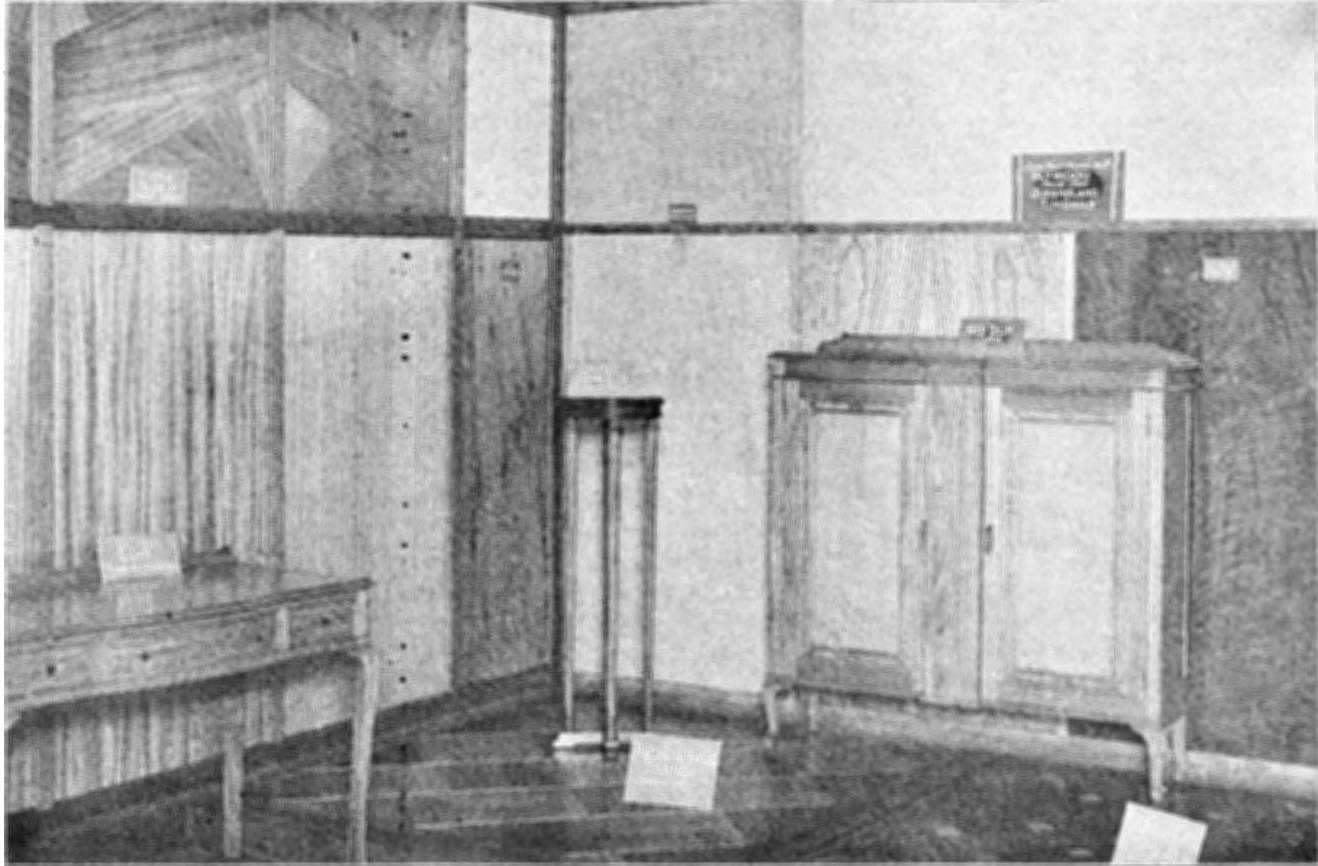
Coachwork.

Plywood panels now play an important part in the coach-building industry, where they give excellent service for the interior decoration of railway coaches, tramcars, and motor-buses.

The American journal *Veneers* for August, 1929, gives a photograph of a de luxe car on the famous European passenger train “Golden Arrow” panelled with Queensland Walnut, which was then sold abroad as “Oriental Walnut.”

This train carries tourists from Calais to Paris, on the London-Paris route. The carriages were built in England.

In the construction of motor-cars, plywood is extensively used for the bases of seats, and occasionally for instrument panels and flooring.



A Corner of the Forest Products Showrooms, George street, Brisbane, showing Queensland Plywood Panellings,

Battery Separators.

Specially treated veneers of Queensland Pine, one-twelfth of an inch in thickness, are now largely used for the separators of car batteries. For this work, the finest soft, even-textured timber, free from resins, is necessary to obtain good results. Quarter-sliced veneers are preferred, as these are less liable to become surface-checked during cutting.

Hoop Pine separators have given excellent results over several years in large storage batteries in Brisbane.

The manufacture of battery separators in Australia has now assumed considerable proportions, and shows every indication of entirely eliminating the imported separators. One Brisbane firm is manufacturing large numbers of separators from local veneers.

Boat Building.

Plywood panelling is now an accepted medium for the furnishing and fittings of the saloons of Queensland yachts and pleasure launches. Plywood constructed with waterproof glues is also used for the construction of racing boats propelled by outboard motors.

In overseas countries, plywood plays an important part in the furnishing of luxury passenger liners. The two largest all-American passenger liners ever built in the United States, the "President Hoover" and "President Coolidge," each 23,000 tons, are finished with plywood.

Box Manufacture.

Both veneer and plywood are now extensively used in the manufacture of boxes and cases in this State.

The greatest production is in the form of butter-boxes, which are constructed both of veneered wood and 3-ply. The annual requirements of the Queensland butter trade is approximately 1,500,000 56-lb. boxes. These are now constructed principally of veneered timber, both band-sawn and rotary-peeled, and strengthened by wire bindings. Hoop and Kauri Pine are the timbers used, and the modern machines used for stapling the box sides to the wire bindings are capable of producing 2,000 butter-boxes in eight hours.

Other boxes manufactured are used for containers for fruit and other produce. Thin pine veneers are bent and stapled to make strawberry trays.

Concrete Forms.

Plywood concrete forms are steadily gaining popularity with engineers and builders in America.

The following extracts are taken from *The Timberman* for July, 1931:—

"By lining forms with plywood, smooth surfaces are given to concrete walls, thus doing away with the necessity of rubbing surfaces smooth. Thus plywood, such as $\frac{1}{4}$ inch, serves satisfactorily as a liner for ordinary forms, or $\frac{3}{4}$ -inch plywood may be used with only the usual 4-inch by 2-inch bracing. Plywood used for form work should be coated with oil on both sides, and a coating of emulsified asphalt applied to the edges.

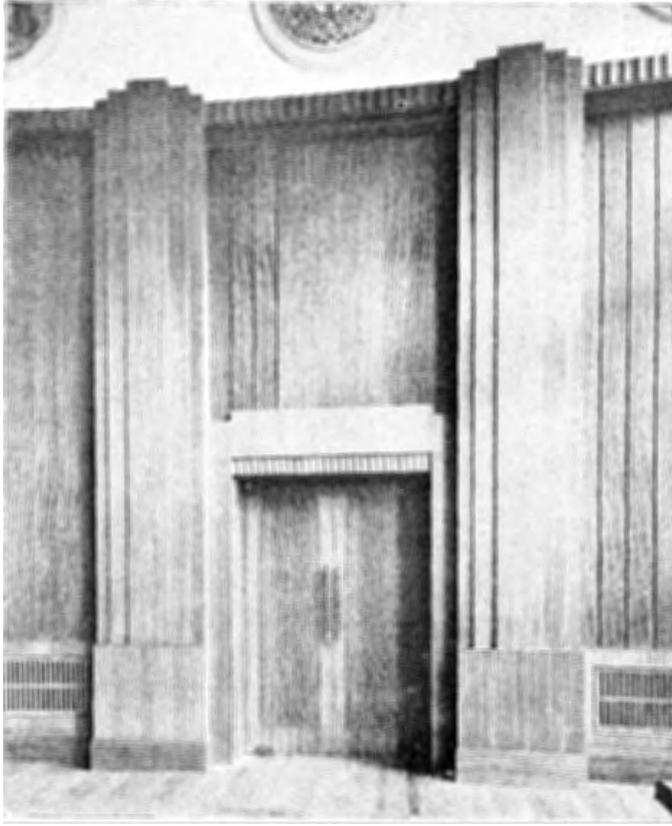
"Many builders have found it expedient to build standard forms of plywood where a number of walls of the same height, as for basements, are to be constructed, and to move these for forms in sections. Where forms are to be taken apart, if care is used in handling the material, the plywood can be used again and again.

"Curved surfaces and rounded corners in concrete can be formed by bending the flexible sheets of plywood to the proper shape. The expense of this material is only a fraction of the cost of sheet metal for this purpose."

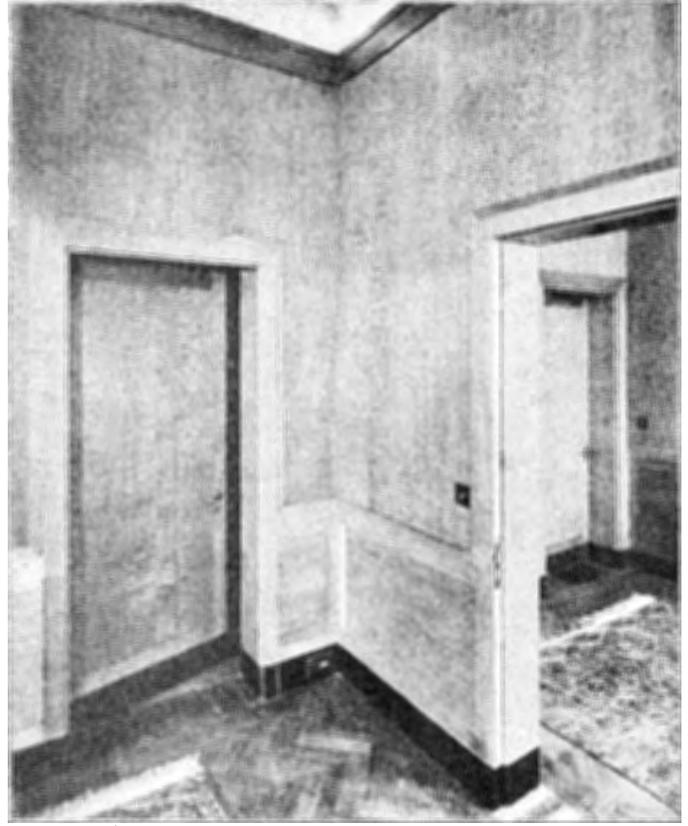
There is no reason why Hoop Pine plywood panels should not be used for similar work in Australia, with equally satisfactory results.

Aircraft Construction.

The combination of the properties of lightness and extreme toughness has earned for plywood its present popularity for the construction of aircraft. Panels formed from a number of thin veneers of a naturally tough wood, such as Queensland Maple, firmly glued together with the grain crossed, are capable of withstanding enormous stresses, both in tension and compression. Such panels containing as many as thirteen plies are used for the sheeting and webbing of the fuselage, wing sheeting, and for instrument panels and cabin furniture. Plywood is also used for the construction of the hulls and floats of seaplanes. The first aeroplane to fly in Brisbane—a tiny monoplane equipped with a 9-horse power engine—had its body and wings sheeted with millimetre thick 3-ply of rotary-peeled Queensland Maple.



Figured Queensland Walnut Panelling in Board Room of
Co-operative Wholesale Society, Ltd. (London).



Silky Oak Panelling in Coutt's Bank, London, England.
[Photos. by courtesy Betty Joel, Limited, London.]



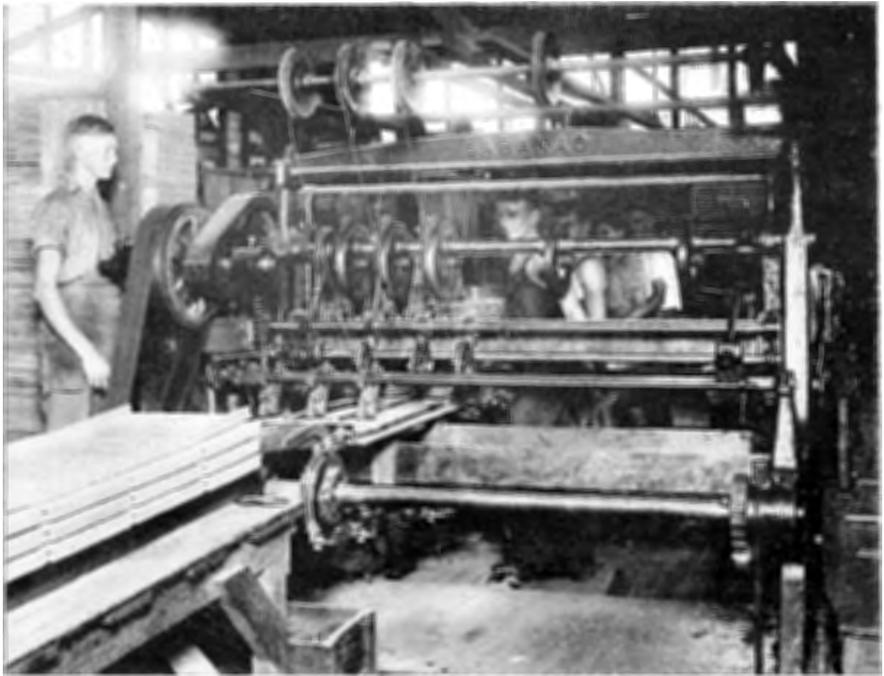
For aircraft work, the best quality straight-grained timber must be used, in combination with the strongest and most durable waterproof glues. Queensland Maple was the first Australian timber accepted by the Air Board for the construction of laminated aeroplane propellers.

Aircraft plywoods are built to very rigid specifications with regard to the veneer construction and cements used, and are subjected to very severe tests for strength and moisture resistance.

Miscellaneous Uses.

Other veneer and plywood uses in Queensland include camping outfits, tables, seats, &c., toys, travelling cases, drawing boards, model-making, ping pong bats and tables, tea trays, and ice cream spoons.

A Melbourne firm has found that Hoop Pine is suitable in every way for the manufacture of match-boxes, and large timber supplies are being used. Figure veneers are used for novelties, such as ladies' fans and for inlaid trinket-boxes.



Veneer Butter-Boxes leaving Wire-Binding and Stapling Machine.

Protection of Plywood.

For all purposes where plywood is used, to obtain the best results, it is desirable to protect both sides of the panels against the effects of changes in atmospheric conditions.

Wood is hygroscopic, swelling and shrinking as its moisture content rises and falls with changes in the humidity of the surrounding air. For this reason, the surfaces of good furniture and panelling should be protected by some protective finish, such as french polish, varnish, lacquer, or paint. It is most important that both sides should be equally protected to prevent unbalanced absorption with consequent warping. In new buildings, care must be taken to suitably protect the back and edges of wall panels against any possibility of moisture absorption. With plywood panels all raw edges must be similarly protected, taking particular care to fill all the pores where end grain is exposed. In room panelling where one side is hidden, the unseen side may be treated with a pitch paint or several coatings of crude petroleum oil.

The following check list of plywood uses in America which appeared in *The Timberman* for December, 1931, gives some idea of the importance of this product in industry.

Plywood is already used for most of these purposes in Queensland:—

Artists' boards	Incubators
Auto body parts	Insulation
Auto camp kits	Kitchen cabinets
Bins	Laboratory table tops
Book shelves	Lockers
Booth panelling	Machinery shelters
Boxes	Magazine racks
Bank vault linings	Map backs
Barrels	Medicine cabinets
Beehives	Millwork
Benches	Mirror backs
Bird houses	Model making
Blackboards	Motion picture scenery
Bread boards	Musical instruments
Breakfast nooks	Office partitions
Boats	Panels
Buffets	Partitions
Built-in fixtures	Patterns
Bulletin boards	Picture frames
Bus tops	Ping pong tables
Cabinets	Plaques
Camp furniture	Portable buildings
Camping trailers	Printing material
Car lining	Radio cabinets
Card tables	Restaurant booths
Ceiling	Refrigerator panels
Chairs, parts	Sample cases
Chests	Screens
Chicken houses	Shaft lining
Clothes chutes	Sheathing
Clothes closets	Shelving
Clothes hampers	Ship building
Concrete forms	Shop cases
Cores	Showcases
Counter fronts	Signs
Crating	Smoking stands
Cupboards	Staircases
Cupboard doors	Stockbrokers' boards
Decorative panels	Stocking forms
Desks	Store fixtures
Display racks	Sub-floors
Dog houses	Table tops
Door panels	Telephone cabinets
Drain boards	Tool boxes
Draughting boards	Toys
Drawer bottoms	Trim
Drawers	Trunks
Dressing tables	Wagons
Electrical equipment parts	Wainscoting
Fire screens	Wallboard
Flour bins	Wall panels
Furniture	Wardrobes
Game boards	Waste baskets
Garage lining	Window boxes
Hog houses	Window displays
Ice cream cabinets	Window seats
Ice machine bases	Window valances
Implement parts	Window ventilators
Instrument parts	Woodenware
Ironing boards	Work bench tops

METHODS OF FINISHING CABINET-WOODS.

To enable the most attractive results to be secured in the use of Queensland veneer woods, the following notes on methods of finishing are supplied.

Filling.

Fillers are used for cheapness—saving time and polish, in filling the grain of open-grained and absorbent woods. Fillers such as whitening are not recommended for Queensland cabinetwoods, which are mostly close-grained and not greatly absorbent. On account of the obscuring of the figure which results, filling is undesirable.

Silky Oak, which is open textured and porous, is best "filled" with a clear white hard spirit varnish mixed in equal proportions with French polish, and rubbed down when dry before polishing. Close-textured, non-absorbent woods such as Satinay require no filling, and a high polish is soon obtained.

Natural Finish. Staining.

Staining is not usually resorted to for rich-coloured or highly-figured woods such as Satinay, Maple Silkwood, Red Tulip Oak, Black Bean, and Walnut. With these the beautiful natural colour, figure, and lustre are liable to be dulled by staining.

Deepening Colour.

If darker colour tones are desired, raw linseed oil will achieve this result, and at the same time bring up the figure. Care must be taken not to use too much oil as this will later cause sweating and dulling of the polish in warm climates.

Darker Shades.

For still darker shades, dark oil or spirit stains should be applied sparingly.

Fuming.

Fuming is the best means of darkening woods containing tannic acid which will react and darken under ammonia gas fuming. Maple and Rose Silkwood, Grey Satinash, and Satinay give excellent results under this process. It is much superior to dark staining in that it does not tend to obscure any delicate figuring, but rather enhances it. The fuming should not be effected by the application of liquid ammonia to the wood surface as this causes a yellow staining.

Stained Work. Figured Woods.

With Silky Oak, judicious staining is necessary to enrich the general colour tone of the timber and bring up the figure resulting from the medullary rays on the radial section, and soft tissue tracery on the tangential section (back sawn). These features are shown in quarter-sliced and rotary-peeled veneers respectively.

Grey Satinash, Satin Sycamore, and Rose Walnut also give the most handsome effects when stained to bring up the figure, particularly on rotary plywoodware the concentric rings of soft tissue give the finest pattern.

Red Tulip Oak lends itself to staining for the same reason. Excellent results are had with rotary plywood.

Maple Silkwood is sometimes stained to an imitation "Rosewood" for bedroom suites. Rose Alder, which is much cheaper, can be used for this. Rose Walnut, Grey Satinash, and Satin Sycamore are also good subjects for this class of work.

Normally Unfigured Woods.

The Pines and Silver Ash may be stained "Rosewood" or "Walnut" for furniture. Although normally unfigured, selected figured panels can be culled out if desired. Silver Ash can be treated to closely resemble Maple Silkwood.

Oil and Spirit Stains.

Oil and spirit stains are recommended in preference to water stains which cause unnecessary work through the raising of the wood fibres and roughening of the surface to be polished.

Stain Varnishes.

Ready prepared stain-varnishes are suitable only for unfigured woods and low-grade work, as their effect is usually to totally obscure all beauty of colouring and figure in choice woods, while giving a very poor polish.



Figure 1 Queensland Maple Crotch.

Mixing.

The following stains have been used on Silky Oak to give varying shades from light-grey to dark "mission" finish:—

- (1) Printer's ink thinned with turpentine.
- (2) Asphaltum and turpentine.
- (3) Nigrosene black (spirit soluble type) and methylated spirits.
(1) or (2) mixed with turpentine applied to Silky Oak give warmer (brownier) tones than (3) which gives more of a "blue black" in dark wood.
- (4) Bismark brown mixed in the proportion of $\frac{1}{2}$ oz. to 1 pint of methylated spirit makes a bright red stain which can be made weaker by the addition of more spirit to obtain the shade desired.

Polishing.

For high-class work where highly-figured woods of rich colour and lustre are used, white polish made from bleached shellac is recommended. This is transparent and does not obscure the figure nor alter the colour of the wood.

Orange polish may be used if slightly darker and browner tones are desired.

Stain dissolved in polish is less transparent than orange polish, and is not recommended except for unfigured woods.

Wax polish is made by dissolving beeswax in turpentine to the consistency of a paste.

Part IV

Queensland Veneer Timbers

Queensland possesses a range of valuable veneer woods, which for beauty and utility are unsurpassed in any country of the world.

Many of the most famous cabinetwoods of the Old and New World are being replaced by Queensland woods of similar colour, figure, and lustre, capable of giving equal service under the most exacting conditions.

Foremost among these are Queensland Walnut, which is often almost identical in appearance to the best Italian and American Walnut, Maple Silkwood, a Mahogany type, and Silky Oak, the quartered figure of which surpasses that of the European Oaks while offering much greater facilities for working.

Ripple figured quarter sliced veneers of Queensland Satinay remind one strongly of figured Mahogany, while rotary-peeled Red Tulip Oak shows a particularly handsome soft tissue figure of tapestry effect which has no parallel in any other known wood.

Hoop Pine is the standard Queensland timber for all plywoods for plain joinery work, and is most largely used for the internal plies and cores of all types.

Following are short descriptions of the more important veneer woods in Queensland with particular reference to their botanical and trade nomenclature, sources of supply and log size, timber qualities, and uses.

QUEENSLAND WALNUT.

(*Endiandra palmerstoni*.)

The close resemblance of this wood to the Walnuts of the Northern Hemisphere gained for it the names of Queensland Walnut and Black Walnut from the date of its first discovery.

In the American trade, it became known variously as Australian, Oriental and Queensland Walnut, Australian Laurel and Oriental Wood, the last name being finally adopted by the Federal Trade Commission for the sole use of the trade in the United States.

Walnut is one of the largest of Queensland trees and is available only on the coastal Tablelands of North Queensland from Innisfail to Atherton, with Cairns as the port of shipment.

Mature trees attain a height of 120 to 140 feet, yielding boles up to 80 feet in length. Logs are sold in six classes ranging in measurement from 8 feet to 13 feet and over, centre girth under bark. They are not always, however, perfectly sound.

It has been estimated that some 40,000,000 superficial feet of Walnut logs are available in North Queensland.

Queensland Forest Service records show that Walnut was first recommended for veneering work in 1917. In February, 1922, the first veneering was done in Queensland by Messrs. D. G. Brims Limited, at Milton, on a log specially obtained from Atherton. The timber was found to peel exceptionally well for rotary-cut veneer, although dulling the knife edges a little more than other woods. Standard sheets of three-ply were exhibited in the British Empire Exhibition, and the remainder were used for panelling the old Forest Products Showroom in William street, and for trade samples. The possibilities of Walnut were recognised by the Forest Service, and a strong publicity campaign was inaugurated. From this modest beginning developed the present overseas demand for this timber.

By 1925 a number of Walnut logs had been sold to local plywood manufacturers, but the plywood did not at once become popular, notwithstanding its attractive figure. Plywood made in Brisbane was at first all of the rotary type, and no attempt was made to obtain the still more beautifully striped or rippled figure by the cutting of the veneers radially by a slicing machine. In Sydney, however, Messrs. Beale and Company used sliced veneers with excellent effect on Australian-made pianos and furniture panels.

Towards the end of 1927 a strong demand for Walnut logs arose in America, which had the effect of greatly reviving the timber trade in North Queensland after months of depression. By March, 1928, more than 300,000 superficial feet of

logs had been shipped to American veneering works. Here it was sold chiefly as Oriental Walnut, later becoming known also as Australian and Queensland Walnut, and from its family (Lauraceæ) Australian Laurel.

Strong objections were raised to the use of the name "Walnut" for the timber by the American Walnut Association, who contended that it was not a true Walnut. There is little doubt that this objection was due to the very successful competition of the Queensland wood for the same purposes as the American Walnut (*Juglans nigra*) which it strongly resembles.



Queensland Walnut, 9-foot Girth (breast-high), North Queensland.

It was finally decided by the American Trade Commission that the wood must be sold only as Oriental Wood in the United States.

From July, 1928, the demand for Walnut logs greatly increased, and up to the end of the year over 2,000,000 superficial feet were exported to America alone. For the first six months of 1929 the quantity exported to America was 2,808,000 superficial feet, valued at £40,000 at the point of shipment. Exports were made chiefly to America, the United Kingdom, Canada, France, and Germany in order of quantity.

For the year July, 1931, to June, 1932, Queensland Forest Service records show that 1,296,000 superficial feet (Hoppus) of Walnut logs were removed from Crown lands in North Queensland. This represents an increase of 60 per cent. on the Crown sales for 1930-31.

In 1932-33 560,000 superficial feet were sold.

Under the name of Australian or Oriental "Walnut" the following extracts are taken from Tropical Woods (1st June, 1929) as published by the Yale University, United States of America:—

"The most recent addition to the American market of so-called Walnut woods is from Queensland, Australia. It appears to have been first introduced in 1927, by Russell Fortune, of Indianapolis, Ind., and has since become a serious competitor of American Walnut. It is known to the trade as Oriental Walnut, Oriental wood, Australian Walnut, Australian Laurel, and Queenswood.

"The Imperial Institute (Descriptive List of some Empire Timbers, London, 1928, pp. 11-12) reports as follows:—'Queensland Walnut—A moderately heavy timber of a pale chocolate-brown colour, somewhat open in the grain and often presenting a fine wavy figure: a streaked figure sometimes occurs. The wood seasons rapidly, works well under the tool, planes to a smooth surface, and takes a good finish and polish. Weight 46 lb. per cubic foot. An excellent substitute for American Walnut. It is well suited for high-class furniture, cabinetwork, joinery, and interior decorative purposes, and is suggested for the manufacture of aircraft propellers. The streaked timber is valued for veneer, which is well suited for shopwindow and other panelling. Queensland Walnut would be useful for many purposes where a strong timber of good appearance is required.'

"Mr. Karl Schmieg, recognised authority on cabinet-making and design, says:—'Queenswood (i.e., Queensland Walnut) is a remarkably fine wood, which runs very sound and uniform, keeps straight, takes glue well, and can be readily stained and polished. It has a greenish-yellow tinge and dark stripes, suggesting French Walnut more than the others, and is appropriate for use in combination with Ash, Oak, or any kind of Walnut. We have not used it in solid lumber, but have recently made a modern bedroom set to serve as a model for four hundred others for a hotel, and all of the surfaces, such as end panels, tops, and drawer fronts are of Queenswood veneer. I consider the wood suitable for modern interiors of offices, clubs, and hotels. The price at present is very reasonable.'

A member of the American Walnut Manufacturers' Association made the following remarks regarding Queensland Walnut logs shipped to America:—

"The logs are very striking in appearance, most of them from 14 to 16 feet long and running in diameter of from 30 inches to 40 inches. The bark has the appearance of Beech bark, except that it is reddish rather than grey. The sapwood is tremendous, the ring running from 2 inches to 3 inches wide. The sapwood is of a pinkish colour and no way has been found to use it.

"Forty to fifty per cent. of the logs show some kind of a figure. There is a great variation in this figure, but a mottle cross figure is not uncommon. When the plain wood is quartered, it produces a striped figure, not unlike the stripe to be obtained from American walnut. It is this type of wood that has been in greatest demand, since much greater width quarters can be obtained from these large logs than from American Walnut.

"Its advantages are that the veneers come wide and long; therefore can be used with the least possible waste. It is also economical from the standpoint of price."

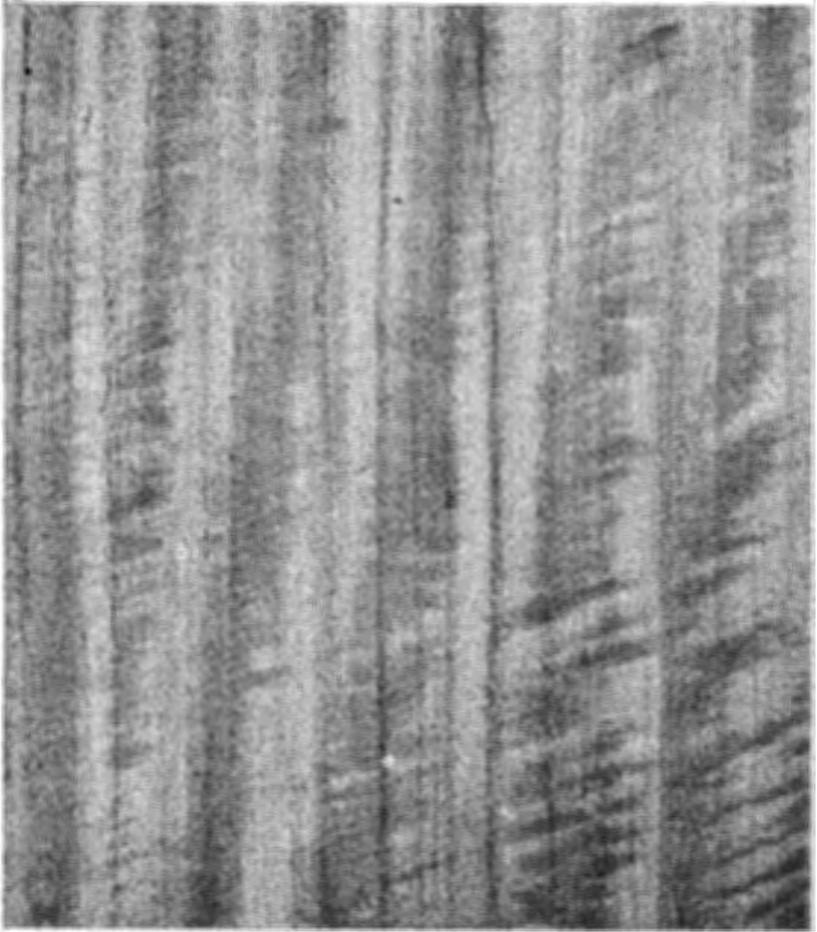
The dark-striped "Walnut" figuring of Queensland Walnut seen most prominently in quarter-sliced veneers is due to decided variations in the depth of colour in the concentric growth rings of the trunk.

Mottled, fiddleback, and ripple figuring are the result of the interlocking of the wood fibres and show the best effects in quartered veneers.

The following excellent description of this beautiful wood is taken from a publication issued by an American veneer manufacturer:—

"Very few commercial woods exhibit such a variety of attractive colours as this native of Queensland's forest. While there are many odd shades, difficult to briefly describe, the most prominent are the "Salmon Red" the 'Walnut tint' and a third group ranging from grey to brown. In spite of the extreme variations of shades afforded by individual specimens, the logs are massive and, as previously stated, produce a large amount of veneer, rendering it easy to procure uniformly coloured material, even for large dimensioned wood work.

"Although the Oriental wood can be worked advantageously on the rotary lathe, the grain of the wood favours it being cut on the quarter. The figure thus produced consists of more or less parallel stripes of varying width which are often interrupted by rich cross figures of different types, the most common of which are the 'fiddle back,' 'broken roe,' 'mottle,' and 'finger roll' markings."



Figured Veneer of Queensland Walnut, Quarter-Sliced.

The various types of figuring available are well illustrated by plates (pages 28 and 50) showing typical examples of Queensland Walnut veneers supplied by Queensland manufacturers.

The use of Queensland Walnut veneered panelling, under the name of "Oriental" Walnut, in the carriages of the famous European tourist train "Golden Arrow" is a striking tribute to the beauty and utility of this valuable wood. This train is reputed to be the most luxurious in the world.

A considerable amount of veneering and panelling work in Queensland Walnut has also been carried out at the headquarters of the British Broadcasting Corporation.

In Australia, Walnut veneered panels are used largely in the construction of high-class furniture, radio cabinets, and for the wall panelling of the best homes and public buildings. It has been used to an increasing extent in recent years with excellent effect in panelling the principal rooms of modern homes erected in Brisbane under the supervision of leading architects. For the best work quarter-sliced matched panels are most favoured.

MAPLE SILKWOOD.

(*Flindersia brayleyana* and *Flindersia pimenteliana*.)

Two distinct botanical identities are included under the official name Maple Silkwood, but the timbers are so similar with regard to colour, figure, and working qualities that they are grouped together for trade purposes. In North Queensland, *Flindersia brayleyana*, once called Red Beech, is now commonly known as Queensland Maple, while *Flindersia pimenteliana* is called Silkwood.



Ripple Figured Queensland Maple Veneer, Quarter-Sliced.

In the American trade the timber has been called Warri Wood.

Maple Silkwood grows only on the tablelands and coastal areas of the Atherton district in North Queensland. Both species attain a height of over 100 feet and logs are sold with girths ranging from 6 feet to over 14 feet measured under the bark at the centre. *Flindersia pimenteliana* usually produces a slimmer bole and is much less abundant.

The latest estimates of the quantity of Maple Silkwood available on Crown lands in North Queensland (December, 1929) are:—

Girth 8 feet and over (breast high)	77,000,000 superficial feet
Girth 5 feet to 8 feet	30,000,000 superficial feet
Total	107,000,000 superficial feet

To enable a sustained supply of this valuable timber to be secured for the future, the annual cut from Crown lands was regulated to 3,000,000 superficial feet for the three years from January, 1930, to January, 1933, but these limits were not reached by sales during this period. The minimum girths cut were 9 feet on the Tableland and 8 feet on the Coast and Molloy areas. Nearly 8,000,000 superficial feet of logs were cut on Crown lands during the five and a-half years period from January, 1924, to June, 1929, and nearly 3,500,000 superficial feet were cut in three years from July, 1929, to June, 1932.



Queensland Maple, 10-foot Girth (breast-high).

The Department's policy of reforestation of this species will perpetuate supplies of Maple Silkwood.

Maple Silkwood is recognised as the finest cabinetwood in Australia. The wood has a pleasing flesh-pink colour with the lustre of satin. Quarter-sliced veneers almost always show a ribbon figure. The broken ribbon and ripple figuring found in butt veneers are particularly beautiful having the appearance of shot silk. Typical examples of Maple Silkwood are illustrated on pages 28, 46, and 51. The best veneers are obtained from stumps, butt logs, and crotches of well-matured trees.

Maple Silkwood ranks as one of the best veneer woods of the world. It cuts cleanly without splitting and very wide and thin veneers can be successfully sliced.

The wood is very tough, and is almost equal in strength to English Oak.

Tests made by the Technological Museum, Sydney, on seasoned timber, gave the following results:—

Weight per cubic foot—37 lb.

Modulus of Rupture—13,300 lb. per square inch.

Modulus of Elasticity—1,649,000 lb. per square inch.

The average weight of seasoned timber is approximately 40 lb. per cubic foot.

Maple Silkwood responds readily to ammonia fuming, turning to attractive grey tones while enhancing the natural figuring.

For interior work it is very durable and is prized for veneered furniture, panelling, doors, shop and office fittings, and joinery generally.

The beautiful symmetrical effects obtainable by the use of veneers of figured Maple Silkwood are well illustrated by the panelled work in the Board Room at the Headquarters of the National Society of Operative Printers and Assistants, Borough road, London (see pages 2 and 38).

In Australia Maple Silkwood matched panels are extensively used in the manufacture of the best furniture, where it is used for table tops, sideboard and wardrobe front panels and ends, dressing-table drawer fronts, and bedstead ends.

Maple Silkwood plywood is eminently suitable for aircraft work for which it is classed with Honduras Mahogany. Made to exacting specifications, Maple Silkwood plywood is utilised in wing and body sheeting, body bulkheads, and cabin furniture.

SILKY OAK.

(*Cardwellia sublimis*.)

The original Silky Oak of the Australian market was produced by two species (*Orites excelsa* and *Grevillea robusta*) occurring in the coastal areas of Southern Queensland and Northern New South Wales, but the North Queensland species (*Cardwellia sublimis*), is the Silky Oak of the veneer trade.

The three species, although somewhat alike in appearance and belonging to the same family, have different properties, the Northern species being superior for veneer purposes and providing the best logs.

Silky Oak (*Cardwellia sublimis*) is the largest tree of its family and is found only in the coastal areas in the vicinity of Innisfail and Cairns, North Queensland. The tree reaches a total height of 120 feet and its massive bole provides logs up to 10 feet and more in girth. The tree first known as Silky Oak in North Queensland was *Embothrium wickhamii* of the same family, and the present Silky Oak of the furniture trade was then more commonly called Bull Oak.

In America it is known as Lacewood, probably because of the lace-like appearance of rotary-cut veneers.

The most recent estimate gives the quantity of Silky Oak log timber available on Crown lands in North Queensland as 105,000,000 superficial feet (Hoppus) of which 70,000,000 superficial feet is in logs measuring 8 feet and over in girth.

To provide for the future requirements of the timber industry while trees growing under sylvical operations attain milling size, the Queensland Forest Service in January, 1930, limited the annual log cut for a period of three years to 2,000,000 superficial feet. For the year 1932-33 998,000 superficial feet were sold by the Crown.

Customs figures for Queensland for 1932 show that 576,000 superficial feet of sawn Silky Oak were exported to United Kingdom alone during the year. This indicates that this timber is gaining in popularity abroad, and the greater use of veneered panels is following in the wake of the increased demand for sawn timber.

Silky Oak is second only to Maple Silkwood in popular esteem for cabinet purposes in Australia.

The timber is light and of a pale-pink colour and owes its popularity chiefly to its ease of working and facility for staining coupled with its handsome "Oak" figuring, which can be varied by the angle of cutting with regard to its large medullary rays. The most striking "silver grain" is seen on quarter-sliced veneers (see illustration, page 28).

When thoroughly seasoned, the wood has an average weight of 36 lb. per cubic foot.

Silky Oak is very tough for its weight and is excellent for holding screws. It takes glue readily but does not fume. On account of the weaving of the fibres through the large rays the transverse strength is considerably lower than that of Maple Silkwood, although ample for joinery and furniture purposes. The modulus of rupture averages about 8,000 lb. per square inch for good quality seasoned timber.

The wood is very durable even when exposed to the weather, and is a general favourite for casement windows which are usually oiled and varnished on the inside to show the attractive grain.



Silky Oak Tree (carrying ferns) in North Queensland Forest.

Silky Oak is well suited for veneering owing to its toughness and flexibility and the wide sheets which can be secured. Veneer sheets leave the knife smooth cut and free from checks.

Silky Oak Plywood is extensively used for panelling in the best residences and in public banks, shops, and offices. It is also favoured for partitions, counters, and showcases.

An excellent example of panelling in quarter-sliced Silky Oak is shown in illustration, page 42, showing an interior view of Coutts' Bank, Mayfair, London.

In the furniture trade it finds extensive uses in wardrobes, sideboards, table tops, and other articles framed in solid timber.

Much of the beauty of Silky Oak is often lost through incorrect methods of finishing. Judicious staining is necessary to bring up the natural figuring to the best effect.



Snigging Veneer Logs with Tractor in a North Queensland Forest.

RED TULIP OAK.

(*Tarrietia argyrodendron* var *peralata*.)

Red Tulip Oak represents the largest and most valuable tree of the Sterculiaceæ family in Australia. It is a native of the tropical coastal forests of North Queensland, where it occurs on the Atherton Plateau and northward along the ranges towards the Daintree River. The tree reaches a height of 120 feet with a bole sometimes exceeding 10 feet in girth above its widely spurred base.

Above the spurs, excellent logs for rotary veneering are usually available, the trunk being long, straight, and cylindrical in shape.

Logs in girths ranging from 7 feet upwards are sold by the Forest Service f.o.b. or f.o.r. Cairns. The total quantity of log timber in North Queensland available for marketing has been estimated at more than 200,000,000 superficial feet.



Two Red Tulip Oaks, 9-foot Girth (breast-high), North Queensland.

It has been found from experience that the best logs for veneering are those containing light, mild timber, cut on sheltered sites. Production of low-grade veneers has resulted from the cutting in error of the harder allied woods, Brown Tulip Oak (*Tarrietia argyrodendron*) and Blush Tulip Oak (*Tarrietia actinophylla*).

Red Tulip Oak is a handsome veneer timber with colour variations in brown and reddish shades. During 1932 it became the most popular wood for the internal panelling of modern Brisbane homes. For this work rotary-peeled plywood gives the most attractive results because of the beautiful tracery effect of the concentric bands of soft tissue prominently exposed on this section.

Quarter-sliced veneers show the comparatively large medullary rays to the best advantage, but the general effect of the figuring is not so pleasing as that secured by rotary peeling.

Red Tulip Oak is a comparatively hard wood and has an average seasoned weight of approximately 50 lb. per cubic foot.

It is very strong and makes particularly strong plywood. A remarkable feature of the wood is its extremely high electrical insulating properties. Under test, rods 4 inches long have withstood a pressure of 33,000 volts for two minutes before failure.

For interior work Red Tulip Oak is very durable and gives long and satisfactory service. It is not adapted for exposure to the weather.

Red Tulip Oak Plywood is at present used chiefly for decorative panelling of private residences, and for shop and office fittings. A good example of Red Tulip Oak wall panelling in a living-room of a modern Brisbane home is given in illustration, page 36.

Where plywood panelling is used in interiors it is usual to use moulded cover strips, and art rails of the same or some other figured wood to give harmonious results.

Finished in light tones the plywood is regarded as specially suitable for the interior panellings of motor launches.

QUEENSLAND SATINAY.

(*Syncarpia hillii*.)

Queensland Satinay has been so named by the Queensland Forest Service because of its resemblance in colour and figuring to the Satiné of French Guiana.

The timber is found in quantity only on Fraser Island, which extends for 80 miles along the Queensland coast, 20 miles east of the port of Maryborough. It prefers the sheltered dells of the immense sandhills forming the backbone of the island, flourishing where the rainfall exceeds 60 inches per annum.

Forest Service field estimates place the available supplies at around 50,000,000 superficial feet. It grows rapidly, regenerates naturally very readily, and rationed supplies can be maintained in perpetuity. Logs are available in centre girths under bark from 6 to 9 feet and over, but the smaller logs are not subject to pipes and provide lighter and more mellow timber, better suited for veneering.

Queensland Satinay is a bright-pink close textured wood showing a beautiful lustrous broken ripple figuring on quarter-sliced veneers. By means of ammonia fuming the colour may be subdued to a greyish-plum tone, with velvet depths lit up by the ripple grain. Probably the most attractive treatment is the unique effect appropriately named "opal finish," because of the changing colours and light reflections of the undulating fibres produced by viewing the panels from different angles. For this purpose the veneers should be cut on the quarter at least $\frac{3}{8}$ inch in thickness. Made up panels are then fumed to dark tones in an airtight chamber and afterwards sanded down about one-sixteenth of an inch or until the natural pink colour of the wood appears, where the fibres lie parallel with the surface and the fuming process has not penetrated so deeply. The variegated effects in colour and shading are then seen. The most brilliant results are obtainable by polishing with transparent French polish. "Opal finish" can only be applied to those rare woods which react chemically with deepening colour under the influence of ammonia fumes, and possess strongly interlocked fibres.

Seasoned Satinay has an average weight of 50 lb. per cubic foot. Timber from less mature trees may fall as low as 46 lb., while the inner flitches of very large logs may weigh up to 56 lb. per cubic foot.

The wood is very strong and Satinay plywood is probably the strongest in Australia.

Static bending tests made by the Technological Museum, Sydney, showed an average modulus of rupture of 14,800 lb. per square inch for small clear specimens of the wood; with an average compression result parallel to the grain of 7,800 lb. per square inch.

To obtain the easiest cutting of veneers from Satinay, the logs should be sliced as soon as possible after felling, or after thorough boiling. Logs should be greased on the ends immediately after felling to prevent drying and splitting on the ends.



Satinay Forest, Fraser Island, Queensland.



Tractor Logging in Hoop Pine Forest, Canungra District.

While extremely durable under all conditions, Satinay is also highly fire resistant, ranking first in this respect among all Australian cabinetwoods. Except for the white sapwood, not used in veneers or furniture, Satinay is not attacked by wood borers of any kind.

Satinay veneers, quarter sliced and matched, give excellent effects in wall panelling and for door panels in furniture. Variations in the depth of colour can be obtained by fuming or finishing with the "opal finish" described above. Wall panelling in the Forest Products Showroom, Brisbane, has given splendid service for over five years although exposed to great extremes of heat and humidity. Queensland Satinay has now proved its value for plywood panelling and its popularity is increasing.

Considerable interest in this timber has recently been shown in America.



"THE TRIPLETS."

Hoop Pines at Cainbale, Sarabah Range, South Queensland.

QUEENSLAND PINE.

(*Araucaria* spp. and *Agathis* spp.)

Queensland Pine plywood is constructed principally of Hoop Pine (*Araucaria cunninghamii*) with Bunya Pine (*Araucaria bidwillii*) and North Queensland Kauri Pine (*Agathis palmerstoni* and *A. microstachya*) in smaller quantities.

Hoop Pine extends along the whole length of the Queensland coast following the coastal hillsides from the New South Wales border to Cape York, but the largest Queensland supplies are found in the south-eastern corner of the State extending westward about 100 miles to the main Dividing Range. Bunya Pine is not nearly so abundant as Hoop Pine and has a very restricted range between Gympie and the Bunya Mountains in Southern Queensland. Kauri Pine, as used in the veneer industry grows only in the mountainous coastal area in the Cairns district, North Queensland.

According to present Forest Service estimates the Queensland stand of Hoop and Bunya Pine of mature size (60 inches girth and over) is approximately 800,000,000 superficial feet.

Logs of plywood class represent about 100,000,000 superficial feet of this total.

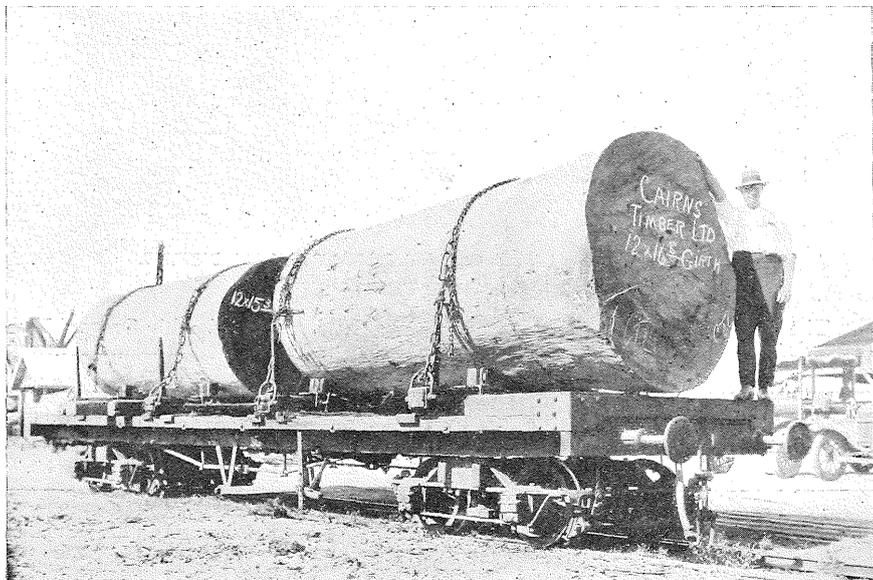
In North Queensland the quantity of Kauri Pine on Crown lands has been estimated at approximately 125,000,000 superficial feet for trees 8 feet and over in girth breast high. In girths from 5 feet to 8 feet a further 30,000,000 superficial feet are available.

Both the Hoop and Bunya Pines grow to a large size, reaching 150 feet and more in height with girths up to a maximum of 10 feet and more. Although Bunya Pine is usually stouter, both species provide long cylindrical boles, yielding clear logs excellent for veneering purposes.

Kauri Pine reaches much the same height, while providing a much thicker bole from which logs up to 18 feet, and sometimes greater, girth are available. In shape and size Kauri provides the best veneer log in Queensland.

Hoop and Bunya Pine logs are sold in girth classes of 5 feet and upwards, while Kauri logs are rarely sold below 8 feet.

Queensland Pine is a close and even textured, firm cabinetwood of the highest quality. Its ivory colour and smooth finish are particularly attractive to the joiner and cabinet-maker, providing a medium which can be readily stained and finished in any colour desired.



Kauri Pine Logs.

It has considerable toughness and strength but is easily worked, glues and stains perfectly, and is normally non-aromatic.

Seasoned Hoop Pine weight approximately 36 lb. per cubic foot, while Bunya Pine and North Queensland Kauri Pine average 33 lb. and 30 lb. respectively.

Hoop Pine plywood has the greatest firmness of surface, followed closely by Bunya Pine, with North Queensland Kauri Pine a little softer.

The colour of Hoop Pine is usually uniformly pale, while Bunya Pine frequently shows stronger figuring in pale-pink shades. Kauri is often seen in uniform shades of light-brown. Although unsuitable for outdoor use, these woods are very durable in interior furniture and joinery.



SCARFING A WALNUT TREE, 11-FEET GIRTH, ATHERTON DISTRICT.
Ripple Marks on Buttresses Indicate Figured Wood.

The relative strengths of Hoop and Bunya Pine compared with Oregon Pine (*Pseudotsuga taxifolia*) are given in the following table from Queensland Railway tests:—

Timber.	Number of Tests.	Moisture Content.	Transverse Modulus of Rupture.	Crushing (on end Grain).
		Per Cent.	Lb. per sq. in.	Lb. per sq. in.
Bunya Pine	3	14.6	13,870	7,830
Hoop Pine	7	13.8	12,830	7,620
Oregon Pine	20	11.3	10,840	6,780

Queensland pine is the standard plywood for all interior work to be stained, varnished, or painted. It is the best wood for corestock and centre plies in Australia, over nine-tenths of all the veneers cut being of Hoop Pine.

Queensland Pine plywood is very extensively used in the building industry for internal panellings, ceilings, door panels, and cabinets in houses, public buildings, and in shops and offices where it also finds service for counters, shelves, and partitions. In the furniture trade, stained and polished panels are used in medicine chests, wardrobes, dressing tables, bedsteads, and wardrobe doors and ends. It is also used almost exclusively for drawer bottoms, wardrobe mirror backs, and patterns.



Rose Alder, North Queensland.

Coachbuilders find the plywood of great service for linings, seats, and internal fittings of buses and trams. Boat builders use Hoop Pine for internal lining and panellings.

The Queensland Dairy Industry requires over 1,500,000 butter boxes per annum, practically the whole of which are made of Hoop Pine and North Queensland Kauri Pine. The greater proportion of these are constructed in the form of wire-bound rotary-cut veneer boxes. Queensland Pine plywood also finds extensive use for a very large number of miscellaneous purposes, including camping kits, drawing boards, toys and models, ping pong bats, radio cabinets, and waste-paper baskets.

OTHER QUEENSLAND VENEER WOODS.

Amongst the Queensland timbers suitable for standard and fancy veneers and available in more or less limited quantities are the following:—

SILVER ASH (*Flindersia pubescens*).—A pleasing white, easily worked timber of the Maple Silkwood type in weight and texture and capable of being stained readily to any shade required. This wood makes a very high-grade plywood and has at times a very pleasing figure. Rotary peeling gives the best effects. Logs are available from North Queensland.



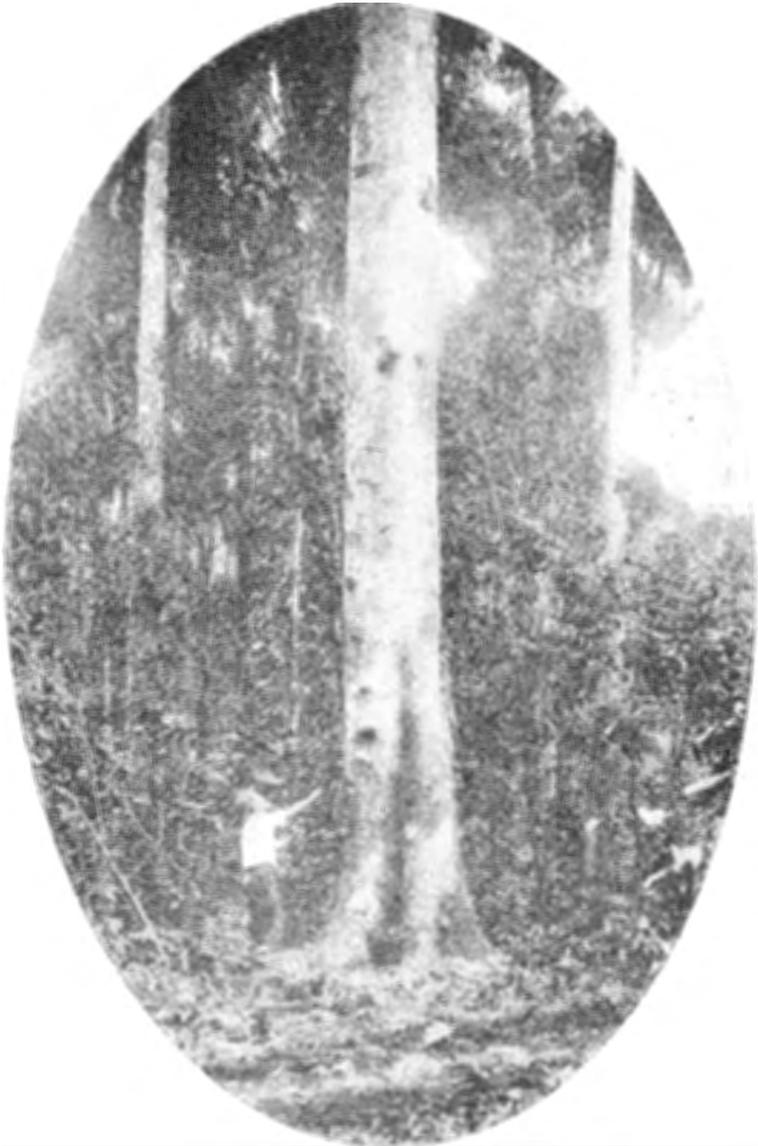
Silver Ash Veneer Log in a North Queensland Jungle.

SATIN SYCAMORE (*Ceratopetalum virchowii*) is similar in texture and working qualities to the Coachwood (*Ceratopetalum apetalum*) of New South Wales, but has a much more attractive figure. Rotary-cut veneer is well suited for interior decorative panelling. This wood grows only in the Atherton district in North Queensland.

ROSE ALDER (*Ackama quadrivalvis*).—This is a similar type to Satin Sycamore and grows in the same areas. It is, however, normally unfigured and presents a uniform bright-pink colour. It makes good rotary plywood.

ROSE WALNUT (*Cryptocarya erythroxylon*) is a native of Southern Queensland scrubs and is available in large logs in moderate quantities. The plywood is pale-pink in colour with pleasing variations in shading. It is very strong and durable and makes attractive wall panelling.

BLACK BEAN (*Castanospermum australe*) is sometimes veneered for overlaying furniture and for special panels. It cuts cleanly and is often available in highly-figured wood, but the irregular shape of the trees makes the average returns of veneer rather low. The best logs are obtained in the Atherton district. The solid wood is often used for carving because of its mellow nature.



Black Bean, 10 feet in Girth, Atherton District, North Queensland.

PRODUCING VENEER LOGS FOR THE FUTURE.



Queensland Maple resulting from Natural Regeneration Operations.



Hoop Pine Plantation, ten years old, Atherton District.



Loading Walnut Stumps, North Queensland.

NAMES OF QUEENSLAND VENEER WOODS.

Official Name.	Botanical Name.	Other Vernaculars.
Black Bean	<i>Castanospermum australe</i>	Beantree
Bunya pine	<i>Arucaria bidwillii</i>	..
Canary sassatras	<i>Doryphora cassafra</i>	Sassatras
Candlenut stirs	<i>Aleurites moluccana</i>	Candfenut
Hoop pine	<i>Arucaria cunninghamii</i>	..
Ivorywood	<i>Siphonodon australe</i>	..
Kauri pine	<i>Agathis palmerstoni</i>	..
Maple Silkwood	<i>Flindersia brayleyana</i>	Maple, Red Beech
Queensland Satinay	<i>Flindersia pimenteliana</i>	Silkwood
Queensland Walnut	<i>Syncarpia hillii</i>	..
	<i>Endiandra palmerstoni</i>	Walnut Bean, Black Walnut, Oriental Wood, Australian Laurel
Red Cedar	<i>Cedrela australis</i>	Cedar
Red Silkwood	<i>Luocma galactoxyla</i>	Cairns Pencil Cedar
Red Stirs	<i>Albizia toona</i>	Acacia Cedar
Red Trump Oak	<i>Turritia argyrodendron</i> var. <i>peralata</i>	Red Crowstoot Elm
Rose Alder	<i>Ackama quadrivalvis</i>	Feathertop, Pencil Cedar
Rose Walnut	<i>Cryptocarya arythra zylon</i>	Pigeonberry Ash
Satin Sycamore	<i>Ceratopetalum virchowii</i>	Blood-in-the-bark
Silky Oak	<i>Candollea sublimis</i>	Bull Oak
Silver Ash	<i>Flindersia pubescens</i>	Ash
Silver Quandong	<i>Flindersia scottiana</i>	Bumpy Ash
Tupp Cedar	<i>Elaeocarpus grandis</i>	Quandong
Tupp Plum	<i>Nitida wendrocht</i>	White Cedar
White Aspen	<i>Pteleocypus salvadri</i>	Burdick Plum
White Blazerwood	<i>Pterocarya wilsoniana</i>	Snowwood
Yellow Cypresswood	<i>Symplocos spicata</i>	..
Yellowwood Ash	<i>Savacarpus aridatus</i>	Leichhardt Tree
	<i>Flindersia acalyana</i>	..

