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SHORT COMMUNICATION

EARLY WOOD-FIBER PANELS: MASONITE, HARDBOARD, AND LOWER-DENSITY BOARDS

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ABSTRACT—The author discusses the early use in the 19th and 20th centuries of lignocellulose fiberboards by artists. Hardboards and "Masonite process" boards are defined and discussed, and patent dates are clarified, including the possibility that fiberboards were available to artists as early as 1861, judging by two British patents of that date, and the fact that wood-fiber boards were commercially manufactured in England by 1893. The advantages and disadvantages of Masonite as an artist's painting support are discussed, as is a new Masonite-type hardboard that recently was introduced.

Fiber-based panel materials today are divided broadly into four groups: insulation board (lower-density boards), hardboard, medium density fiberboard, and laminated paperboard (Forest Products Laboratory 1987). All these panels are made of reconstituted wood or other lignocellulose fibers like straw, beetroot pulp, bagasse, megasse, cane, and bast, which are reduced to fibers or fiber bundles and then reconstituted by special forms of manufacture (heat, steam, pressure, moisture) into panels. Bagasse and megasse are the woody waste products from sugar-cane manufacturing often used as fillers in panels.

As conservators, we are interested in hardboard and Masonite (a type of hardboard) because artists have used these panels in the 20th century as painting supports. All hardboards today are basically Masonite-process boards. Paper boards such as academy and mill boards have been discussed previously by the author (Katlan 1992). What is known today as insulation board by the building industry was considered not relevant to artists or conservators. However, considered as lower-density boards, they become important for the 19th-century patents of products produced under less-refined industrial processes, such as grinding and pressing under millstones.

"Hardboard," as defined by the American Hardboard Association, is a generic term for a panel manufactured primarily from interfelted lignocellulose fibers consolidated under heat and pressure to a density of at least 31 lbs per cubic ft (lpc) (AHA n.d.). The lignin of the fibers in a hot press acts as the natural bonding in the board. The density of 31 lpc is critical, according to the association, and differentiates hardboard from lower-density boards and paperboards. Hardboard is practically a 100% wood product, converted to fibers that are bonded permanently under heat and pressure. In many cases these boards are formed from the wastes of the lumber industry, such as wood chips, sawdust, and board trimmings. Hardboard should not be confused with particle board, which also is made from wastes of the lumber industry, but the wood chips and particles are not refined into distinct fibers or fiber bundles. Particle board production is a "dry" process, while hardboards are produced both from a "wet" and a "dry" process.

Attempts to utilize sawmill waste can be seen by the number of European and American patents in the 19th century relating to reducing the wood to a paste or pulp using chemicals,

TABLE 1
MISCELLANEOUS RELATED PATENTS

PATENT NO.	DATE	NAME	DESCRIPTION
BRITISH PATENTS			
1,011	April 3, 1772	W. Whitlock and W. Hodgson	Composition, or artificial wood for ornamental purposes
5,202	July 8, 1825	C. A. Malo	Composition of wood and other substances
10,344	April 10, 1844	J. E. Chabert	Molding composition for picture frames, architectural ornaments, etc.
112	Jan. 15, 1861	C. Stevens	Manufacture and application of pulp from wood
217	Jan. 28, 1861	J. Clark	Wood paste for molding, etc.
10,983	July 22, 1893	J. M. MacIntosh	Improvements in panels, tablets, or slabs for the use of artists or others
U.S. PATENTS			
21,077	August 3, 1858	A. S. Lyman	Papermaking
88,515	March 30, 1869	R. W. Russell	Improved paper stock, box board roofing paper, etc.
114,868	May 16, 1871	E. A. Seeley	Improvement in the manufacture of paperboards
177,487	May 16, 1876	B. F. Field	Manufacture of strawboards
259,206	June 6, 1882	G. H. Pond	Reducing wood, etc., to fiber
267,715	Nov. 21, 1882	G. H. Pond	Comminuting wood pulp
369,835	Sept. 13, 1887	H. Blackman	Process of and apparatus for manufacturing paper-pulp
369,836	Sept. 13, 1887	H. Blackman	Disintegrating fibers and manufacturing of paper-pulp
1,122,404	Dec. 29, 1914	B. Loomis	Process of treating wood and plants to make cellulose
1,422,251	July 11, 1922	M.C.J. Billingham	Method of and apparatus for disintegrating paper stock
1,455,594	May 15, 1923	F. P. Miller	Process of treating paper stock
1,598,260	August 31, 1926	D. M. Sutherland, assignor Agasote Millboard Co.	Pulpboard and method of making same
1,631,171	June 7, 1927	H. F. Weiss, assignor Wood Conversion Co.	Utilizing wood waste
1,631,173	June 7, 1927	H. F. Weiss, assignor Wood Conversion Co.	Wallboard and process of making same
1,680,896	August 14, 1928	R. A. Marr	Manufacture of fiberboard
1,793,711	Feb. 24, 1931	W. O. Mitscherling, assignor A. M. Johnson	Method of wood disintegration
1,831,940	Nov. 17, 1931	J. A. Wiener and J. B. Harmon	Method of preparing fibers
1,862,688	June 14, 1932	E. C. Loetscher	Process for making a fibrous building material
1,900,698	March 7, 1933	G. H. Ellis, assignor Insulite Co.	Insulating body
1,900,699	March 7, 1933	G. H. Ellis, assignor Insulite Co.	Waterproof insulating body
2,008,892	July 23, 1935	A.J.A. Asplund, assignor Aktiebolaget Defibrator, Sweden	Method of manufacture of pulp

water, grinding, or mechanical means. The earliest patents that I have found are two British patents from 1861 that both specifically mention the use of wood paste or pulp in artists' panels for paintings (Stevens 1861, Clark 1861) (table 1). The claimed advantage of these boards is that "there are no joints in the panels and the grain of the dry paste is fine and soft" (Clark 1861, 3).

The Clark patent is described as "the application of a paste to any kind of ornamental and other mouldings, without the least admixture of any other Materials, or use of any Chemical Agent" (Clark 1861, 2) through a milling and grinding process, while the Stevens patent manufactures a paste from lignin or fibrous particles of wood by caustic lye and a fermentation process. In the Stevens patent, the resulting material is also used for roofing, mosaics, and bricks, while in the Clark patent the material is used for "inlaid flooring and tesselated pavement" (Stevens 1861; Clark 1861, 3). Both materials must have been fairly hard and dense and should not be considered paperboards, although the resulting paste would have been suitable for papermaking. According to the Forest Products Laboratory of the U. S. Department of Agriculture, low-density boards are interfelted lignocellulosic fibers that are consolidated into homogeneous boards under elevated temperatures only, while hardboards are consolidated under both heat and pressure in a hot press. "Both of the patents . . . mention some type of pressing. Stevens mentions pressing and rolling for making floor and roofing tiles. Clark mentions using a hand or stamper pressure to fill a mould. Neither specifically mentions consolidating and drying the wood pulp in a heated hot press. Therefore, according to the current standard definitions, Clark and Stevens products probably would not be classified as hardboard" (Myers 1993). If not a hardboard, then these two patents should be considered a type or variation of low-density board using pressure but not heat for consolidation. It is unclear whether either of these two products was ever commercially produced.

More likely, the first wood pulp panels were manufactured for artists' use in the early 1890s. For example, MacIntosh Boards were advertised in the catalog of James Newman and Co., London, ca. 1910, and thus this patent of 1893 was commercially available. The panel is described in the catalog as follows: "The J. M. MacIntosh Patent Compressed Art Panels are light, durable and will not crack or warp" (Newman 1910, 164); standard sizes are listed. The catalog makes the point that "any other size [can be] cut to order."

The panel is described as ordinary wood-pulp manufactured into sheets of ¼ in. to ⅜ in. In some instances the surface is smooth primed with flake white, while in others, "I mould or press the panel or slab of wood-pulp between rollers . . . to impress . . . a surface or surfaces resembling canvas or other suitable texture" (MacIntosh 1893, 1). The MacIntosh boards were manufactured into sheets "of any convenient size and under pressure considerably greater than that ordinarily used in such manufacture in order that the material may be made very solid and homogeneous" (MacIntosh 1893, 1). Painting conservator Steven Prins has informed me that a painting signed and attributed to artist Daniel Israel, entitled *Studying the Koran*, was executed probably in Paris on a homogeneous interfelted wood-fiberboard (Prins 1993). I believe the Israel board was possibly a similar type to the MacIntosh board.

Masonite is a brand name for a type of hardboard. The development of the "Masonite process" was stimulated by the desire to utilize sawmill waste of the long-leaf yellow pine from the southern mills of the United States (Suchsland and Woodson 1990). William H. Mason was experimenting with the process of converting wood chips and edgings into fiber without loss of lignin (Mason 1926, 1928). His patents produced the Masonite-type fiberboards that are still manufactured today (table 2). His

TABLE 2
SELECTED LIST OF WILLIAM H. MASON PATENTS

PATENT NO.	DATE	DESCRIPTION
1,578,609	March 30, 1926	Process and application for disintegration of wood and the like
1,586,159	March 25, 1926	Low-temperature explosion process for disintegration of wood and the like
1,655,618	Jan. 10, 1928	Application for and process of explosion fibration of lignocellulose material
1,663,503	March 20, 1928	Process of making structural insulation boards of exploded lignocellulose fiber
1,663,505	March 20, 1928	Hard grainless fiber products and making the same
1,767,539	June 24, 1930	Process for making composition board and like apparatus
1,812,969	July 7, 1931	Process integral insulating boards with hard welded surfaces. Assignor Masonite Corp.
1,812,970	July 7, 1931	Process of manufacture of insulation boards. Assignor Masonite Corp.
1,824,221	Sept. 22, 1931	Process and apparatus for disintegrating fibrous materials
1,894,777	Jan. 17, 1933	Process of vegetable fiber sheets
1,894,778	Jan. 17, 1933	Multiple fiberboard production

process subjected wood particles to high steam pressure in a digester; the pressure was suddenly released to atmospheric level, thus exploding the fiber. The steam softened the lignin and fiberized the wood particles. When compressed under heat, the pulp was converted to a hard, rigid board in which the lignin served as a bonding agent. The first hardboard plant was built in Laurel, Mississippi, in 1926 by the Mason Fiber Company (later called the Masonite Corporation) for the manufacture of this new type of hardboard (Suchsland and Woodson 1990).

There are many advantages to Masonite hardboard as a painting support, which artists rapidly discovered and first used in the late 1920s. Masonite is homogeneous, having no grain unlike wood panels, yet having the advantage of not swelling or shrinking like a panel (Wehlte 1975). It has a dark brown surface color. Masonite is not as sensitive to climatic changes as wood. It can be purchased in large sheets in sizes up to 4 × 12 ft, with the most common large sheet size being 4 × 8 ft. The large sheets tend to warp and twist, and the corners tend to compress. Artists often have adhered strips of wood or battens for added support to alleviate these problems. Unlike wood, masonite is not attacked by wood-boring insects.

Most Masonite is smooth on one surface and textured on the back, as a result of a screen used in the manufacturing process. This process is called S1S (smooth one side) hardboard. It is a "wet" method; a screen must be inserted on one side of the wet fiber mat, which is then pressed to facilitate the escape of steam and water. The result is an embossed screen pattern on the reverse of the board, indicative of this production method. In the early 1930s, U.S. Gypsum Company (Celotex Corp.) applied for a patent at its Greenville, Alabama, plant to produce S2S (smooth two sides) hardboard. This hardboard was produced by pressing the wet fiber mat between two smooth plates (platens) in a hot press. A patent infringement suit resulted, with the Masonite company and William H. Mason finally being awarded the patent in 1938. A license agreement with U.S. Gypsum and Masonite allowed U.S. Gypsum to

become the first company to produce S2S hardboard (Suchsland and Woodson 1990).

Experienced artists have complained that one limitation of masonite hardboard is that the primings fail to adhere to the smooth side of the board. This failure is probably due to the manufacturing process, as paraffin oil from the hot presses remains as a surface residue. Cleaning the surface of the board with solvent should correct this problem. Some artists make the mistake of sanding and roughening the surface to provide a tooth for the priming. Unless the sanding is done uniformly, the exposed wood fiber of the surface will swell unevenly as the wet priming is applied, resulting in an irregular textured surface as opposed to a smooth surface.

Experiments with Masonite-type hardboards for artists' needs are still under way. A recently introduced board, "Clayboard," using a hardboard support, provides an interesting example of a "mineral coated, pH neutral surface which will accept any media from pencil to oils" (Ampersand Art Supply, 1993). According to the manufacturer the surface is nonyellowing, and the soft matte finish creates a nonglare surface. The manufacturer also claims its unique binders prevent flaking and cracking. This example shows that Masonite-type hardboards are continuing to be used by artists and art material suppliers in the 1990s just as Masonite hardboard was used by artists in Europe and America shortly after its invention in the late 1920s.

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SOURCES OF MATERIALS

Clayboard
Ampersand Art Supply, 8920 Business Park Dr. Suite 120, Austin, Tex. 78759

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