

AN ABSTRACT OF THE THESIS OF

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1890-1962

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Sally Francis

The Thomas Kay Woolen Mill operated between 1890 and 1962. The mill produced predominately woolen blankets and woolen fabrics for outerwear garments. Mission Mill Museum Association purchased the woolen mill after its closure in order to develop the property as a museum. The purpose of this study was to provide historic documentation of the Thomas Kay Woolen Mill woolen finishing processes and machinery which will be used to interpret a new exhibition of the mill's finishing departments.

Business records of the Thomas Kay Woolen Mill which were found in the museum's archives, newspaper articles, extant mill machinery, old machinery manuals, and woolen process texts provided most of the documentation for this study. Generally, the finishing processes and finishing machinery used by the mill remained the same during its seventy years of operation.

The proposed plan for the exhibition retains the extant wet finishing department and proposes suggestions for interpretation of the predominant finishing processes used in the Thomas Kay Woolen Mill.

The Thomas Kay Woolen Mill:
Finishing Departments 1890-1962

by

Patricia Gehrman Allen

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Figure 1.
Thomas Kay Woolen Mill ca. 1896
(Mission Mill Museum Association)



Figure 2.
Thomas Kay Woolen Mill ca. 1950
(Mission Mill Museum Association)

THE THOMAS KAY WOOLEN MILL:
FINISHING DEPARTMENTS 1890-1962

INTRODUCTION

The first worsted fabric manufactured west of the Mississippi River was produced at the Thomas Kay Woolen Mill in Salem, Oregon. Owned by an experienced English woolen manufacturer, Thomas Lister Kay, the mill began operations in 1890 and continued under the management of four generations of the Kay family until it discontinued operation in 1962. The plant processed raw Willamette Valley wool into fabric and blankets distributed throughout the United States. Over the seventy-two years of the mill's operation, limited manufacturing modernization occurred in the plant. (Lomax, 1974)

The Mission Mill Museum Association was formed in 1964 with the purpose of purchasing the woolen mill and preserving this example of early Oregon industrial history. In 1973, the mill complex of seven buildings was placed on the National Register of Historic Places and fund raising efforts were begun to restore the structures and woolen manufacturing operation as a museum. No other 19th century example of the once common woolen mill industry has been

preserved west of Missouri. A map of the historic Thomas Kay Woolen Mill site, known today as Mission Mill Village, is shown in Figure 3 (Mission Mill Village, 1986).

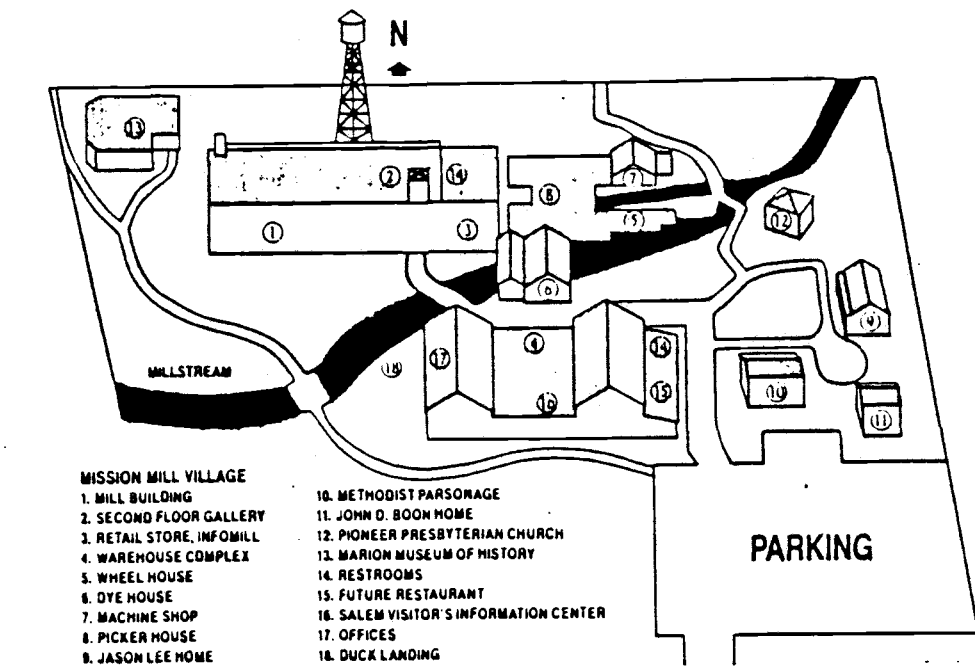


Figure 3.
Mission Mill Village grounds
(Mission Mill Museum Association)

Today, fund raising efforts have been successful in developing the Thomas Kay Woolen Mill complex as a community educational and cultural center known as Mission Mill Village. The center provides support for community arts organizations, especially those involved in the textile arts.

Progress in the restoration of the woolen mill structures has been continuous since 1980. Those structures that have been entirely restored are the millrace with its water-powered turbine and the machine shop.

There has been modified restoration of the dye house and wool warehouse. The dye house was in such disrepair that portions of it had caved into the millstream. In 1980, the building was substantially replaced with a structure approximating the original structure. The wool warehouse structure remains as it was during the mill's operations. The interior, however, has been modified for use as office and retail space. The exterior has been modified slightly with a covered entry porch and the addition of some windows.

The largest structure in the mill complex is the three and one-half story brick main mill building. Restoration of this building

is currently in progress. Some of the interior space will remain as it was during the mill's operation to provide an educational experience for visitors and to provide the opportunity for continued study by historians, architects and students. A partially completed museum exhibit illustrating textile production processes from "Fleece to Fabric" is located on the second floor of this building. Other spaces will be modified for use by community groups and arts organizations.

The remaining structures of the mill complex, the boiler house and the picker house, are unrestored.

Purpose of the Study

The Mission Mill Museum Association has received funding from the Fred Meyer Charitable Trust to complete the woolen fabric manufacturing exhibit of the Thomas Kay Woolen Mill. The manufacturing processes of wool preparation, spinning, and weaving have been illustrated in the current exhibition on the second floor. The final manufacturing processes, the fabric finishing, have yet to be illustrated. This portion of the exhibit will be illustrated on the

first floor of the mill building and will incorporate portions of the finishing manufacturing department which have remained unchanged since the closing of the mill.

The purpose of this study is to provide historical documentation necessary to develop the finishing departments portion of the exhibition.

Objectives of the Study

1. To determine the wool fabric finishing processes that were used in the Thomas Kay Woolen Mill during its operation from 1890 to 1962.
2. To determine where the finishing processes took place in the woolen mill.
3. To determine what machinery and equipment was used in the finishing processes of the Thomas Kay Woolen Mill from 1890 to 1962.
4. To document extant finishing process machinery and equipment as to its manufacturer, patent date, and period of

use in the Thomas Kay Woolen Mill.

5. To provide contextual information about the finishing departments' processes and machinery.
6. To provide recommendations on the inclusion of machinery and equipment, from the Mission Mill Museum collections, in "The Finishing Department" museum exhibition.

Limitations of the Study

This investigation is a case study of an individual woolen mill. Generalizations about other mills can not be made based on the findings of this single case.

The study is limited by written material available about the mill during its operation, the survival of mill business records, and the memory and physical condition of former mill employees.

Definition of Terms

burling The trimming of loose yarn ends after the fabric has been woven.

dry finishing The finishing processes which occur to wool fabric after it has been dried.

extracting Following the washing of fabric, the removal of excess water from the fabric by centrifugal force in a machine called an extractor.

finishing The processing steps in wool fabric manufacture which follow the weaving of the fabric.

fulling The controlled shrinking of wool fabric in both the warp and weft direction whereby the wool fibers expand and felt. The overall effect of this action is a fabric which is thicker and of a tighter weave than it was when the fabric was removed from the loom.

napping The raising of fiber ends from the surface of woolen fabric such that the fabric has a softer, loftier feel and appearance. In industrial wool fabric production, napping is accomplished

by passing the fabric over rotating racks of teasel in a machine called a gig or by passing the fabric over rotating wire brushes in a napping machine.

shearing The trimming of excess nap from the surface of wool fabric. The process creates a smoother more uniform surface to the fabric.

pressing The application of steam heat and pressure to a wool fabric. This process eliminates wrinkles and stabilizes the orientation of the warp and weft yarns.

warp The lengthwise yarns or threads in a fabric.

weft The crosswise yarns or threads in a fabric; those threads which run from selvedge to selvedge.

wet finishing The finishing processes which include the application of water and/or chemicals to wool fabric.

REVIEW OF RELATED LITERATURE

There are few published studies about the Thomas Kay Woolen Mill. The only publications with documented references are Lomax (1974) and Gertenrich (1978). These studies provide only an overall story of the mill's operation. Specific information about the finishing departments can be obtained only from oblique references within these two works. The following review of literature is a summary of the information about the finishing department that can be obtained from Lomax (1974) and Gertenrich (1978).

Fabric finishing processes were conducted at the Thomas Kay Woolen Mill from the beginning of its operation in 1890 until the close of operation in 1962 (Lomax, 1974; Gertenrich, 1978). In addition to finishing the fabrics produced at the Salem mill, from 1896 to 1898 the finishing departments processed fabrics produced at Thomas Kay's Waterloo mill (Lomax, 1974). In 1959, when other departments in the mill closed, the finishing department continued to operate, processing other manufacturers' fabrics until 1962

(Gertenrich, 1978).

Included in Gertenrich's (1978) general description of the Thomas Kay mill is a pictorial outline of the mill's processes. Those pictures pertaining to the finishing processes are dated 1947, late in the operation of the mill. The following captions beneath the pictures in Gertenrich's outline (p.61-71) give a brief summary of the finishing processes in the mill:

1. "Burling...snipping off loose threads after weaving."
2. "Re-weaving"
3. Fulling- "Woven fabric marked by yards before going into fuller. Cloth ends sewn together to form continuous fifty-yard length strip before entering fuller. ""Gallons of 'soft soap' added to fulling machine. Cloth removed from fuller after shrinking and felting."
4. "Cloth placed in washing machine after leaving fuller."
5. "Washed fabric removed from extractor"
6. "Cloth dryer which permits drying of 2,000 yards of fabric every eight hours."
7. "Shearer which cuts off excess nap from dried fabric."
8. "Pressing machine which hooks and stretches fabric to keep it square while pressing."
9. "Flaws in cloth tied on edge with string at final inspection."
10. "Cloth winder which places fabric on bolts."
11. "Shipping department which wraps bolts of cloth."

The Location of Finishing Processes in the Mill

The wooden building which comprised the first Thomas Kay Woolen Mill was destroyed by fire in 1895. The three and one-half story brick building that remains standing today was constructed in 1896. Wet finishing processes in this building took place in the cement half basement which was excavated to the full length of the building around 1920. (Gertenrich, 1978)

The addition to the east end of the brick building in 1898 for "a finishing gig and other machinery" (Lomax, 1974,p.53) indicates that this was the early dry finishing area. That this remained as a finishing area is indicated in a reference to the 1937 two-story addition at the east end of the building "above the finishing room" (Gertenrich, 1978,23-24).

Drying of the fabric took place on tenter racks in the attic of the mill building until around 1942 when a dry room was constructed on the south side of the wet finishing room. This room was intended to accommodate a mechanical cloth dryer purchased at that time. (Gertenrich, 1978)

Finishing Machinery Used in the Mill

Before opening his mill in 1890, Thomas Lister Kay made a trip to England and the east coast of the United States in order to study the latest machinery and wool fabric production methods. While in the East, he ordered machinery to be manufactured according to his specifications for his new mill. An 1890 machinery list indicates that included in this machinery were : 2 fulling mills and wash boxes, 1 cloth winding machine, rinse boxes, shears, presses, and brushes.(Lomax, 1974)

Although some equipment modernization occurred in other departments, little modernization occurred in the finishing department over the years of operation of the mill. The addition of a cloth dryer in 1942 was the only exception. (Gertenrich, 1978)

Gertenrich referred to the mill machinery as "turn-of-the-century vintage." The chart of machinery she compiled (Figure 4, pp.13 & 14) confirms that this was the condition of the finishing department machinery. The only pieces of finishing machinery on Gertenrich's chart that were not "turn-of-the century"

Manufacturing Process	Machinery	1890	1900	1910	1920	1930	1940	1950
8. Weaving (1st Floor Mill)	Looms	1898 Crompton-Knowles 4-90" Cashmere 25 Har. 4 Box 1893 Knowles 3-72" Cashmere 20 Har. 3 Box 1898 Knowles 4-90" Cashmere	1904 Knowles 7-90" Heavy Worsted 30 Har. 4 Box Knowles 6-90" Cashmere 25 Har. 4 Box 1900 Crompton-Knowles 8-108" Cashmere Broad 25 Har. 3 Box					
	Percher					Pre 1934 1-98" Roll 36 yd. Dial		
9. Wet Finishing	Extractor			1918 Tolhurst Centrifugal (Sold Later)		1930 Tolhurst Centrifugal	1947 48" Whirlwind	
	Dryer Cloth	Attic Tenter Bars & Stream				1935 Tenter Bars	1942 Miller 20th c.	
	Washer, Cloth		1904 Hunter (3-4 String) (1-2 String)					

Figure 4.
Gertenrich's machinery chart (Gertenrich, 1978)

Manufacturing Process	Machinery	1890	1900	1910	1920	1930	1940	1950
	Fulling Machine		1900 5(4 String)					
	Sewing Machines		1900 Tilling Hast With Table 1900 Singer 1 Zigzag					
10. Dry Finishing (Finishing Room)	Napper				1914 Jones Single-Acting 88"			
	Shear		1908 Parks & Woolson 2(66" Single)		1908 Curtis & Marble 1920 1(66") David Gessners	Pre 1934 1(66" Rotary Steam)		
	Cloth Winder & Doubling		1900 Windle 1(32")				1946 Springfield Folding Machine	
11. Power (Water Turbine House)	Water Wheel #1	James Leffel 48" Water Turbine						
	#2			1914 James Leffel 45" Samson				
(Wet Finishing House)	Generator Motors						1941 1 60 H. P. 1948 3 for Blower & Burr Picker	

Figure 4. (continued)
Gertenrich's machinery chart (Gertenrich, 1978)

vintage are: a 1920's shear; 1930's extractor and shear; a 1940's extractor; a cloth dryer; and a folding machine. It is unclear from Gertenrich's chart whether later vintage machinery replaced earlier machinery or was an addition to earlier machinery. A press is not shown in Gertenrich's chart (1978) of the finishing department machinery.

Power to operate all of the machinery in the finishing department was furnished by a water turbine. The force of water from the millrace was transferred through the turbine via a drive shaft to a series of pulleys and belts attached to each machine. This source of power continued from 1890 until 1941 when the addition of equipment in other departments necessitated changing the source of power in the wet finishing department to a 60 horsepower generator. (Gertenrich, 1978)

The information provided by Lomax (1974) and Gertenrich (1978) about the Thomas Kay Woolen Mill finishing department from 1890 to 1962 gives an incomplete picture of the operation. Their studies indicate that the mill had complete finishing departments during the years of its operation. However, the finishing production

processes mentioned in the Thomas Kay mill are relatively simple when compared to the finishing production processes used by other wool fabric manufacturers during the same time period.

PROCEDURE

The purpose of this historic research was to provide the documentation necessary to develop the finishing departments portion of a museum exhibition at the Thomas Kay Woolen Mill.

Manuscripts in the Mission Mill Museum archives were analyzed for information about the finishing department of the Thomas Kay Woolen Mill. Records of the mill's operation for every year from 1890 to 1962 were available. However, not all records are complete for every year. To determine the location of the finishing departments in the mill (Objective 2), architects' plans and insurance company plans were analyzed. Bookkeeping records, department work logs and equipment inventories were available to clarify finishing production processes (Objective 1) and the machinery used in the finishing processes (Objective 3). A chart was constructed in order to list finishing department machinery used during the mill's operation.

Newspaper articles about the Thomas Kay Mill in The Oregonian, The Oregon Statesman, The Capitol Journal, and The Statesman Journal were available on microfilm in the Oregon State Library for

the years that the mill operated. Pertinent dates were reviewed for articles including information about the Thomas Kay Woolen Mill finishing department (Objectives 1,2,3,4).

Extant finishing process machinery in the museum buildings and warehouses was inventoried and compared to machinery manuals in the archives for accurate identification. A comparison of inventories and bookkeeping records was made to determine purchase dates of the machinery (Objective 4). A chart was made of finishing department machinery that was in the Mission Mill Museum collections.

Gertenrich (1978) interviewed about fifty employees of the Thomas Kay Woolen Mill. Tapes of those interviews with employees of the finishing departments were obtained and analyzed for the purpose of clarifying finishing production processes and the methods of use of finishing department machinery and equipment. Any employees of the finishing departments who were still available were interviewed by this researcher in order to gain information not obtained from the Gertenrich tapes.

Recommendations on the inclusion of machinery in the museum exhibition (Objective 5) was based on the findings from the other

research objectives. These recommendations were illustrated with a proposed plan of the museum exhibition space.

THE WOOL FABRIC FINISHING PROCESSES

The fabric finishing processes discussed in this chapter are the processes that were predominantly used during the operation of the Thomas Kay Woolen Mill between 1890 and 1962. The processes used were determined by the types of fabrics produced and the machinery that was available. Sufficient information was not available to describe finishing processes that may have been used during the short-term production of some fabrics, such as the worsted fabrics or some of the finer weight suiting fabrics. The processes described are those commonly used in the manufacture of woolen fabrics (Von Bergen & Mauersberger, 1938). However, the present research was a case study of the Thomas Kay Woolen Mill and the procedures for these processes may be different from other woolen mills.

The fabric finishing processes in the Thomas Kay Woolen Mill changed very little between 1890 and 1962. Unlike other departments in the mill which acquired modern machinery and modified production processes during the 1930's and 1940's, there were only

minor changes in the finishing department. These changes were in the modernization of the drying process.

The first worsted fabric manufactured on the West Coast was produced at the Thomas Kay Woolen Mill in 1896 ("The first bolt," 1896). However, production of worsted fabric was discontinued at the Kay mill a few years later (Blanchard, 1977; Finishing Department Ledgers, 1895-1964; Jantze, 1977). Production of woolen fabrics was more suited to the variety in wool clip and the financial resources of the mill than the production of worsted fabric (Reid, 1977; Pero, 1987). In addition, the Alaskan gold rush and later World War I created an increased market for heavy woolen blankets and fabric for warm outerwear ("Many order ahead," 1897; Lomax, 1974).

Thomas Kay purchased a mixed variety of fleece from local farmers in addition to fleece purchased from wool brokers (Blanchard, 1977; Kay, 1977; Picha, 1977). Not all of the fabrics produced at the Thomas Kay Mill were made of virgin wool. The use of "shoddy" (wool fibers obtained from ground rags or wool mill waste) mixed with virgin wool allowed a savings in the cost of raw materials while

still allowing the production of a high quality woolen fabric (Page, 1977; Pero, 1987).

Perching

At the Thomas Kay Woolen Mill, woven fabric was removed from the loom and draped overhead on parallel wooden rollers called perches, (see Figure 5, p.23). Here, the fabric was examined and irregularities were marked with chalk along the selvedge. The fabric was weighed and a paper tag that listed the cut number and the style number was attached. Each cut of fabric was rolled into a long bundle and dropped through a trap door to the first floor wet finishing room. (Pero, 1987)

Burling

During the burling process at the Thomas Kay Woolen Mill, women removed unwanted yarn ends from the fabric surface, mended minor errors and marked the fabric for wet finishing. A bundled cut of fabric was placed beneath the tilted top of the burling table.



Figure 5.
Perching
("The woolen mill," 1947)

Scissors were used to trim loose yarn ends off the surface and selvedge of the fabric as it was passed over the surface of the metal table top (see Figure 6 & 7, p.25). Any knots or slubs of yarn ends were pushed to the back side of the fabric for removal by the sewers. Next, the fabric was draped over perches that were hung from the ceiling along the south side of the finishing room. A perch was located in front of each window in order to provide the optimum light. Standing beneath the perch and between the lengths of fabric (see Figure 8, p.26), the burlers removed extra warp or filling threads with a long tweezer-like tool called a burling iron.

Sometimes errors in the weave were rewoven using a long needle. At other times, the error remained and the purchaser was given a yardage allowance to compensate for the error. Before the cuts of cloth were taken to the fulling mills, the paper tags were removed and the tag number was sewn on the fabric end. (Ade, 1977; Vohs, 1977; Pero, 1987).

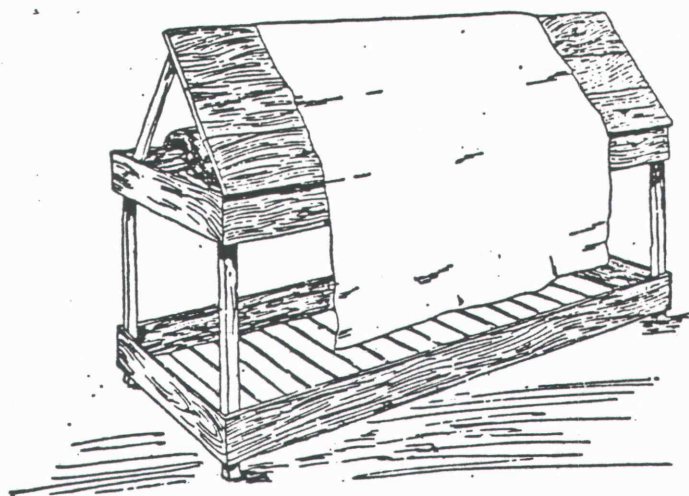


Figure 6.
Burling table
(Umpleby "et al," 1916)



Figure 7.
Woman burling
("The woolen mill," 1947)

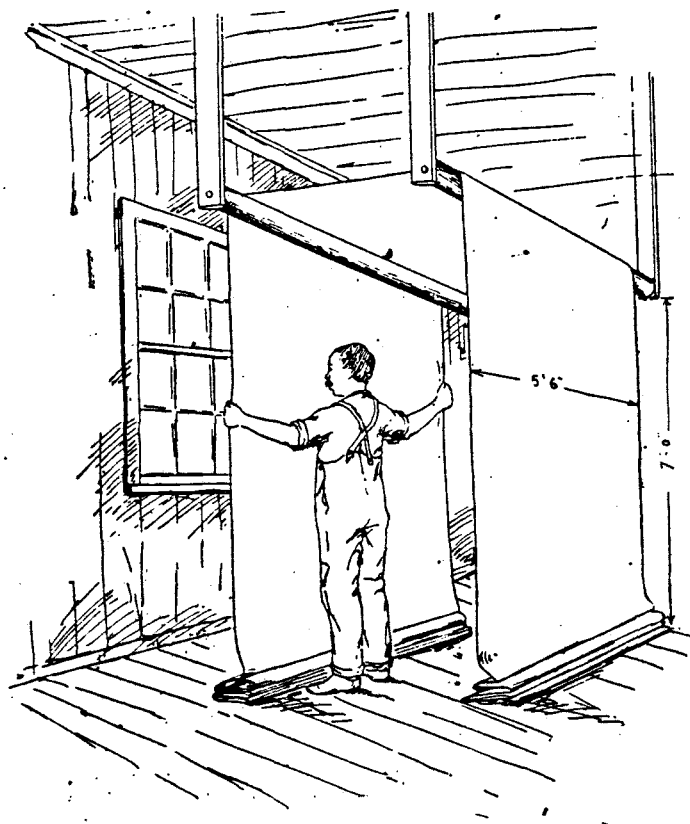


Figure 8.
Burling perch
(Umpleby et al, 1916)

Fulling

Fulling is a process in which the fabric acquires its desired density. This is achieved by applying water, soap, heat, and friction to the wool fabric in a machine called a fulling mill. Under these conditions, the wool fiber expands and felts and the fabric shrinks. The fabric weave becomes more dense and the fabric has a softer feel.

Fulling was a particularly important process at the Thomas Kay Woolen Mill because the majority of the fabrics produced were blankets and woolen fabric in which the density of the fabric was more important than the weave structure of the fabric (Pero, 1987).

Along with the dyemaster and the mill superintendant, the foreman of the fulling department was considered one of the most important persons in the mill (Reid, 1977; Blanchard, 1977; Pero, 1987). It was also a position that required great skill to be done well. To be successfully fulled, a cut of fabric had to be evenly shrunk to the desired density. If the fabric was allowed to shrink too much, it became board-like and was ruined. If a fabric was allowed

to run too fast through the fulling mill, the fabric would tear (Reid, 1977).

The workers interviewed who operated the fulling mills in the Thomas Kay Mill acquired their training by experience. They judged the condition of the fulling fabric by the smell and the feel of the fabric. Their job was made more complicated by the fact that no two batches of wool have just the same felting properties. It was further complicated by the fuller's uncertainty of the proportion of shoddy and virgin wool in each cut of fabric (Reid, 1977; Pero, 1987).

The procedure used in the fulling process at the Thomas Kay Woolen Mill began with threading the cuts of cloth into the fulling mill and sewing the cuts together to form a continuous belt (see Figure 9, p.29). In the large fulling mills, usually two cuts of fabric approximately forty-eight yards long were sewn together to form a belt. A belt of fabric was formed on each side of the fulling mill. Two strings were tied at the selvedge exactly thirty-six inches apart (see Figure 10, p.30). These markers were checked periodically during the fulling process in order to judge the amount of shrinkage of the fabric (Hubbard, 1977).



Figure 9.
Sewing fabric before fulling
("The woolen mill," 1947)



Figure 10.
Marking fabric before fulling
("The woolen mill," 1947)

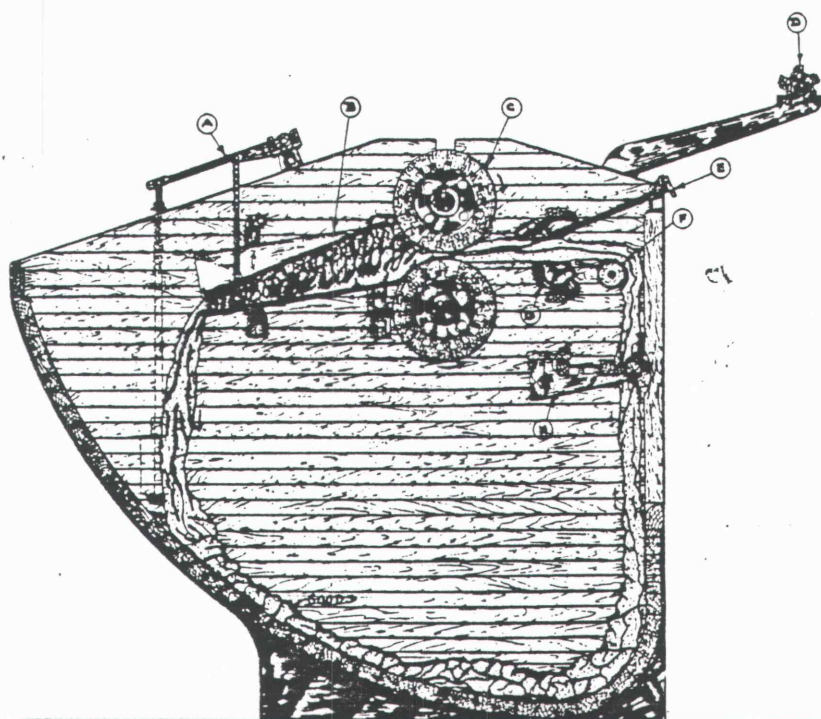


Diagram of a Modern Rotary Fulling Mill.
Specially prepared by J. Hunter Machine Co.

A—Compound Weighting.
 B—Crimping Box or Trap.
 C—Main Rolls.
 D—Outboard Delivery Roll.

E—Adjusting Nut for Tension.
 F—Tension Whip Roll.
 G—Diamond Eye Tension.
 H—Stopmotion.

Figure 11.
 Fulling Mill
 (Von Bergen & Mauersberger, 1938)

As shown in Figure 11 (p.31), the fabric rotated through the fulling mill. As it passed through the weighted rollers at the top of the mill, it was compressed, encouraging shrinkage in the filling or crosswise direction. A trap door at the top rear of the fulling mill was weighted in order to regulate the speed at which the fabric passed through the mill. The bunching of the fabric beneath the trap door encouraged shrinkage in the lengthwise or warp direction (Reid, 1977; Hubbard, 1977).

As the fabric rotated in the fulling mill, soap was gradually poured into the back of the mill to be evenly distributed throughout the fabric (see Figure 12, p.33). If a fabric was very thick, it was sometimes passed through a soaping machine (see Figure 13, p.34). Soap solution was placed in the lower trough of the soaping machine. Fabric was inserted at one end of the trough and pulled through the soap solution by hand. This insured a more even distribution and absorption of the soap solution than could be achieved by pouring the solution directly into the fulling mill. The soaping machine was not frequently used in the Thomas Kay Mill (Pero, 1987).

The soap used in the Thomas Kay Woolen Mill was purchased in



Figure 12.
Adding soap to the fulling mill
("The woolen mill," 1947)



JAMES HUNTER MACHINE CO.

NORTH ADAMS, MASS., U. S. A.

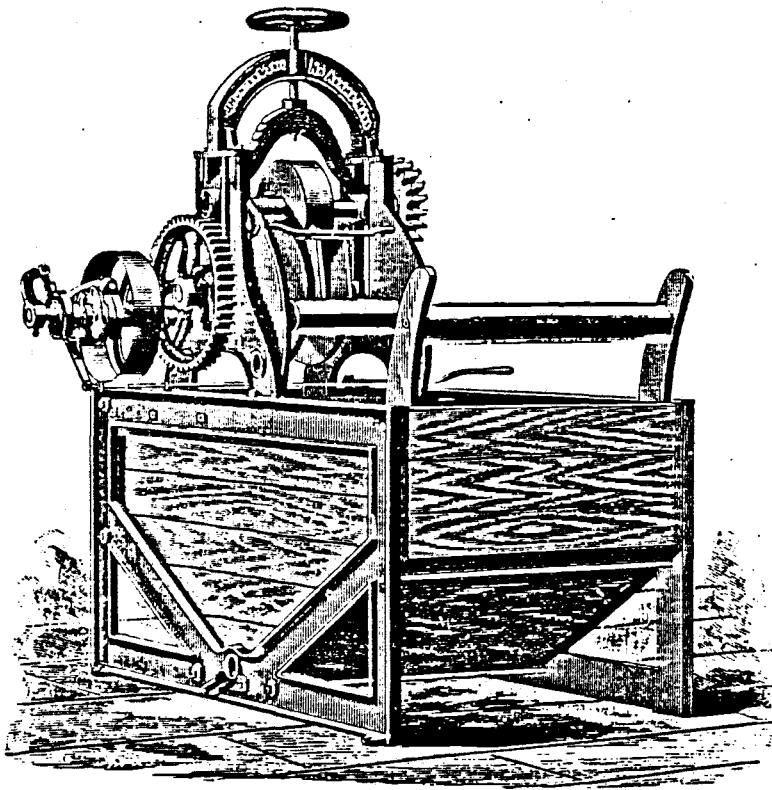


Soaping Machine

Bulletin 52



SOAPING MACHINE



**For Soaping and Wetting Goods
Before Fulling**

Figure 13.
Soaping machine
(Mission Mill Museum Association)

a solid form. The soap was chipped and boiled with hot water in a vat located north and adjacent to the wet finishing room. When the soap reached a liquid consistency, it was piped to wooden vats located along the north wall of the wet finishing room. If the soap cooled and became hard, steam pipes reheated the mixture (Hubbard, 1977).

The amount of time that the fabric rotated in the fulling mill depended upon the reaction of that particular batch of wool to the felting elements of water, soap, heat and friction. One fabric might run one-half hour, another fabric might run four hours. The length of the cut of fabric would also influence the length of running time. For example, a light weight, long cut of fabric might run a similar length of time as a short cut of a heavy weight fabric (Hubbard, 1977).

Washing

Water for washing the fabrics was piped to the washers from the millrace via an intake pipe just above the power turbine. The water was heated as it passed through pipes near the boiler. Drainpipes from the washers emptied the dirty water back into the

millrace until the 1940's when the drainpipes were routed into the sewer system (Mentzer, 1977).

Soapy, full fabric was threaded into the washers to be rinsed. Again, the ends of the fabric were sewn together to form a continuous belt of cloth. The bottoms of the washers were filled with warm water. Sometimes soda ash was added to the water if additional abbrasion to the fabric was desired. The fabric was rotated until soap, dirt and manufacturing oils had been removed (see Figure 14, p. 37). The washer was drained and the fabric was rinsed with clear water (Hubbard, 1977).

Extracting

Fabric removed from the washers was carted to the extractor where excess water was removed by centrifugal force. Glenn Brooks (1977) reported that a sizeable man with strong shoulders and arms was needed for this job. Fifty-yard cuts of wet wool fabric were heavy to lift and maneuver. Figure 15 (p. 38), shows the extractor operator aided by a machine called a scutcher which was added to the

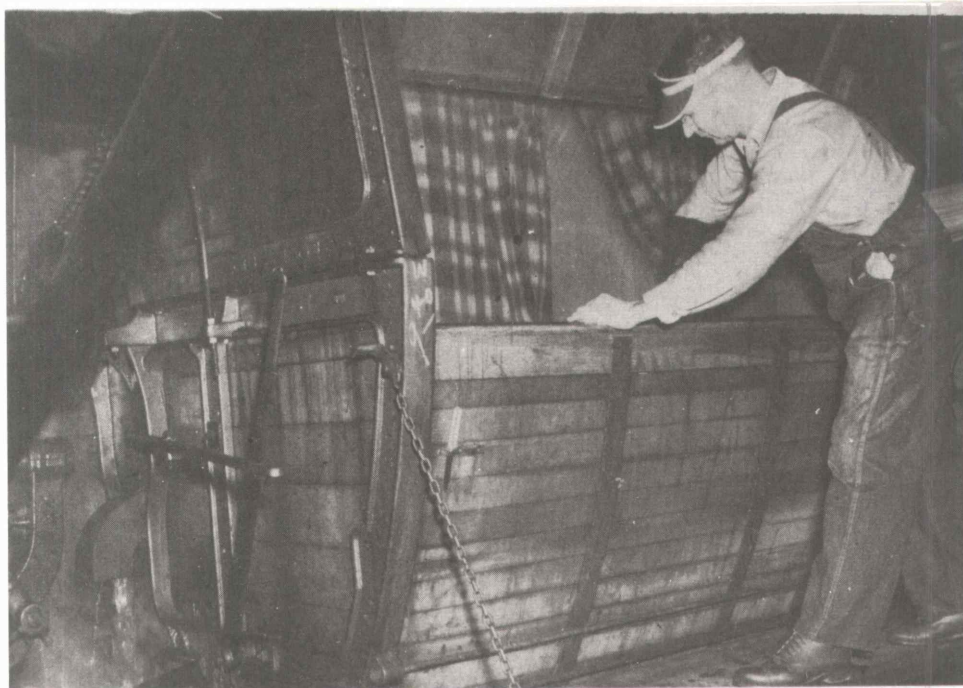


Figure 14.
Checking fabric in the washer
("The woolen mill," 1947)

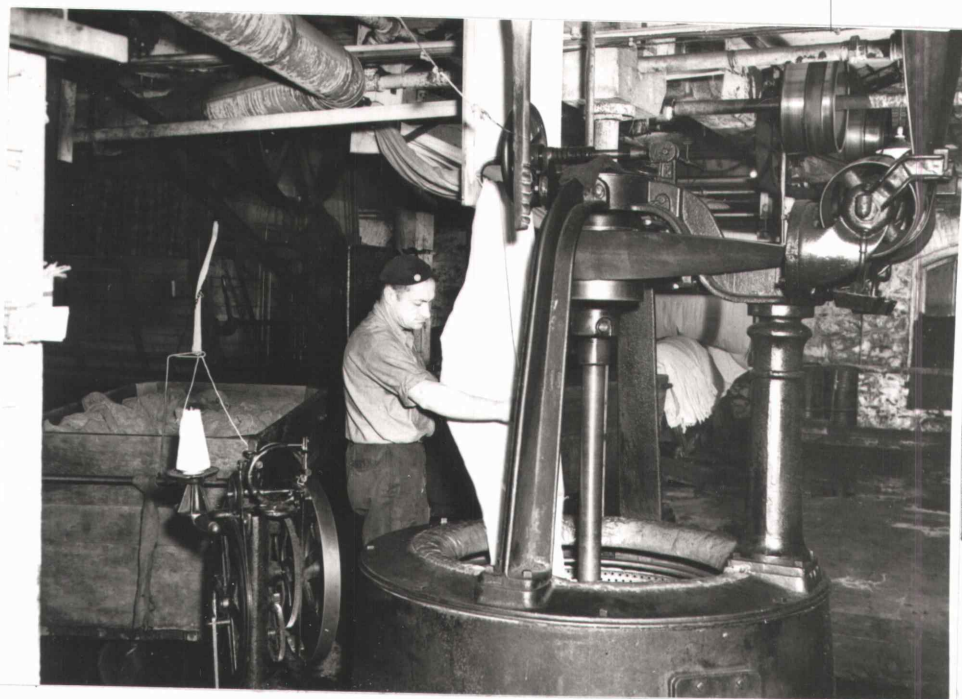


Figure 15.
Unloading the extractor
("The woolen mill," 1947)



Figure 16.
The scutcher distributing fabric on the "horse"
("The woolen mill," 1947)

mill in the early 1940's. As the damp fabric was removed from the extractor, the scutcher untangled the fabric, stretched it and folded it on a wheeled wooden "horse"(see Figure 16, p.39). Folded fabric was wheeled to the drying areas. (Hubbard,1977; Pero, 1987)

Drying

Until 1941, fabric was dried by tentering. Tentering is an open-air drying process in which wet fabric is stretched between horizontal wooden boards which are spiked with sharp nail-like hooks (see Figure 17, p.41). Tenter racks lined the walls of the fourth floor loft of the brick mill building. Five rows of two-sided racks, 120 feet long, filled the loft; leaving just enough room for walking between them. Fabric was hung on the tenter racks during the day. Steam, which was piped in overnight, accelerated the drying process. (Pero,1987; General Appraisal Company, 1934).

Workers' hands became calloused and agile as they hooked the selvages of the fabric over the sharp hooks and adjusted the top bar of the tenter rack to make the fabric taut. Sometimes there was time

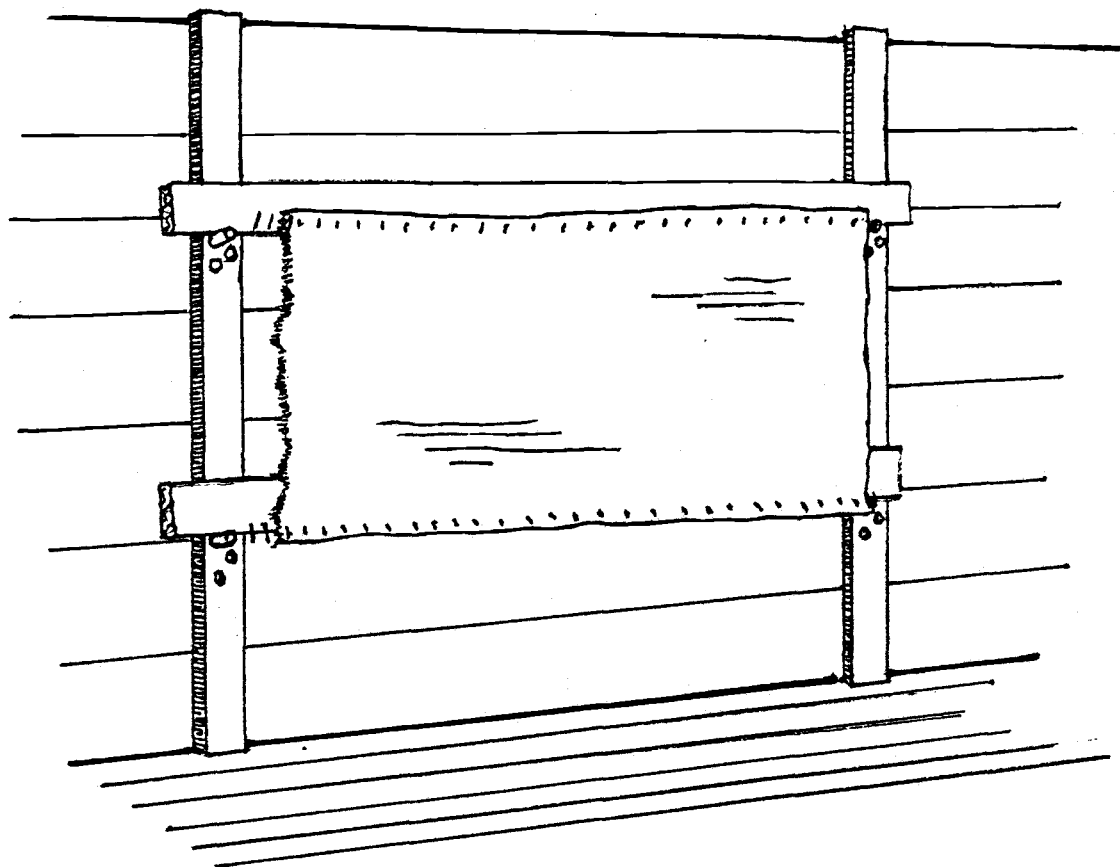


Figure 17.
Fabric hung on the tenter rack

to rest before the next load of fabric arrived in the elevator, but the hot, humid air did not make the job appealing to some of the workers interviewed (Brooks, 1977; Pero, 1987).

A small mechanical dryer, installed in the wet finishing room, supplemented the tentering during the 1930's. In 1941, a larger mechanical cloth dryer was purchased which eliminated the need for tentering (see Figure 18, p.43). This addition, housed in a shed adjacent to the wet finishing room, greatly improved efficiency in the drying operation. No longer was it necessary to haul fabrics to the fourth floor from the first floor and back down again for dry finishing. Fabrics could also be dried with the labor of just one worker instead of five. (General Appraisal Company, 1934; Scott, 1935; General Journal, 1935-43)

Raising

Raising refers to the process in which abrasion is applied to woven wool fabric such that some of the yarn fibers are brought to the surface of the cloth. It is used to create a thicker, softer cloth.

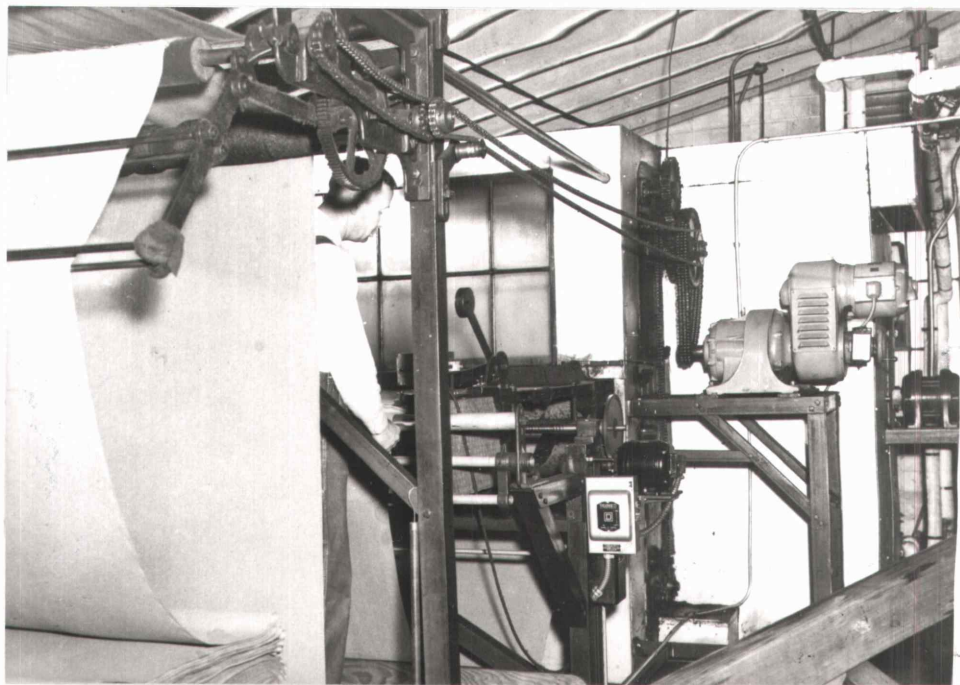


Figure 18.
The mechanical cloth dryer
("The woolen mill," 1947)

Raising also is used to visually blend the colors or the weave of a fabric to create a muted appearance. Sometimes the weave structure of a fabric is made completely undetectable by heavy fulling and napping processes. For raising, the cloth may be dry or damp depending on the desired finished appearance. To produce minimal raising of the fibers, a light brushing of the fabric is sufficient. If more raising of the fibers is desired, such as for the surface of a blanket, a napping machine is used. (Etzel, 1987).

When the Thomas Kay Woolen Mill opened in 1890, brushing machines and napping machines were used for raising (Sanborn-Perris Insurance Atlas of Salem, Oregon, 1890). One type of napping machine was called a gig (see Figure 19, p.45). The heads of teasel, a specially cultivated plant, were arranged in wooden racks (see Figure 20, p.46). The racks were placed on the gig and as the machine rotated, fabric was passed in contact with the sharp, hooked, spines of the teasel heads. This raised some of the wool fibers to the surface of the fabric (Beaumont, 1909).

A wire napper was also used for raising (Sanborn-Perris Insurance Atlas of Salem, Oregon, 1890). Rollers with wire brushes

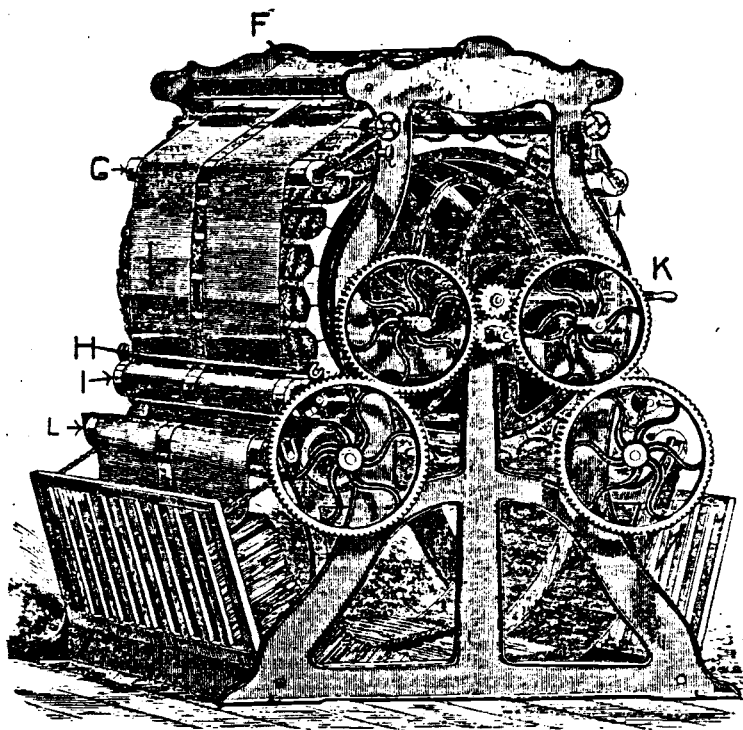


Figure 19.
Gig
(Umpleby et al, 1916)

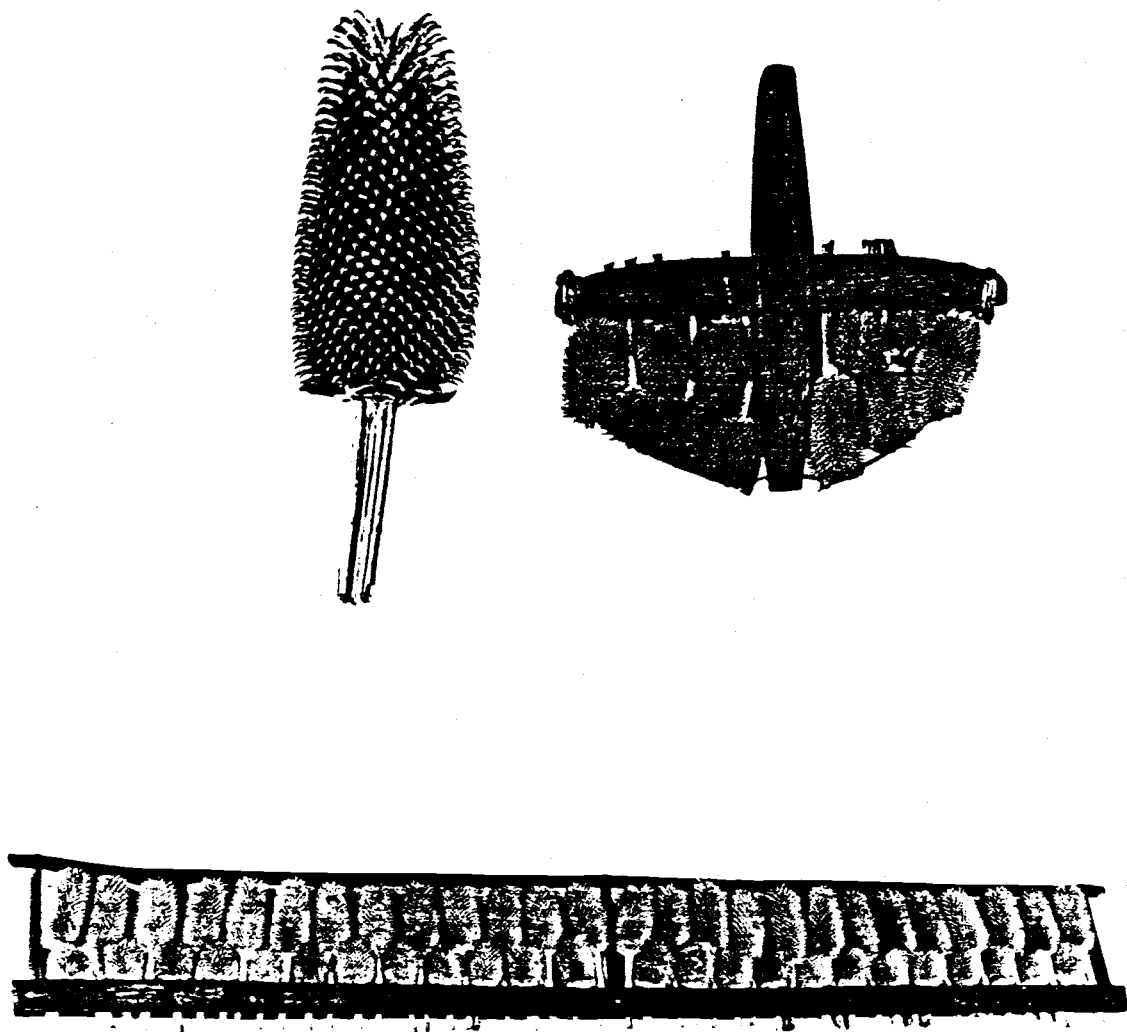


Figure 20.
Teasel
(Merrimack Valley Textile Museum)

replaced the teasel racks in the wire napper design . In the industry, some woolen finishers believed that the wire nappers were too harsh on the fabric. Therefore, some teasel gigging continued in the industry until the 1930's (Gross, 1986). It is unclear from the records how long the teasel gig continued to operate at the Thomas Kay Mill (Accounting book, 1890-1924). However, by 1934 only wire nappers were in the inventory (General Appraisal Company, 1934).

Blankets produced at the Thomas Kay Woolen Mill were always napped. Not all of the fabrics, however, were finished on the nappers. Fabrics which required only a slight raising were brushed in the brushing machine or were brushed only by the brushes in the shear (see Shearing, p.48). The fabrics which required the nap to lie in one direction were run through the single-acting napper and fabrics which required the nap to lie in more than one direction were run through the double-acting napper. If a raised finish was desired on both faces of the fabric, the cloth was turned over after the first pass through the napper and run through the napper again. (Pero, 1987)

Shearing

Fabrics which required a smooth, flat surface were sheared. At the Thomas Kay Woolen Mill this process was performed on a machine called a shear which had a lawn-mower like blade that trimmed the excess raised fibers from the fabric (see Figure 21, p.49). The adjustable height of the blade allowed for an exacting trim of the fibers to the desired length.

Fabrics, such as meltons and mackinaws, used for heavy outer garments were napped before they were run through the shear. Other fabrics such as those used for suitings, were sheared with little raising of the fibers other than that which occurs in the wet finishing processes and the brushing which occurs as the fabric passes through the shear. (Pero, 1987)

Shear operators had to pay close attention to their work. Lengths of fabric were seamed together to form a loop. As the fabric passed through the shear, the operator had to manually lift the rotating blade over the seam or the fabric would be cut. (Brooks, 1977)

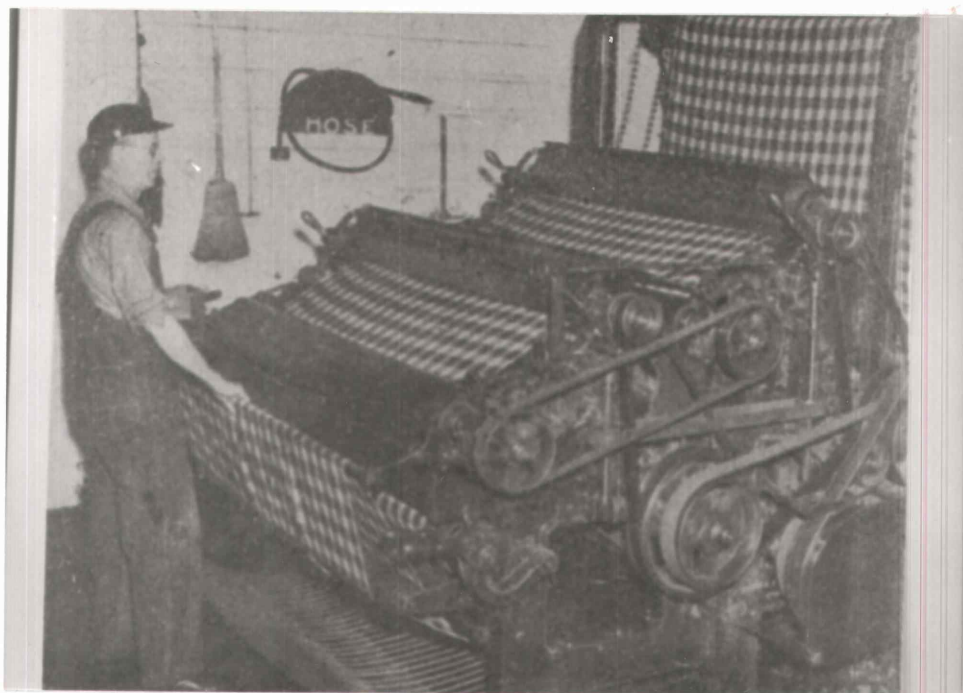


Figure 21.
Shearing
("The woolen mill," 1947)

Pressing

Pressing is the final flattening of the surface of the fabric with the use of moisture, heat and pressure. The Thomas Kay Woolen Mill had horizontal steam presses throughout its years of operation (General Appraisal Co., 1934). Figure 22 (p.51) shows the operator guiding the fabric through the press.

It did not require a long period of training to operate the press. Glenn Brooks (1977) said it was a hot, uncomfortable job and was sometimes delegated on warm days to the worker with the least seniority in the dry finishing room.

Inspecting

Blankets and fabrics that had received the necessary dry finishing processes were inspected. Until the 1940's, the cloth was unrolled over a fifteen foot table in the dry finishing room. One end of the table had a glass window with a light beneath it. As fabric passed over the glass any irregularities in the fabric would be

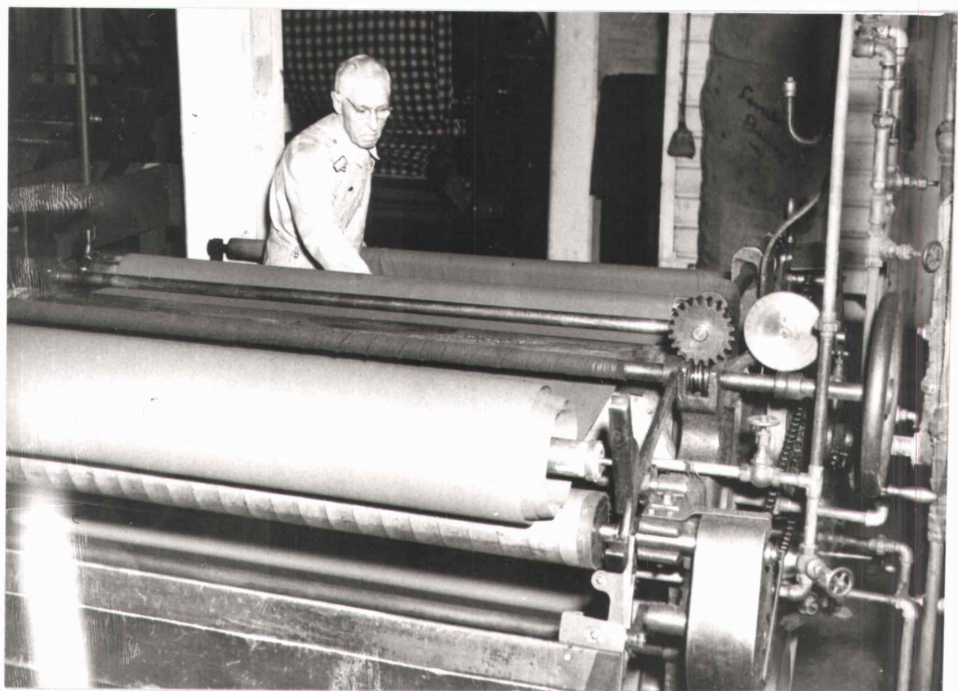


Figure 22.
Pressing
("The woolen mill," 1947)

illuminated. Workers would remove any unwanted specks of thread or dirt which might remain on the fabric with tweezers. (Pero, 1987; General Appraisal Co., 1934)

Early in the 1940's the method of final inspection of the fabric changed. The finished fabric was draped over a tilted glass inspecting frame (see Figure 23, p.53). This frame hung from the ceiling directly in front of a window in the dry finishing room. The inspector marked any flaws in the fabric by placing a string at the selvedge and purchasers were given a yardage allowance. ("At the woolen mill," 1947; Pero, 1987)

Sewing and Stamping

At the Thomas Kay Woolen Mill, blankets required additional finishing steps that were not necessary for the fabric yardage that was produced. Each blanket was cut to the specified size and the edges were overcast or bound with fabric. In some cases, labels were



Figure 23.
Final inspection
("The woolen mill," 1947)

sewn to the blanket. This sewing took place at long tables which could accommodate as many as two or three sewing machines that were located near the perches in the wet finishing room. (Brooks, 1977; Hubbard, 1977; Vohs, 1977)

Blankets produced for military contracts for the United States Army were stamped at a table constructed just for that purpose. U.S. initials were stamped precisely in the middle of the blanket. (Hubbard, 1977)

At this point, the finishing processes of the woolen fabric were complete. The fabric was either rolled on long tubes or folded and made into bolts on a mechanical winder (see Figure 24, p.55). Bolts were wrapped with twine and paper (see Figure 25, p.56). Some of the blankets were boxed and either a Thomas Kay label or a distributor's label was inserted. ("The woolen mill," 1947; Pero, 1987)

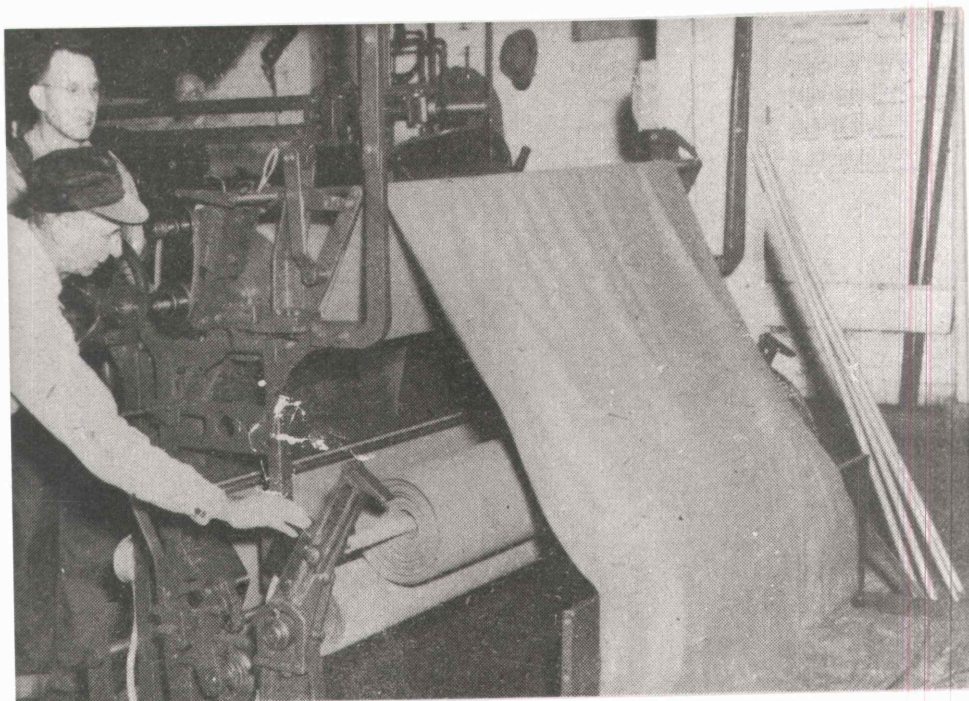


Figure 24.
Mechanical bolt winder
("The woolen mill," 1947)



Figure 25.
Wrapping bolts for shipping
("The woolen mill," 1947)

LOCATION OF THE FINISHING DEPARTMENT

Thomas Lister Kay built his Salem mill the winter of 1889-90 ("Opening day," 1890). The site of the closed Pioneer Oil Company was purchased along with the millrace water rights from the Willamette Woolen Co. (Bill of Sale, 1889). The primary mill building was a three story wooden structure with additional buildings built to the east (see Figure 26, p.58) ("A fine building," 1889).

Sanborn-Perris Insurance Atlas of Salem, Oregon maps, (1890;1895), (see Figure 27, p.59 and Figure 28, p.60) indicate a finishing department on the first floor of the mill building. The maps also indicate a separate fulling room directly north of the turbine house. Probably dry finishing occurred in the main mill building and the wet finishing was performed in the fulling room. A steam dry room is indicated on the fourth floor. It is probable that this fourth floor was a loft in the rafters.

The wooden mill buildings burned to the ground in November of 1895 ("A new woolen mill," 1895). In 1896, Thomas Kay

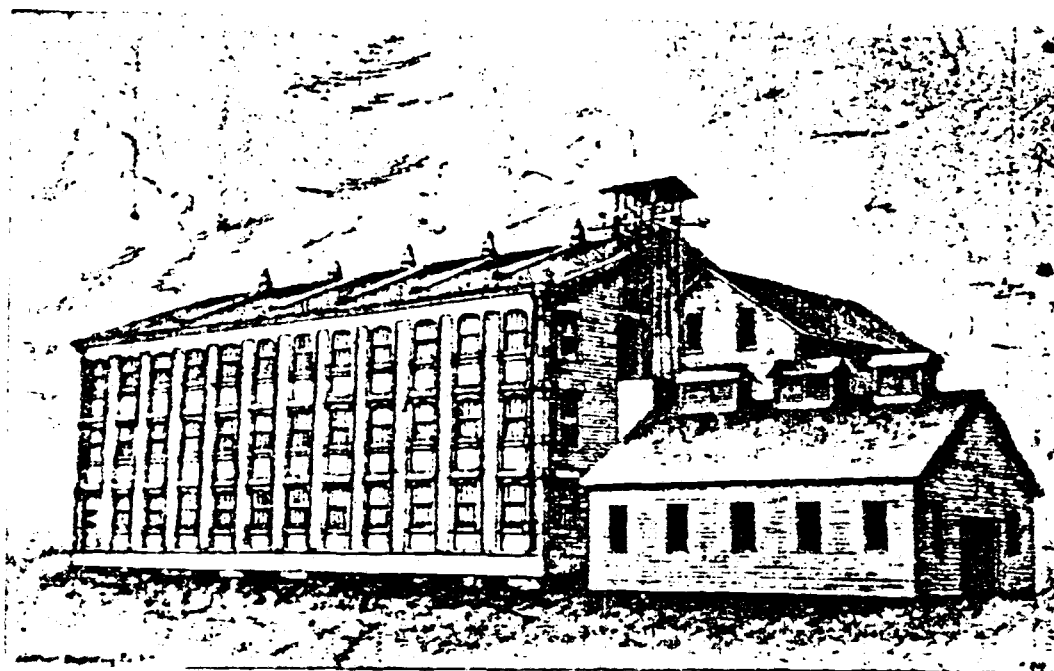


Figure 26.
Thomas Kay Woolen Mill ca. 1890
("A fine building," 1890)

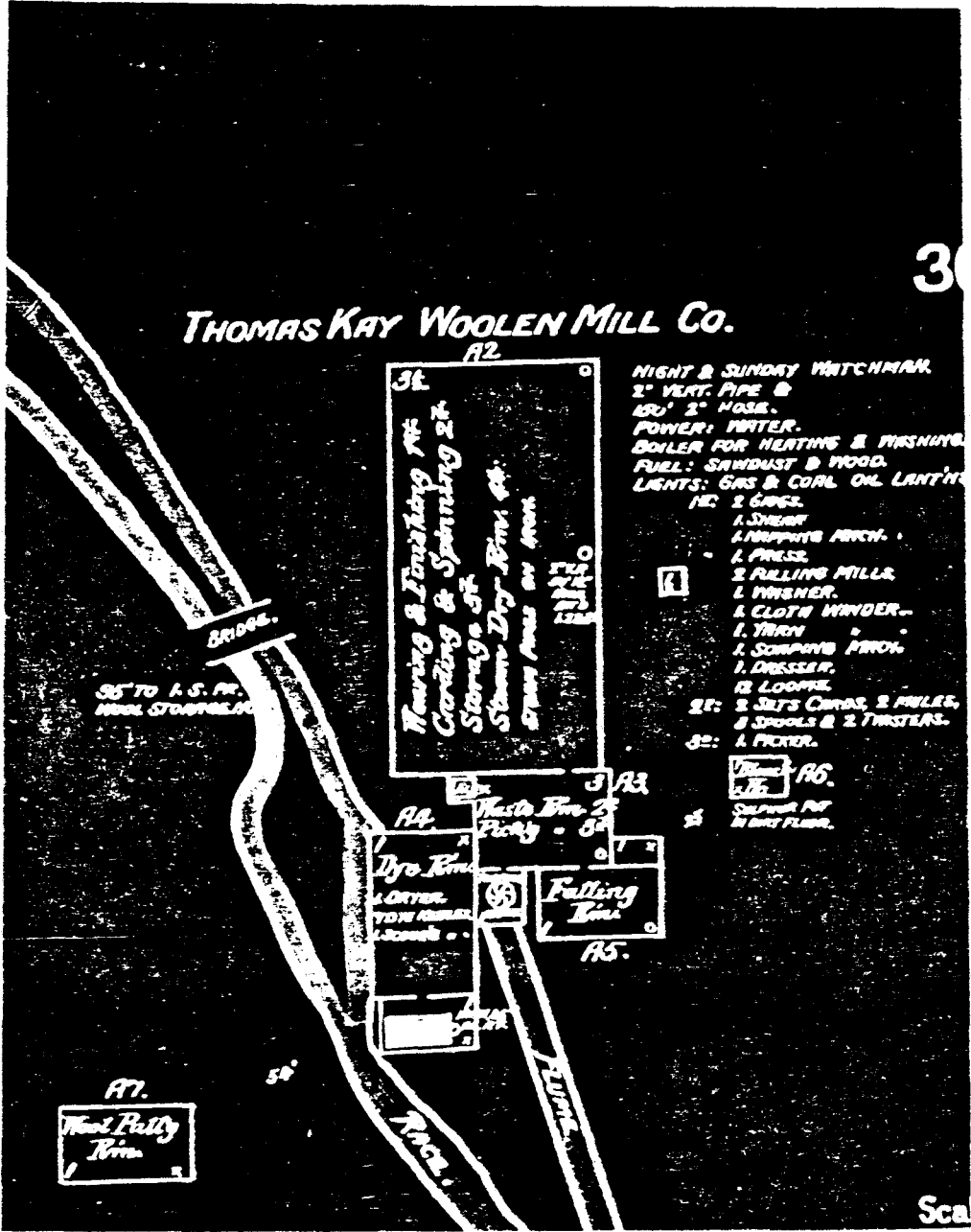


Figure 27. .
Sanborn-Perris Insurance Atlas of Salem, Oregon map, 1890

asked W.D. Pugh to design the present brick mill building which was constructed the same year ("The stock all taken," 1895). To decrease the extent of damage in case of another fire, a forty-foot corridor separated the main building from the dye house and picker house ("The work started," 1895).

Sanborn-Perris Insurance Atlas of Salem ,Oregon maps

(1895-1915) indicate that the main brick building was a two story building with a partial basement and an attic. Steam drying is indicated in the fourth floor attic. The 1895 map, updated to 1915 (Figure 29, p.62), shows the wet finishing room in the basement at the east end of the building. The dry finishing room is indicated to the east, adjacent to this basement finishing area and on the same level.

Since there is no fire corridor indicated on the 1895-1915 map, it is likely that the dry finishing room was added to the mill after the main mill building was built in 1896. Lomax(1974, p. 74) stated that the finishing department was enlarged in 1898. He also mentioned (p. 53) that in 1898 a two-story brick addition was added on the east end of the main structure. Photographs of the mill

buildings that are dated as late as 1904 do not show a two-story structure at the east end of the mill building. However, they do show a single story structure ("The Thomas Kay Woolen Mill," 1904). It is likely that the 1898 two-story addition to which Lomax referred is the single-story dry finishing room .

Subsequent plot plans of the Kay mill show little change in the location of the finishing departments between 1898 and 1962 (Dyer, 1948; Oregon Insurance Rating Bureau, 1956). Gertenrich (1978) mentioned (p.29) that the basement was excavated to the full length of the brick building around 1920. The basement was enlarged to expand the wet finishing department. She based this observation on the recollection of the millwright, Wayne Mentzer (1977). Gertenrich's recorded interviews with mill workers in 1977 and this researcher's personal interview with Bill Pero (1987), former finishing room foreman, provided conflicting dates of the basement excavation.

Lack of complete machinery inventories or accounting records from 1915 to 1934 make it difficult to substantiate the exact date of the wet finishing room expansion. Inventories show an increase in

the wet finishing room machinery from three fullers and three washers in 1915 (Sanborn-Perris Insurance Atlas of Salem, Oregon, 1895-1915) to four washers and five fullers by 1934 (General Appraisal Company, 1934). Plot plans of the mill show that the basement was fully excavated by 1934 (General Appraisal Company, 1934).

Minor changes to the finishing departments were recorded in the early 1940's. The walls of the dry finishing room were reinforced when two stories were added to the east end of the mill building to accomodate new carding and weaving equipment (Work order, 1941). The addition of a drying room on the south side of the mill building occurred in the fall of 1940 (General Journal, 1935-43). The cloth drying machine installed in this room eliminated the need for tentering fabrics in the attic loft (Mentzer, 1977).

In summary, the finishing departments had different locations in the mill built in 1890 from the mill built in 1896. The location of the finishing departments in the mill built in 1896 changed very little between 1896 and 1962. The only major change in location

was the moving of the drying process from the fourth floor drying loft to the basement level drying room.

THE MACHINERY AND EQUIPMENT USED IN THE FINISHING DEPARTMENTS

There are few early records of machinery for the Thomas Kay Woolen Mill. There was not a full-time bookkeeper until 1906 (Minutes Book, 1889-1940) and complete accounting records were not maintained until the 1920's (Tax files, 1920). Prior to 1934, extant machinery documentation is limited to the inventories on insurance plot plans, occasional accounting inventories and the discussion of machinery purchases in the newspaper or the annual company minutes.

In 1934, a complete appraisal of the mill was conducted in which every item in the mill from the building timbers to the dust pans was listed. The lists from this appraisal for the finishing departments are found in Appendix A (p.90). After 1934, more complete accounting records make it possible to document the buying and selling of finishing department machinery and to identify the machinery that is in the mill today. The machinery used in the finishing departments of the Thomas Kay Woolen Mill from 1890 until 1962 is summarized in Figure 30 (p.67 & p. 68).

-
- 1- 3'6"x7' Hunter fulling mill (1896-1962)
 - 1- 3'6"x7' Hopkins fulling mill (1896-after 1945)
 - 1- 4'x8' Hunter fulling mill (1896-1962)
 - 1- 4'x8' Hunter fulling mill (1929-1962)
 - 2-4'x8' Hunter fulling mills (before 1934-1962)

 - 1- teasel gig (1896-?)
 - 1- 1886 Davis & Furber single-acting napper (1896-1962? mfg. name missing)
 - 1- 1918 Davis & Furber double-acting napper (1931-1962)

 - 1-4 or 6 string James Hunter washer (1896-1962)
 - 1-2 string James Hunter washer (1896-1962)
 - 1-4 or 6 string James Hunter washer (before 1934- after 1934)
 - 1- homemade washer (1896-before 1934)

 - 1- Heathcote cloth dryer (1931- 1941)
 - 1- Miller cloth dryer (1942-1962)

Figure 30
Thomas Kay Woolen Mill
finishing department inventory of machinery
and approximate dates of use: 1896-1962*

1- 6/4 shear (1896-?)
 1-Parks & Woolson 66 1/2" single shear (1929-1935)
 1-Parks & Woolson 66 1/2" single shear (before 1934-1962)

 1-6/4 press (1896-?)
 1-66" rotary steam press mfg. unknown (before 1934-1935)
 1-1920 "David Gessners" Curtis & Marble press (before 1934-1962)

 1-72"x36" semi-decating machine (1949-1962)

 1-6/4 cloth winder (1896-?)
 1-3/4 cloth winder (1896-?)
 1-32" single cloth winder mfg. unknown (before 1934-1946)
 1-32" 1900 J. E. Windle cloth doubling & winding machine (before 1934-1946)
 1-66" Springfield doubling or open folding machine (1946-1962)

 1-6/4 brush (1896-1946)
 1- steamer (before 1915-?)

*based on Sanborn-Perris insurance maps, 1890,1895,1915; Machinery inventory, 1906; General Appraisal Co. Appraisement, 1934; General Journal 1935-1945; General Ledger 1947-1954

Figure 30 (continued)

Thomas Lister Kay traveled to England and the eastern United States to select machinery for his Salem mill ("The woolen mill," 1890). He reportedly wanted the latest equipment for his mill to produce not only woolen fabrics, but also worsted fabrics. He interviewed the machinery manufacturers and visited mills using the machinery in order to discuss its performance. The 1890 machinery list (Sanborn-Perris Insurance Atlas of Salem, Oregon, 1890) shows the following finishing equipment: 2 gigs, 1 shear, 1 napping machine, 1 press, 2 fulling mills, 1 washer, 1 cloth winder, 1 soaping machine.

Presumably, this equipment was damaged or destroyed in the 1895 fire. The mill was rebuilt in 1896 to accommodate more machinery ("The work started," 1895). Finishing machinery from Thomas Kay's Waterloo, Oregon woolen mill was relocated to Salem, where until 1898, fabrics were finished for both mills ("At the woolen mill, 1896).

In 1898, the dry finishing department was expanded (Lomax, 1978). Perhaps this was done in anticipation of expanded business with the newly produced worsted fabrics ("The first bolt," 1896). A

comparison of machinery inventories indicates that the machinery in the wet and dry finishing departments had increased by about one-third between 1895 and 1915 (Sanborn-Perris Insurance Atlas of Salem, Oregon, 1895; "Machinery inventory" 1906; Sanborn-Perris Insurance Atlas of Salem, Oregon, 1895-1915).

The prosperity of the Thomas Kay Woolen Mill fluctuated (Minutes Book, 1889-1940). Second-hand machinery was purchased from the Matzen Woolen Mill, Kirkland, Washington, in 1929, including a fulling mill and a shear for the finishing departments (Minutes Book, 1889-1940). In 1931, authorization was granted to purchase a second-hand double acting napper and a small cloth dryer (Minutes Book, 1889-1940). Modernization of equipment was discussed in the 1930's (Scott, 1934; Minutes Book 1889-1940). However, it wasn't until 1941 that a loan enabled the company to update some of the turn-of-the-century machinery (U. S. National Bank of Portland, 1941). In July, 1941 an automatic cloth dryer was installed, eliminating the need for open-air steam drying of the fabrics (General Journal 1935-1940). A cloth cutting machine was also purchased which enabled workers to cut stacks of blankets at

one time that had previously been cut singly by hand (Brooks, 1977).

Around World War II, there was a marketing shift to produce higher quality suit weight fabrics (Annual Report, 1943,44,45,47). In 1946, a doubling open rolling machine was purchased and to produce a more satisfactory finish to these higher quality fabrics, a semi-decating machine was purchased in 1949 (General Ledger 1947-54). It was the last piece of machinery purchased to improve the finishing department.

During the seventy years of operation of the Thomas Kay Woolen Mill there was very little change in the machinery and equipment in the finishing departments. It is very probable that some of the machinery in the wet finishing department was used from 1896 until the mill closed. The wooden bodies and rollers of the fulling mills and washers were repaired and replaced, but the metal frames remained the same (Mentzer, 1977). Wooden carts and horses, (handmade by Wayne Mentzer, the millwright, and by other millworkers) were also recycled and repaired (Mentzer, 1977; Pero,

1987). Most of the machinery in the dry finishing department had a patent date no later than the 1920's.

RECOMMENDATIONS FOR "THE FINISHING ROOM" EXHIBITION

The Mission Mill Museum Association and the designer of the exhibition, "The Finishing Room," have set the following specifications for the exhibition design:

1. Interpret as many of the finishing processes that took place in the Thomas Kay Woolen Mill as possible.
2. Retain the wet finishing department equipment that remains in place as it was when the finishing departments closed in 1962.
3. Wherever practical, use artifacts from the Thomas Kay Woolen Mill collections (see Figure 31, p.74). If possible, at least one of the representative machines for each process should be restored to operating condition.
4. The exhibition is to be appropriate for a variety of visitors, from school and tour groups of approximately fifteen individuals to families and senior citizens. There must be access for wheelchairs.

Fulling

1. James Hunter fulling mill. patented 1875.
2. James Hunter fulling mill. model #10.
3. " " " "
4. " " " "
5. James Hunter fulling mill. (curved style hatch).
6. Wm. Smith & Sons "Eclipse" model tacking machine with cloth reel.
7. Birch Bros. floor model, foot-powered, portable sewing machine.
8. Tillinghast floor model, foot-powered, portable sewing machine. model #9.
9. Tillinghast floor model, foot-powered, portable sewing machine. Model #2 "master" head.
10. Tillinghast floor model, foot-powered, portable sewing machine. Model #2 "master" head.
11. James Hunter soaping machine with stand.

Washing

1. James Hunter 2- string cloth washer.
2. James Hunter 4-string cloth washer.

Raising

1. Davis & Furber double-acting napper, patented 1918.
2. Single-acting napper, mfg. unknown, patented 1886.

Shearing

1. Parks & Woolson single shear, patented 1909

Pressing

1. Curtis & Marble horizontal cloth steam press patented 1920.

Figure 31

Thomas Kay Woolen Mill finishing department machinery
in the collections of Mission Mill Museum

5. The exhibition is to be confined to the former wet finishing room on the first floor (basement) of the Thomas Kay Woolen Mill building (see Figure 32, p.76 and Figure 33, p.77).

The Exhibition Plan

Figure 34 (p.78) is the proposed design plan for "The Finishing Room" exhibition. The inclusion of machinery, equipment, and interpretive panels in the exhibition is based on the research prepared for this thesis and the artifacts available in the museum's collections. The placement of the machinery, equipment and interpretive panels is based on the specifications defined by the Mission Mill Museum Association and the exhibition designer.

It is recommended that the east end of the former wet finishing department be restored as it was when the mill was in operation. An area for fabric rolls should be provided beneath the trap door from the weaving area on the floor above. A burling table should be placed adjacent to the fabric rolls. Two of the burling perches along the south windows and across the aisle should be

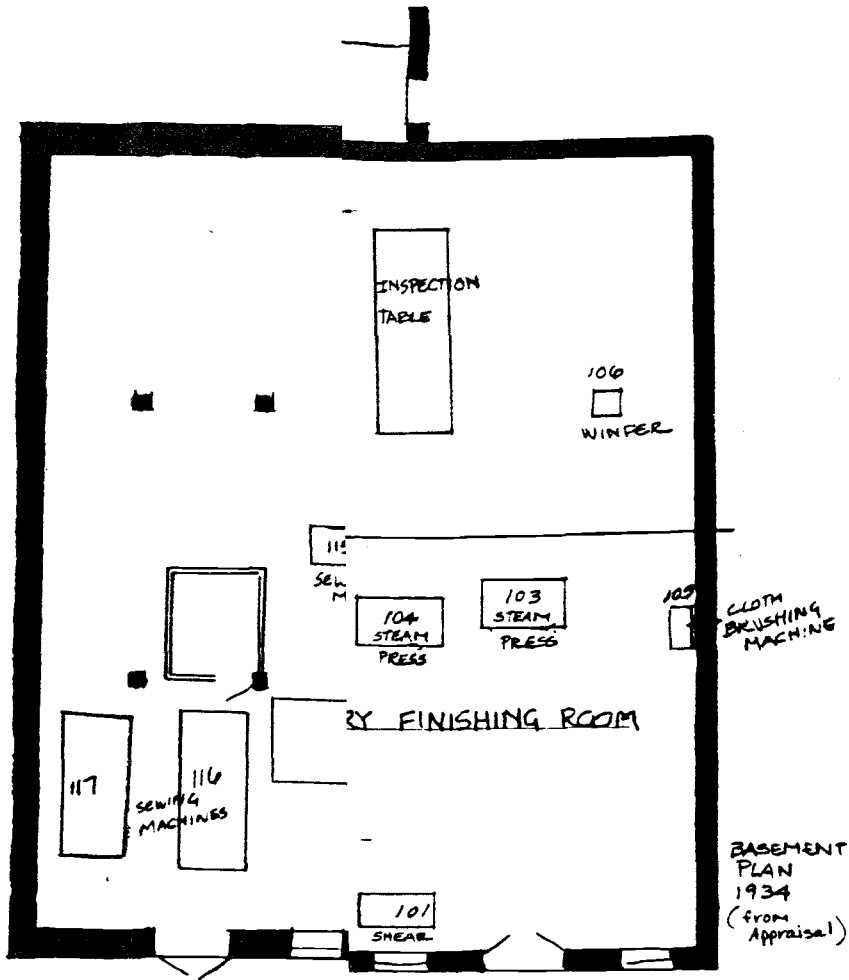


Figure 32.
Finishing departments ca. 1934
(General Appraisal Co., 1934)

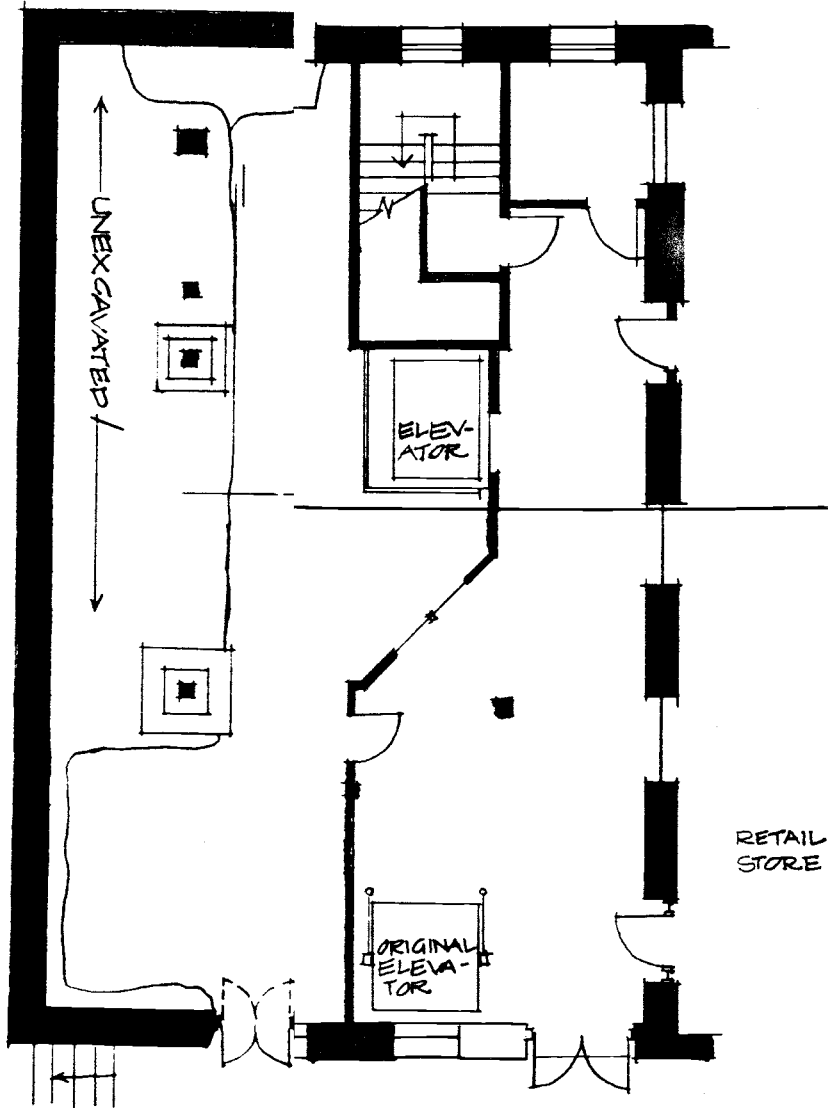
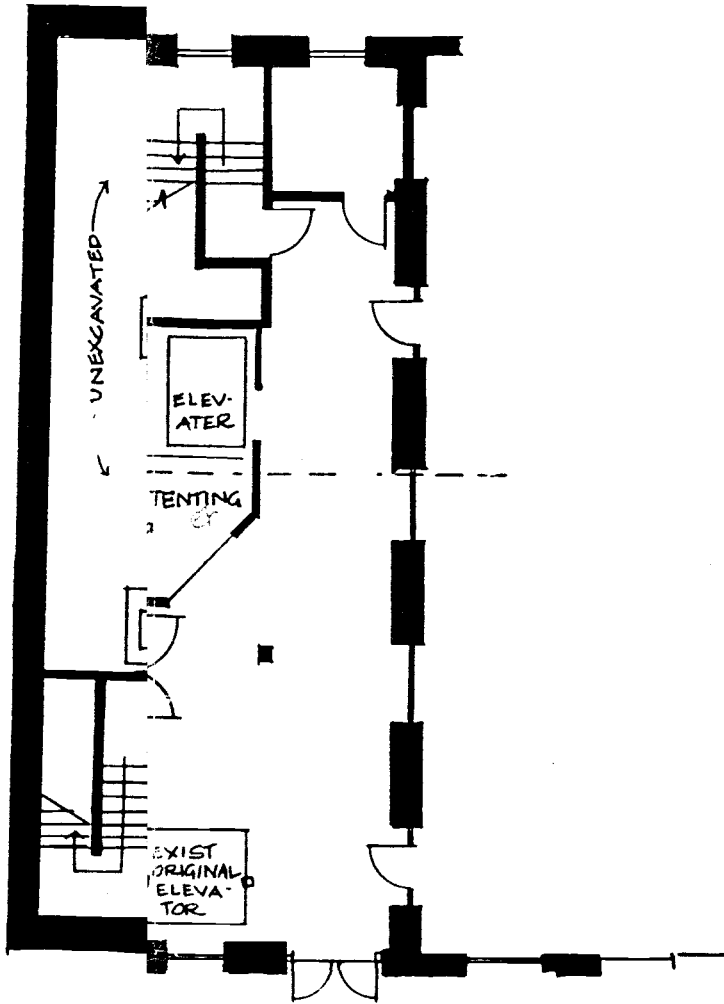


Figure 33.
Former wet finishing room ca. 1986
dapted from Mention, Hanns Associates)
(Mission Mill Museum Association)



UM

Figure 34.
Proposed plan for "The Finishing Room"

restored in place. The remainder of the burling perches along the south wall should be removed to provide space for interpretation of other finishing processes. The arrangement of these areas will allow the visitor to view the initial finishing processes together and in the approximate location in which they were performed when the mill was operating.

The two #10 fulling mills which are in the best condition and the smaller 1877 fulling mill should be positioned under the main drive shaft. The two fulling mills in the most disrepair should be retired to collections storage. The side of the fulling mill next to the visitor viewing area, between the fullers and washers, could be removed. This would allow visitors the opportunity to view fabric inside the fuller and therefore understand the fulling process better.

The washers should be restored in their present position. An extractor should be purchased and placed next to the washers. The soaping vats beneath the windows on the north wall should be retained and restored. The soaping machine and the fabric tacking machine could be placed adjacent to the washers and fulling mills.

This arrangement of the washers and fulling mills would place

the equipment related to washing and fulling in approximately the same position as when the mill was operating. In addition, the line of multiple washers and fullers will retain the visual alliteration of the former wet finishing room and assist the visitor in associating this exhibition with the original wet finishing room.

It is not practical in terms of financial investment and the space requirements of the exhibition to obtain a dryer for the museum collections. Graphic panels, on the east wall, should be used to interpret the drying processes. Tentering, which took place on the fourth floor of the mill, could be recreated with graphic illustrations and models in the area adjacent to the new elevator.

The wire napping machines should be restored in their present position. The wooden decking around these machines and the wooden decking around the soaping vats should be restored. It is recommended that decking also be built around the fullers and washers. During the operation of the mill, most of the wet finishing room had wooden decking to prevent workers from slipping on the wet concrete floor. In order to allow for safe and smooth aisles for

museum visitors, the decking should be built only in the areas indicated on the plan.

The west end of the exhibition space could be used to interpret the remaining finishing processes. The shear, the press and the final inspection perch should be grouped together to approximate the former dry finishing department. The final steps of preparing fabric for the market should be grouped together in the remaining space. The smallest sewing machine table, a sample wrapping table and an interpretive panel depicting the bolt winding machine would complete the interpretation of the finishing department processes. These should be placed in the southwest corner of the exhibition area.

The traffic flow for the exhibition is admittedly circuitous, if the visitor wishes to follow the finishing processes in order. However, tour personnel, signs and written materials will be available to the visitor who wishes to view the exhibition in process order. The design presented is a solution which retains the maximum amount of the original wet finishing room, illustrates all of the finishing department processes while utilizing machinery from the

museum collections and locates machinery near the central drive shaft for actual operation.

SUMMARY

The Thomas Kay Woolen Mill operated in Salem, Oregon between 1890 and 1962. The products of the mill were primarily woolen blankets and woolen fabrics for outerwear clothing. Since its closure in 1962, the property and buildings of the mill site have been purchased by the Mission Mill Museum Association for the purpose of interpreting early Salem history. To assist in this interpretation, the Fred Meyer Charitable Trust granted the Association the funds to develop an exhibition on woolen fabric manufacturing. The portion of the exhibition currently being developed is the finishing departments of the mill. The purpose of the present study was to provide the historic documentation necessary to develop the finishing departments exhibition.

The objectives of the study were: (1) To determine what wool fabric finishing processes were used at the Thomas Kay Woolen Mill during its operation between 1890 and 1962; (2) To determine where the finishing processes took place in the woolen mill; (3) To determine what machinery and equipment was used in the finishing

processes; (4) To document extant process machinery and equipment as to its manufacturer, patent date, and period of use in the mill; (5) To provide contextual information about the finishing departments' processes and machinery; and (6) To provide recommendations on the inclusion of machinery and equipment from the Mission Mill Museum collections in "The Finishing Room" museum exhibition.

The historic documentation of the exhibition was gathered by reading industry manuals on woolen fabric processing and machinery, analyzing the business records of the Thomas Kay Woolen Mill, listening to the work accounts of former mill workers, and reading local newspaper articles which pertained to the Thomas Kay Woolen Mill. Some of these documents have been unavailable or unknown to previous researchers because they were in old storage areas of the mill until discovered by this researcher.

Generally, there was very little change in the location, the processes, or the machinery of the finishing departments during the years of the mill's operation. Modernization of the fabric drying process, in 1941, was the only significant change in the "turn of the century" woolen manufacturing finishing methods used.

A large portion of the wet finishing department remains today as it was when the mill closed. Much of the finishing department machinery and equipment is in the collections of the Mission Mill Museum Association. It was recommended that the predominant finishing processes used in the mill between 1890 and 1962 should be interpreted in the exhibition. The plan for the finishing department exhibition designed by this researcher indicates how the interpretation of the finishing department processes and machinery should be arranged within the exhibition space in order to best maintain the integrity of the extant wet finishing department and represent the predominant finishing processes.

Recommendations for Further Research

This study is just a beginning of an examination of the woolen manufacturing business of the Thomas Kay Woolen Mill. A complete study of the processes which took place in the dye house and the picker house of the mill would provide historic documentation for the future interpretation of these museum spaces.

Research related to the general business operations of the Thomas Kay Mill would provide more insight about this early Oregon industry and its relationship to the economy of Oregon. Further research about the wool purchased by the Thomas Kay Woolen Mill would provide documentation of the mill's relationship to the Oregon wool growing industry. An analysis of the financial success of the mill and a comparison of this mill's prosperity compared to other Oregon woolen mills would contribute to the knowledge about woolen manufacturing in Oregon.

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APPENDIX

1934 EQUIPMENT LISTING OF THE FINISHING DEPARTMENTS
 compiled from the Appraisement of Thomas Kay Woolen Mill
 by the General Appraisal Company

WET FINISHING ROOM: (pp. 104-109)

Fire Apparatus

- 1 5 Gal. chemical fire extinguisher

Trucks-Baskets-Boxes

- 1 3'6"x3' wash truck built of 2" lumber with false bottom, 2-9"x2 1/2" cast iron wheels
- 2 2'x6' Flat top truck mounted on 4 casters
- 1 wood hopper wheel barrow
- 1 2'x9'-2wheel hand truck 4x6" wood frame, 2-24x4" cast iron wheels
- 74 4 castor bobbin trucks averaged 3'x4'-3' box corner ironed
- 2 2 wheel beam dollie
- 1 *3 Lane canvas basket
- 36 Loom bobbin boxes
- 38 12x36" Galv. iron bobbin cans
- 12 16"x24"- 16' Kennett fiber chain box
- 20 *6 Lane canvas baskets

Scales

- 1 Fairbanks double beam double column counter scale with 12"x14" platform
- 1 Fairbanks Warehouse Sacle 17"x24" platform single beam

Benches, Racks & Lockers

- 1 2'6"x12' - 10" Stock bench
- 1 6"x10' Cloth inspection roll with rack
- 1 3"x6" Five roll cloth rack
- 1 5'6"x15' Bench with T&G top, end roll and 3 drawers
- 4 2'6"x6' zinc covered specking tables with adj. incline top

Benches, Racks & Lockers (cont)

- 1 3"x7' Two roll cloth inspection rack
- 2 3'x12' Work tables with T&G top
- 1 6' wide 6' high 16" deep two door stock locker
- 1 5' Wide 6' high 16" deep two door stock locker

Tools & Misc. Equipment

- 2 Arlington foot power portable sewing machines
- 1 4' Step ladder
- 1 9 Tread ladder
- 4 Spring bottom oiler
- 1 1"x50' Rubber hose
- 10 Galv. iron bucket
- 8 Broom
- 2 10 Gal. copper lye buckets
- 1 20" Rake
- 1 Aluminum lye dipper
- 1 Paper towel rack
- 1 Wood frame wheel barrow
- 1 12" Scoop shovel
- 1 Long handle round point shovel
- 1 Galv. iron waste can
- 5 Bench seats
- 1 12"x20" Bevel plate mirror
- 6 Hand cards
- 1 Pr. 10" shears
- 1 Junior clip punch
- 2 4 Spool factory sewing machine thread stands
- 2 Pitcher chairs
- 1 8 Day clock
- 8 Pr. misc. shears
- 1 6" Spade
- 1 Large hand scoop

DRY FINISHING ROOM: (pp. 135-136)

Benches, Racks & Lockers

- 4 2'8"x6' Metal top benches, 4x4" legs slant lower shelf
- 1 4'6"x14" Bench
- 1 2'6"x5' Bench 1x4" T&G top 4x4" legs
- 3 2'6"x6' Benches 1x4" T&G top 4x4" legs
- 2 2'6"x6'6" Floor platform
- 1 6'x6' Floor platform linoleum top
- 1 2'6"x7'6" Linoleum top bench
- 2 6' Benches
- 1 Common chair
- 1 4'x18' Floor platform
- 1 Wall cupboard
- 1 6'6"x15' Inspection bench with 24 drawers in base, test scale and reel
- 1 2'x3' Slant top desk
- 2 2 Door wall cupboards
- 1 Lot roller rails

Tools & misc. Equipment

- 4 Whisk brooms
- 1 Chicago pencil sharpener
- 1 12" Dial Hammond electric clock
- 1 Galv. iron bucket
- 2 1/2 pt. oil cans
- 1 1 pt. oil can
- 4 Common brooms
- 2 Galv. waste cans
- 2 Dust pans
- 1 8 Tread ladder
- 1 1 Qt. pump oiler