Paper Production
in the Hawley Pulp & Paper Co.
of
Oregon City, Oregon
by
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of the
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Approved:

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Founder of the Hawley Pulp & Paper Co.
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Figure 2

DIAGRAM OF THE HAWLEY PULP & PAPER CO.

OREGON CITY, OREGON

Southern Pacific Railroad

- R. R. Siding
- Sub-Station
- Sawmill
- Engines & Machine
- Sawmill "H"
- Plate Mill
- Boiler House
- Willamette River

- Salvage
- Groundwood Storage Tanks
- Electric Grinders
- Oregon City
- Woolen Mill
- #1 Machine
- Mill "A"
- Hydro-Plant
- Log Dump
- Boiler House
- North

- Willamette River
- Log Chain
- Boat
- Shredder
- Oil Tank
- Oil Pier
- 4th St. Warehouse
- Time Office
- Toweling Department
- Nurse

- Freight Spur to Portland, Ore.
- Storage Tanks
- Oregon City
- Sawmill
- #2 Oil Tank
The material included in this thesis gives a definite process of making paper as carried out at the Hawley Pulp & Paper Co. The material includes all the steps in making paper from the time the log reaches the mill until it is ready to be shipped to waiting buyers, as the finished product, paper, and also includes costs of materials used, size of equipment, and other statistics concerning paper production at this plant. This provides a short, complete story of paper which may be used in place of several separate books on the subject of "Papermaking".

Mr. Willard P. Hawley, after many years in the paper-making business where he started at the bottom and worked up to a position of second largest stockholder in the Crown Paper Mills, (now the Crown Willamette Paper Mills), carried out an old ambition to have his own business by founding the Hawley Pulp & Paper Company on the East bank of the Willamette River at the Oregon City Falls in Oregon City, Oregon, in 1908. The Willamette Valley is extremely narrow at this point with a narrow strip of shore on either bank being backed by a precipitous rocky bluff. The mill was therefore forced to build on this narrow strip in somewhat extended order.

After launching this company Mr. Hawley began to manufacture paper under his own name on a single machine housed in a wooden building. There was also a small sulphite mill and a groundwood mill which derived its power from the falls. In 1911, the Number two and Number three machines, 114 inch
and 116 inch Harper fourdriniers, were added and both the sulphite and groundwood mills expanded. In 1917 production was doubled by the installation of the Number four machine which was a 164 inch machine with a speed of 700 feet a minute. A serious fire in 1923 completely destroyed the Number one machine, but it was immediately replaced with the present Number one machine, a 136 inch fourdrinier. The capacity of this machine was increased in 1927 by the installation of a new drying system.

The year 1927 was the beginning of several new improvements. Two of these improvements were the building of a modern, electrically driven groundwood mill, and the installing of a new Number four machine. Since this time numerous changes have been continually made throughout the mill.

THE OLD GROUNDWOOD PROCESS

The Hawley Mill employs two methods of making pulp which is later made into paper. The first of these two methods is the making of pulp by the groundwood method which is accomplished by two distinct processes. The first method, the old groundwood process, is the process used when the mill was first established. The log is brought to the mill by truck or is rafted in on the Willamette River, and placed in the log pond at the Southern end of the mill, where it is directed toward a spiked cog lift which carries the log into the sawmill after being washed off by streams of water which are under a large pressure. This stream of water tends to
clean all the surface dirt and gravel off the log, thus saving wear on the cutting saws, Figure 3 and 4. This sawmill, Mill "H", cuts the log, which may run as long as 40 feet, into approximately four foot lengths with an eight foot circular saw, (for location of different sections of the mill see Figure 2). These four foot pieces are then placed on end and moved by means of moving chains, toward the splitting machine, Figure 6, which is a pneumatic, punch like hammer actuated by hand to strike a wedge placed on top of the piece by hand. This machine splits the section into four or more separate parts, depending on the size of the log. Farther down the chain the pieces are split again by the use of a hand axe, after which time the larger and knotty pieces are cut into smaller pieces by using a smaller four foot circular saw or knee bolter. These pieces average about 180 pieces per cord of wood and are now about 24 inches by 8 inches in size, and are ready to be barked. This is accomplished by placing the wood against a revolving set of knives which cut off the outer layer of bark which cannot be used in making the pulp. The remaining piece is either sent to the grinders at Mill "A", to the grinders at Mill "H" located below the sawmill, or to the chipper, located back of the Number four boiler house, by means of a water flume built overhead. Surplus pieces of wood from this sawmill are stored on a boat located in the Northwest corner of the log pond. At the grinders the wood
is wetted and passed into a series of grinding operations during which it is torn to shreds against revolving grinder stones approximately 54 inches by 27 inches in size. The wood is kept continually wet, water being sprayed onto the grindstone to lower the temperature and to prevent burning of the pulp, and is constantly being crushed to finer and finer particles, finally emerging as pulp, mashed and churned to the consistency of a soggy breakfast cereal. After this reduction to pulp it is screened to remove the knots and the coarse slivers, and is then pressed into laps or piped to the beater room as slush pulp.

Pulp laps are pressed out on a wet machine. The pulp is placed on a felt which carries it between two wooden rolls, the felt going around the bottom roll, the pulp sticking to the top roll. When the pulp on the top roll is thick enough it is cut off with a wooden stick and then folded and sent to a pulp pile in order to have a supply of groundwood pulp available during the summer when the river is too low to run the grinders. These laps vary in size and weight, but are about 28 inches by 18 inches by 5 or 6 inches thick, weighing 18 pounds if air dry pulp, but are generally heavier because they consist of 70% moisture and 30% dry pulp. Pulp laps are piled in open places around the mill, these stacks being as high as sixty feet, other dimensions depending on their location.
Figure 3
Log entering the sawmill on a cog lift, showing water jets used to clean logs.

Figure 4
Looking out from the inside of the sawmill lift.

Figure 5
Left foreground is the hydro-electric plant. Right foreground is Mill "A". Far right foreground is a pulp pile.
Figure 6
The splitting machine.

Figure 7
Left foreground is the boat used to store surplus wood from the sawmill. Behind this the Little Crown boiler house. Right middle is the sawmill. The large building to the right is the Number one machine, and the Number one beater room. The log pond is to the direct front.
THE NEW ELECTRIC GRINDERS

The second method of making groundwood pulp is attained in the new electrically driven groundwood mill, Mill "B", a building which is two stories high on the west half, and four levels high on the east half. Four foot, peeled wood is delivered by truck and railway cars and is either carried in one cord racks or is loaded directly to these racks at the mill where it is picked up by an overhead electric car, which operates as a bridge crane, 40 feet high and 200 feet long, on three tracks or two separate sets of tracks, and delivers to the grinder room which is on the second floor, Figure 8 and 10. This simple method of conveying the wood not only affords a means of handling and rapid transportation, but also gives a check on the car measurements. The grinding room proper is equipped with five three-pocket, left hand 54 inch by 54 inch face grinders, operated singly, and each driven by a 1000 horsepower, 2300 volt synchronous motor which is operated by push button control, Figure 9. Stock from these grinders passes to an inclined top bull screen and is then pumped to the fourth floor level to flow by gravity through two knotters, riffle boxes, two screens, a battery of four 138 inch by 72 inch deckers, and then to two large concrete stock tanks on the ground floor, each of these being equipped with a battery of agitators. All drives in the mill are individual, there being no belting, drives operating directly or through reduction gears. The two circular concrete storage
Figure 8
Forefront is the overhead crane. Far right Mill "B" electric grinders. Left background, the two storage tanks.

Figure 9
The new electric grinder installation in Mill "B".

Figure 10
Left middle is the Number 4 warehouse. Right middle is the Number 4 machine building. Right foreground is Mill "B", sub-station to the rear.
Grinders  
Artificial &  
Sandstones

Bull Screen  
1/2" Perforations

Knotter Screens  
7/32" Perforations

Fine Screens  
.060" Perforations

Deckers--  
Thickeners

Storage--  
Tanks

Paper Machines

Wood

Water

Slabs to boiler room furnace

Rejects to flat screens

Reject to flat screens

Flat Screen

Rejects

Refiner

Accepted

GROUNDWOOD FLOW DIAGRAM

Figure 11.
tanks which are in connection with the groundwood mill have a total capacity of about 125 tons, permitting the storage of slush pulp to take care of production fluctuations. There are 2200 pounds of groundwood pulp obtained from one cord of pulp wood.

THE SULPHITE PROCESS

The second method of making pulp in the Hawley Mill is by the sulphite or acid process, the active pulping chemicals being sulphurous acid, $\text{H}_2\text{SO}_3$, and its calcium salt, calcium bisulphite or $\text{Ca(HSO}_3\text{)}_2$, in a watery solution. This chemical dissolves the lignin, or all the non-cellulose material, leaving the cellulose fibers in the form of pulp. Lignin and the non-cellulose products of very complex character comprise more than 50% of the weight of the wood so that the yield of good papermaking fiber is less than 50% in the preparation of the wood pulps by this process, a yield of 42% to 45% of the weight of the wood being considered satisfactory.

A mixture of sulphur dioxide, air, and nitrogen, formed by first melting sulphur with steam and then burning the sulphur in a burner located in the acid plant, part of Mill"C", is passed up through acid towers containing stacks of limestone placed on crib work forming a grate to let the acid come through. Here the sulphur dioxide is absorbed by water forming sulphurous acid, which in turn contacts calcium carbonate, forming calcium bisulphite. The strength of the gas
FLOW SHEET OF
ACID PLANT AND DIGESTERS

Figure 12
Figure 14
Center background is the Number one beater room, with a stock tank in front. Center foreground is the accumulator tank. Right foreground is part of Mill "C".

Figure 15
Left foreground is Mill "C". Cement towers are the acid towers. Right foreground is the receiving and shipping room with Southern Pacific Railroad tracks. Large smokestacks are from the Number four boiler house.
to the towers is 18% sulphur dioxide, SO₂, and the strength of the acid from the towers is 3.80% free sulphur dioxide, and 1.20% sulphur dioxide combined with calcium.

All wood used in the sulphite process is reduced to chips to aid penetration and cooking, the chips being about ½ inch to 1 inch long. The wood is chipped before it is put in the bins over the digester in the digester room, part of Mill "C", where it is cooked with the liquor made in the towers. See Figure 14 and 15. The cooking time is 8 to 9 hours, the maximum cooking pressure is 76 pounds, and the maximum cooking temperature is 302°F. The Hawley Mill digesters are small in comparison to other mills, there being three, five and one-quarter ton and three, eight and one-half ton cooks. The amount of sulphur dioxide bled off the top of the digester controls the amount of acid and the temperature inside. These digesters are blown at 45 pounds pressure by opening a valve at the bottom of the digester, the inside pressure forcing all the pulp out into a blow pit with a drainer bottom. During the first three hours of cooking any surplus acid from the digesters is run off into an accumulator tank where it is available for later use. This cooking acid is not a chemically pure combination because it contains organic matter which is driven over with the relief from the digester and also leached out of wood during precirculation, but this is settled out and the acid re-used. See Figure 12, for flow sheet of sulphite plant, and Figure 13 for pipe diagram.
After the liquids have drained away in the blowpit, the remainder is washed with water, screened, and either compressed into laps, put in a beater, or it is put in storage chests and soon used in the beaters. The laps of sulphite pulp are stored in large piles the same as for groundwood pulp in order to have a supply to meet excessive demands.

The mechanical wood pulp represents the lowest grade and the cheapest form of pulp for papermaking. The strength of the resulting paper is reduced because of the amount of lignus material that can't be hydrated from the pulp. This loss of strength is so great that the pulp must be mixed with sulphite pulp when it is converted into newsprint and other better paper." Newsprint is 20% sulphite and 80% groundwood pulp, while wrapping paper is 100% sulphite, the percentage used depending on the type of paper to be made.

THE PAPERMAKING PROCESS

The conversion of pulp into paper is a process entirely separate from the manufacture of the pulp. If the pulp is in lap form it is first shredded by a set of revolving knives, and then pumped through a pipe to the beater room. If the pulp is in slush form it is piped directly to the beaters. All the added materials that compose paper are placed in the beater with the pulp. The pulp fibers pass between two sets of bars and are cut and spread in this operation, the action being regulated to yield a pulp of the desired character for the particular paper wanted. This process of beating the
pulp also gives it a uniform texture, see Figure 16. Sizing is one of the compounds placed in the beaters, and is the term used for the process making paper water and blood proof. Rosin and wax emulsions are the sizing agents used and are precipitated with aluminum sulphate, papermakers alum. Mineral fillers are also added to fill the interstices between the fibers and to make the resulting paper smoother and more nearly opaque. China clay, talc, and calcium carbonate are the fillers that can be used.

Most papers require coloring, blue dyes being used to make white paper as it masks the yellow and brown color of the pulp and makes it look brighter. Colored papers of any particular shade may be obtained by adding the proper dyes to the pulp while in the beater. Analin dyes are the ones used at the Hawley Mill. The mixing of the color continues until it has been thoroughly and uniformly impregnated in the mass.

After these materials are added, the final step is fabrication and finishing the sheet of pulp on the paper machine. This machine may be considered to be an aggregation of four machines which operate simultaneously, the most important unit of which is known as the Fourdrinier wire. The first section of the machine forms a web of paper by receiving a thin suspension of pulp in water on a moving endless belt of wire cloth through which the water drains off leaving a fine web of matted fibers, see Figure 17. The gauge of the wire depends on the kind of paper to be made. The second section
Figure 16
The beating and coloring machine. "The beaters."

Figure 17
The wet end of the paper machine showing pulp on traveling wire screens.

Figure 18
The end of the wire screen where sheet is fed into the presses.
compacts this wet sheet by passing it through a series of steel and rubber rolls or presses, see Figure 18. The third section of the machine dries the sheet on a series of steam-heated drying cylinders around which the paper passes. Then the sheet passes to the fourth section of the machine which consists of heavy steel rolls or calenders, set in series, between which the sheet is passed. Here it is ironed, in approximately the same manner as an electric ironer performs the task in an ordinary household, see Figure 19. The ripples in the sheet vanish, and the roughness caused by fibers fuzzing at the surface is smoothed out.

The paper comes out of the calenders and is wound on rolls which are a trifle unwieldy, being about 36 inches in diameter and weighing between 2200 and 3000 pounds on some of the machines, while on the large Number four machine the rolls may weigh as much as 5800 pounds, so the paper is next wound on a second reel and trimmed to the correct width as it travels from one roll to the other, see Figure 20.

The rolls are now carried by an overhead crane to the weighing and wrapping department where all the rolls are marked and labeled, see Figure 21. The roll is then placed in the shipping department or may be cut up into special sizes, or kept in the storage room as a supply for special orders, see Figure 22 and 23. One type of sheet cutter is the type used to cut Cheviot meat wrap. This cutter is a machine that holds twelve or more machine reels. The ends of each reel
Figure 19

The paper coming from the driers, being ironed, and wound on reels.

Figure 20

The reel of paper being rewound and trimmed to smaller sizes.

Figure 21

The wrapping machine. This turns the cylinder of paper as the wrapping is applied.
are threaded through a cutting device on the sheet cutter, the slitters being so placed that sheets of the desired width can be produced. As the spacing of the slitters determines one dimension of the sheet, the other dimension is determined by the speed of a large revolving blade which cuts the paper to the required measurement. As the rest of the equipment on the sheet cutter travels at a uniform speed, when the revolving blade operates at a slower speed a longer sheet is produced, with shorter sheets being the result of speeding up the revolving blade. Sizes vary from excelsior paper in one-eighth inch strips to 72 inch sheets.

Figure 22
The storeroom for paper rolls.

Figure 23
The truck shipping room and the R.R. siding for loading cars.
After this final cutting of the paper in the finishing room it may be shipped from the mill.

FACTS ABOUT THE MILL

Shipping methods of the Hawley Mill are 50% by truck. Paper is shipped by this method into Idaho, to Southern Oregon, and north to Bellingham, Washington. The biggest percentage of this being trucked to Portland newspapers. These trucks hold 13 rolls of paper weighing about 1800 pounds each. Rail shipments include the remaining 50% which goes to the New York market. Some of this paper is shipped by boat by reloading it at Portland. Today the Hawley line of papers is distributed by paper jobbers throughout the nation and also in foreign countries.

The Hawley Pulp & Paper Co. is one of three mills in the low pressure boiler operations evaporating at 150 pounds guage pressure, steam being delivered at boiler pressure to the digesters and to the turbines and engines, which exhaust at 15 to 30 pounds to the dryer headers of the paper machines. The Little Crown boiler house, located west of the sawmill on the east bank of the Willamette River, develops supplementary power by burning refuse from the sawmill.

The company owns original water rights on the Willamette River for 1,405 horsepower, produced at the Hydro-electric Mill located beyond Mill "A", and also has long term leases for 10,598 horsepower which is available for the groundwood pulp mill and power requirements approximately eight months
in the year. This power is acquired from the Portland General Electric Company.

The company also owns some 23,000 acres of timber lands located in Clatsop and Tillamook Counties, Oregon, which are estimated to carry 800 million feet of timber. This timber has been carefully selected as to quality and accessibility, and is held as a reserve for future needs.

The complete organization of the mill is at Oregon City. This includes a regular office force, an engineering department, a sales organization, and a business staff. The laboratory staff consists of sixteen men, some of whom are at work all the time.

All maintenance is carried out at the mill except for foundry work and the making of large castings and machine parts which are made elsewhere.

Today the company turns out over 250 tons of paper and 100 tons of sulphite a day, has a capacity of 260 tons of groundwood pulp per day, a payroll of 680 men whose wages range from sixty-five cents per hour on upward, these wages being now regulated by the two labor unions at the mill, these being the "International Brotherhood of Paper Makers", and the "Brotherhood of Pulp, Sulphite, and Paper Mill Workers". The annual payroll runs over one million dollars, the mill is valued at five million dollars.

The newest paper machine, the Number four machine, ("The W. P. Hawley"), is the last word in newsprint machines being
the second largest on the coast, operates at a speed of 1200 feet a minute, and produces 168 tons of paper per day.

The company stores peeled pulp wood on a field overlooking the Oregon City Falls. This provides a continuous supply of pulp wood for periods when climatic conditions make it hard to bring wood into the mill.

The mill's policy concerning anyone interested in visiting the mill is quite convenient for anyone wishing to see paper produced. Anyone applying at the office is given a pass, see Figure 24, which the individual must sign to relieve the company of any responsibility. A guide is then provided in order to explain the different processes of making paper. Under periods of hazardous construction this privilege is canceled.

At the present time Mr. Hawley, the founder's son, has no interest in the mill, it now being owned by a corporation. Many stockholders of this corporation are employed in the mill, these employees buying stock when the Hawley's sold the mill.

STATISTICS CONCERNING PAPER PRODUCTION

Mill production is on four separate machines:

The Number one machine produces 65 tons of paper per day, is a straight Fourdrinier with 134 inch wire and 122 inch trim.

The Number two machine produces 21 tons per day, is a Fourdrinier pickup with 114 inch wire and 104 inch trim.
HAWLEY PULP & PAPER COMPANY

ISSUED SUBJECT TO THE FOLLOWING CONDITIONS: The person accepting this pass assumes all risk of accident, and expressly agrees that the Company shall not, under any circumstances be liable, by negligence of its agents or otherwise, for any injury to the person or for loss or injury to his or her property while using it.

Interference with apparatus and conversation with Employees are strictly forbidden. All passes subject to revocation by the Company or any authorized agent thereof.

OREGON CITY, OREGON

PASS BEARER

TO

Good only for use on March 19 41

The undersigned having applied for a pass to go through mills of HAWLEY PULP & PAPER COMPANY, hereby agrees and accepts said pass on the express condition that he or she will make no claim whatever for damages in case of accident or injury to him or her in person or property while on said premises of said company or in use of said pass.

Signature

Figure 24

Pass issued to anyone wishing to go through the Hawley Pulp & Paper Company Mill.
The Number three machine produces 38 tons of paper per day, is a Harper machine with 116 inch wire and 107 inch trim.

The Number four machine produces 168 tons of paper per day, is a straight Fourdrinier high speed newsprint machine with 234 inch wire and 222 inch trim.

The Number one and three machines have steam engines driving direct current generators. The Number two machine has a steam turbine, and the Number four machine a direct current turbogenerator with electric drives.

There are four species of wood used by the Hawley Pulp & Paper Company; a total of 425 cords being used per day.

- Hemlock: 312 cords used per day.
- Spruce: 91 cords used per day.
- White Fir: 22 cords used per day.
- Cottonwood, a small percentage is used per day.

The cost of pulp wood varies between $5 and $7 per cord, spruce being the highest priced and cottonwood the cheapest.

The cost of newsprint is about $50.00 a roll by contract, the roll weighing about 1800 pounds, $58.00 a roll for paper in sheets, and about $5.00 higher for spot or call orders.

Barging rates for moving oil from the oil company docks located at Linnton, below Portland, to Oregon City.

- 5000 barrel minimum, six cents per barrel.
- 3000 barrel minimum, seven cents per barrel.
- 2000 barrel minimum, seven cents per barrel.

The present posted price is $1.15 per barrel, f.o.b. seller's storage plant, with a barging cost to the mill of six cents, in this case, per barrel of 42 gallons, making a total cost of $1.21 per barrel delivered to the Hawley plant.
along the Willamette River where it is pumped into oil storage tanks.

4Sulphur, bought through the Texas Gulf Sulphur Co. of New York, costs about $24.00 per long ton of 2240 pounds. Limestone costs, from the different sources, will range between $4.00 and $5.00 per short ton of 2000 pounds delivered, depending on its source, but will probably average about $4.50 under present conditions. Most of this limestone is bought from the Pacific Portland Cement Co. of Portland, Oregon.

Quality and control over production are maintained by the following tests:

For the groundwood process: Freeness, consistency, strength, temperature, fibre length, and fibrillation.

For the sulphite process: Beaten strength, raw strength, bleachability, beaten tear, raw tear, beaten freeness, and raw freeness.

For newsprint paper: Weight, bursting strength, tensil strength, density, brightness, oil penetration, formation, opacity, caliper, smoothness, and ink test.

The company's best market is its immediate vicinity, California, and the Southwestern states. Oregon City is on the main line of the Southern Pacific Railroad with freight rates as quoted on newsprint, per ton, minimum 40,000 pounds, from Oregon City to the following places:
To Montana, Wyoming, and Colorado is $12.70.
To North & South Dakota, Nebraska, Kansas, Oklahoma, Texas, and New Mexico is $15.80.
To Idaho is $8.60.
To Utah is $11.10.
To Iowa, Illinois, and Missouri is $20.00.

A cost analysis for the mill is as follows:

For groundwood pulp manufacture:

<table>
<thead>
<tr>
<th>Item</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood</td>
<td>45%</td>
</tr>
<tr>
<td>Direct labor</td>
<td>14%</td>
</tr>
<tr>
<td>Power</td>
<td>23%</td>
</tr>
<tr>
<td>Pulp stones</td>
<td></td>
</tr>
<tr>
<td>Repair labor</td>
<td>9%</td>
</tr>
<tr>
<td>Repair materials</td>
<td></td>
</tr>
<tr>
<td>Depreciation</td>
<td></td>
</tr>
<tr>
<td>Taxes</td>
<td>9%</td>
</tr>
<tr>
<td>Insurance</td>
<td></td>
</tr>
<tr>
<td>Manufacturing burden</td>
<td></td>
</tr>
</tbody>
</table>

For sulphite pulp manufacture:

<table>
<thead>
<tr>
<th>Item</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood</td>
<td>60%</td>
</tr>
<tr>
<td>Direct labor</td>
<td>10%</td>
</tr>
<tr>
<td>Steam</td>
<td>10%</td>
</tr>
<tr>
<td>Power, repair labor, and repair material</td>
<td>6%</td>
</tr>
<tr>
<td>Limestone and sulphur</td>
<td>7%</td>
</tr>
<tr>
<td>Taxes, depreciation, insurance, man. burden</td>
<td>7%</td>
</tr>
</tbody>
</table>

For the manufacture of paper:

<table>
<thead>
<tr>
<th>Item</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulp, 80% groundwood and 20% sulphite</td>
<td>57%</td>
</tr>
<tr>
<td>Direct labor</td>
<td>8%</td>
</tr>
<tr>
<td>Power</td>
<td>12%</td>
</tr>
<tr>
<td>Felts, wires, canvas, repair labor, repair material, and miscellaneous</td>
<td>10%</td>
</tr>
<tr>
<td>Depreciation, taxes, insurance, manufacturing burden</td>
<td>9%</td>
</tr>
<tr>
<td>Finishing labor, finishing material</td>
<td>4%</td>
</tr>
</tbody>
</table>


The following grades of paper are manufactured by the Hawley Company:

Cheviot meat wrap
Cheviot wrappings
Cheviot bristol
Cheviot book
Cheviot envelope
Drawing manilas
Sierra meat wrap
Sierra sulphite
Poster papers
Crepe napkin paper
Roll and interfolded towels
Unbleached toilet tissue
Moistproof wrappings
Fruit wrapping papers
Treated Cheviot innerwrap
Victor meat wrap
Shasta meat wrap
Economy sulphite

See pages 28, 29, 30, and 31 for samples of these different papers.
Variety of Papers Manufactured by the Hawley Pulp & Paper Co.

Shades of
Blue, Green, Gray
Goldenrod, Mandarin
Granite, Brown, Fawn

Green
*Aristel Cover*
26x40 - 98/500 &
26x40 - 125 lbs.
per 500

TINTED CHEVIOT BRISTOL
Canary, Green, Tan, Red
Blue, Orange, Gray, Mandarin

Tinted Cheviot Mimeograph
Canary, Green, Tan, Red
Blue, Orange, Gray, White

POSTER PAPERS
32 lb. Basis
Green, Orange, Mandarin
Blue, Canary, & Pink

DISTINCTIVE COLORS

TINTED CHEVIOT WRAPPING
Grade 274
*Basis 30 lb.*
Green

QUALITY PAPERS

White
Newsprint
Grade 125
32 lb. Basis
Roll Finish
DISTINCTIVE COLORS

SIERRA KRAFT
Machine Finish
*Basis 75 lb.*
Brown
QUALITY PAPERS

SIERRA KRAFT
Machine Finish
*Basis 100 lb.*
Brown
QUALITY PAPERS

SIERRA KRAFT
Machine Finish
*Basis 25 lb.*
Brown
QUALITY PAPERS

GIBRALTAR MANILA
Grade C 70
*Basis 25 lb.*
Manila
QUALITY PAPERS

SHASTA DRUG BOND
Grade 276
*Basis 35 lb.*
White
QUALITY PAPERS

PATTERN PAPER
Grade 251
*Basis 50 lb.*
Black
QUALITY PAPERS
<table>
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<tr>
<th>Product Type</th>
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<tr>
<td>Cheviot LiteWrap</td>
<td>B 275</td>
<td>25 lb.</td>
<td>Distinctive Colors</td>
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<tr>
<td>Cheviot Meat Wrap</td>
<td>275</td>
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<td>Macaroni Paper</td>
<td>A 86</td>
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<tr>
<td>Laundry Sulphite</td>
<td>C 75</td>
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<td>Economy Sulphite</td>
<td>C 159</td>
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<td>Shasta Meat Wrap</td>
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DISTINCTIVE COLORS

NATURAL
M. F. SIERRA KRAFT
Basis 30 lb.

QUALITY PAPERS

DISTINCTIVE COLORS

SIERRA BUTCHER
Grade C 300
Basis 55 lb.

QUALITY PAPERS

DISTINCTIVE COLORS

BUTCHER FIBRE
Grade 310
Basis 55 lb.

QUALITY PAPERS

DISTINCTIVE COLORS

BROWN
NARROW STRIPED KRAFT
Basis 25 lb.

QUALITY PAPERS

DISTINCTIVE COLORS

GRAY
NARROW STRIPED KRAFT
Basis 25 lb.

QUALITY PAPERS
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1</td>
<td>Pacific Pulp &amp; Paper Industry</td>
<td>April 1928</td>
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<td>2</td>
<td>The Story of Your Newspaper</td>
<td></td>
<td>Hawley Pulp &amp; Paper Co.</td>
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<td>3</td>
<td>Timber Products and Industries</td>
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<td>4</td>
<td>The Pulp &amp; Paper Industry of the Pacific Northwest in Three Parts</td>
<td></td>
<td>Raymond M. Miller, Bruce E. Hoffman, W.J. Wakeman, Lyman Griswold, and Frank M. Byam</td>
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<td>5</td>
<td>Paper Mill and Wood Pulp News</td>
<td>November 28, 1940</td>
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<td>6</td>
<td>Cheviot Selling Tips</td>
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<td>Celmor Cheviot</td>
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